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Shark Meshing (Bather Protection) Program 2023/24 Annual Performance Report

Prepared in accordance with the 2017 Joint Management Agreement and associated 2023 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 *Biodiversity Conservation Act 2016* (BC Act).

A new, single JMA under the FM Act was prepared in 2017 and the 2017/18 meshing season marked the beginning of SMP operations under the 2017 JMA. Some of the key changes to the JMA were refined trigger points and defining 'target shark' species as White Shark, Bull Shark, and Tiger Sharks for the purposes of the JMA and Management Plan. In 2022 the JMA and associated Management Plan were reviewed as part of the 5-year review of the Plan. This review identified no need to amend the JMA, however the Management Plan (MP) which controls the operational aspects of the SMP was amended with key changes being made to the trigger point analysis system and reporting timeframes for tripped trigger points, giving rise to the new 2023 MP. The 2023/24 meshing season was managed and operated under the 2017 JMA and associated 2023 Management Plan.

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 BC Act by 31 July each year.

A total of 255 marine animals were caught in the SMP during the 2023/24 meshing season, comprised of 15 target sharks and 240 non-target animals. Ninety-two animals (36%) were released alive.

The 15 target sharks comprised 12 White Sharks and 3 Tiger Sharks.

The 240 interactions with non-target animals consisted of:

- 109 non-target sharks, including 57 Smooth Hammerhead Sharks; 14 Greynurse Sharks; 11 Dusky Whaler Sharks; 10 Bronze Whaler Sharks*; 3 Great Hammerhead Sharks; 3 Broadnose Sevengill Sharks*; 3 Common Blacktip Sharks*; 3 Shortfin Mako Sharks*; 2 Silky Sharks*; and 1 of each of Australian Angel Shark, Spinner Shark*, and an unidentified hammerhead shark (* reported as target sharks prior to 2017).
- 90 rays, including 52 Southern Eagle Rays; 33 Australian Cownose Rays; 4 Smooth Stingrays, and a White Spotted Eagle Ray.
- 29 marine reptiles comprised of: 11 Leatherback Turtles; 3 Loggerhead Turtles; 13 Green Turtles; 1 Hawksbill Turtle; and 1 Olive Ridley Turtle.
- 7 marine mammals comprised of: 5 Indo-Pacific Bottlenose Dolphins; 1 Common Dolphin; and 1 Humpback Whale; and
- 5 interactions with finfish (Australian Bonito, Longtail Tuna, and Mulloway).

56 (22%) of the interactions were with threatened species comprised of: 14 Greynurse Sharks; 13 Green Turtles; 12 White Sharks; 11 Leatherback Turtles; 3 Loggerhead Turtles; and 3 Great Hammerhead Sharks.

Nine (3.5%) of the interactions were with protected species comprised of: 5 Indo-Pacific Bottlenose Dolphins; 1 Humpback Whale; 1 Common Dolphin; 1 Olive Ridley Turtle; and 1 Hawksbill Turtle.

The observer program was implemented with observers present on 16.5% of all net checks (hauls/runs) undertaken by SMP contractors. Observers continued to focus on ensuring collection of biological samples in accordance with the Strategic Research and Monitoring Program. Biological samples were taken from 110 animals (4 alive, 106 dead) entangled in the nets in 2023/24.

The trigger point for the objective of '*minimising the impact on non-target species and threatened species'* was tripped in 2023/24 for Leatherback Turtles, Indo-Pacific Bottlenose Dolphins, and Great Hammerhead Sharks.

During the 2023/24 meshing season there was one reportedly unprovoked shark-human interaction at a meshed beach of the SMP. A female surfer reportedly suffered minor injuries to her lower left leg from what is believed to have been a wobbegong shark at Avoca Beach in November 2023, noting that DPIRD was unable to formally verify the incident. As the injuries sustained during this interaction were minor the trigger point for '*reducing the risk to humans from shark attacks at beaches of the SMP*' was not tripped.

During the 2023/24 meshing season, there were two verified, unprovoked shark-human interactions at unmeshed ocean beaches along the NSW coastline. Both interactions were outside of the SMP area of operation and occurred at: Old Bar Beach, Old Bar in the Mid North Coast region (minor injuries to leg); and Brunswick Heads Beach, Brunswick Heads on the Far North Coast (minor injuries to foot and ankle). A third unprovoked interaction did occur within the SMP region of operation but was not at an ocean beach, it was in a coastal estuary at Elizabeth Bay, Sydney Harbour (serious injuries sustained to lower leg). There was also a fourth unprovoked interaction at Lord Howe Island, where a surfer's board was bitten by a small Galapagos Whaler.

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 2023/24.

In 2023/24, DPIRD met all requirements of the JMA and associated Management Plan.

In accordance with clause 9 of the JMA, the Management Plan and 2017 JMA were subject to review in 2022. The review by the Parties to Agreement in 2022 did not identify a need for any specific amendments to the JMA but specific amendments to the Management Plan were identified. A working group was established to make changes to the Management Plan with specific attention being placed on trigger point analysis of threatened species entanglements. Amendments were made to the MP and a new 2023 MP adopted for the 2023/24 meshing season. DPIRD and DCCEEW, in consultation with the two scientific committees, are continuing investigations into the use of trigger points for the SMP.

Introduction

The Shark Meshing (Bather Protection) Program (SMP) is a public safety measure introduced in 1937 to reduce the risk of shark interactions at the State's most popular public bathing beaches. Surf Life Saving NSW figures indicate that about 4.1 million people visited those beaches in 2023/24. Under the current program, 51 beaches between Wollongong and Newcastle (Table 1, Map 1) are netted by seven contractors using specially designed mesh nets from 1 September to 30 April.

The aim of the SMP is to reduce the threat of shark interactions 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. According to the May 2024 update of the Australian Shark Incident Database (ASID, formerly known as the Australian Shark Attack File – Appendix 1), 35 unprovoked shark encounters have reportedly occurred at netted beaches of the SMP, 17 of which involved White Sharks, a target species for the program. Other encounters at meshed beaches were with Wobbegong Sharks (12), unknown species of sharks (3), and unidentified Whaler Sharks (3). Although one White Shark bite was fatal and some have caused serious injuries, the shark bite data for the SMP and similar programs in other jurisdictions have reportedly reduced the rate of interactions by an average of 90% (Dudley, 1997 – noting that at the time of that publication there had only been 14 interactions at NSW netted beaches).

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, or causes 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 five-yearly reviews, and those reviews gave rise to a single 2017 JMA between the then Minister for Primary Industries and the then Chief Executive of the Office of Environment and Heritage (now the Secretary, Department of Climate Change, Energy, the Environment and Water (DCCEEW)) in accordance with section 221W(3) of the FM Act. The 2022 five-yearly review identified no need to amend the 2017 JMA, but the management plan was amended and published in October 2023 as the 2023 Management Plan.

This Annual Performance Report was prepared in accordance with the 2017 JMA and the 2023 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 DPIRD 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 seven regions and 51 beaches of the SMP in 2023/24.

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	Freshwater	Wanda	Thirroul
Merewether	The Entrance	Killcare	Mona Vale	Queenscliff	Elouera	North Wollongong
Redhead	Shelly	Umina	Warriewood	North Steyne	North Cronulla	South Wollongong
				Manly	Cronulla	

* Blacksmiths was historically called Swansea-Blacksmiths

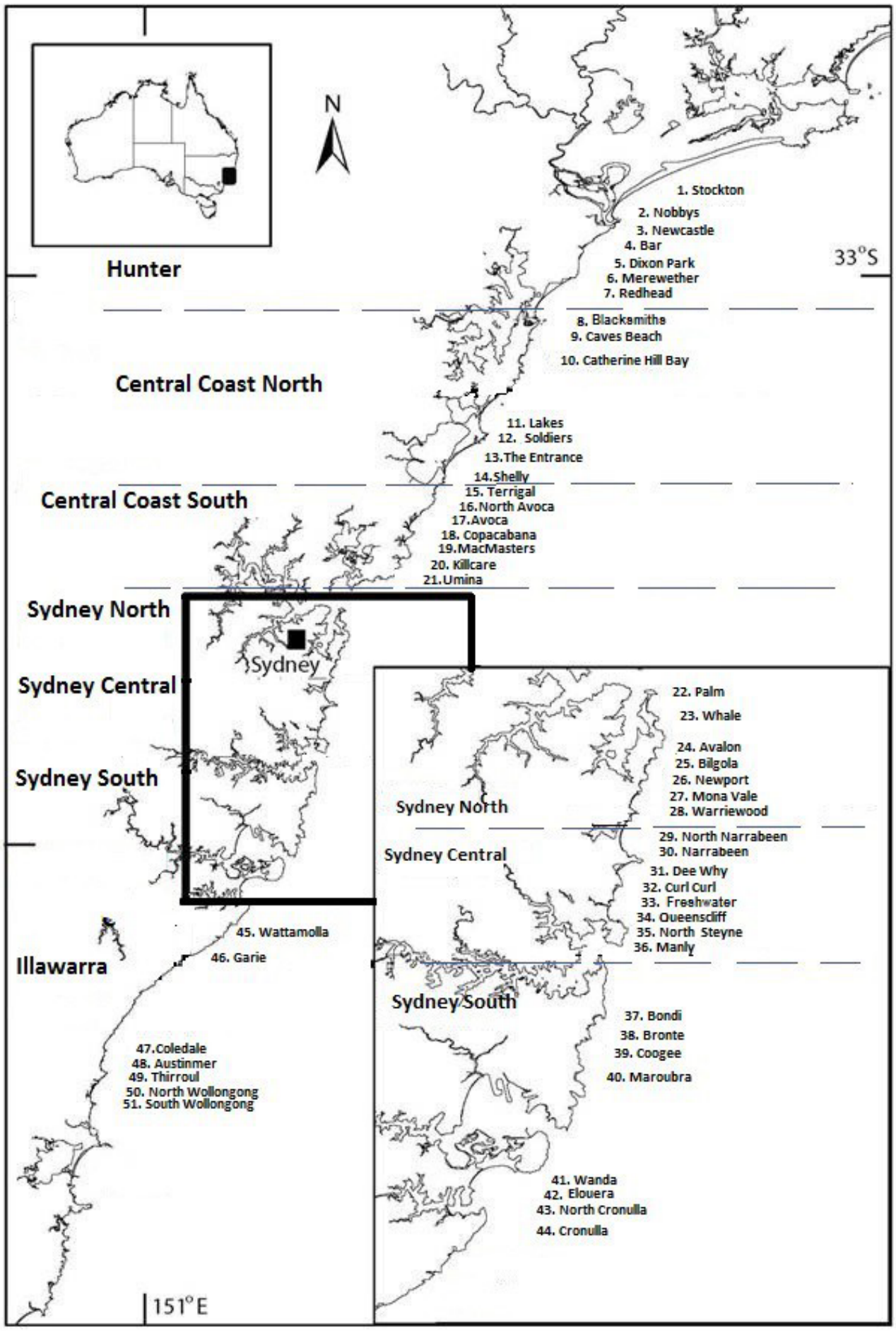

Figure 1 Location of Shark Meshing (Bather Protection) Program beaches.

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 Agriculture, Regional NSW and Western NSW and the Secretary, Department of Climate Change, Energy, the Environment and Water (DCCEEW), respectively, of any deficiencies in implementation of the JMA by either party. This report and the advice of the FSC and SC are 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 are expected to be inspected prior to the commencement of the season to ensure all contractors were complying with current contract conditions, however due to contractual delays preseason net inspection could not take place. Net inspections were carried out by observers while conducting observer duties onboard vessels.
- 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 seven meshing regions instead of six, with net numbers and geographic size of regions more even, where possible.
- All contractor vessels are required to be equipped with an Automatic Identification System (AIS) whilst undertaking meshing activities. The AIS units are a contractual requirement under the Shark Meshing Program, and live monitoring of vessels is conducted by the DPIRD Shark Program staff.
- 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.
- Auditing processes are conducted regularly through cross referencing of vessel movement data, contractor catch reports, and overt and covert observer inspections.

The SMP nets are also subject to numerous factors outside the control of the Management Plan such as weather conditions, whale strikes and human interference. The following damaged, vandalised, or lost nets were reported during the 2023/24 season.

There were eleven reports of nets being damaged during the 2023/24 season:

- 23 September 2023 – Central Coast North contractor and shark meshing observer reported a large hole in the nets at Caves and Catherine Hill Bay. Suspected whale damage on both nets due to size of the damage/hole and the mesh appearing to have been snapped. All ropes, floats and mesh recovered;
- 26 September 2023 – Sydney North contractor and shark meshing observer reported a large amount of damage to the net at Bilgola. All ropes, floats and mesh recovered. Suspected whale damage;
- 29 September 2023 – Sydney North contractor reported a large hole in the shark net at Warriewood. Mesh appeared to be torn so suspected to be from a large animal. All ropes and mesh recovered;
- 01 October 2023 – Sydney North contractor reported suspected whale damage to the shark net at Mona Vale. All ropes, floats and mesh recovered;

- 06 October 2023 – Sydney North contractor reported suspected whale damage to the shark net at Whale beach. All ropes, floats and mesh recovered;
- 06 October 2023 – Central Coast North contractor reported suspected whale damage to the shark net at Soldiers beach. All ropes and mesh recovered;
- 08 October 2023 – Central Coast North contractor reported suspected whale damage to the shark net at Shelly beach. All ropes and mesh recovered;
- 11 October 2023 – Central Coast North contractor reported a large hole in the net at Caves beach. Suspected whale damage due to size of the hole and the mesh appearing to have been snapped. All ropes, floats and mesh recovered;
- 23 October 2023 – Sydney North contractor and shark meshing observer reported extension damage to the shark net at Palm beach. Suspected whale damage due the amount of damage to the net. All ropes, floats and mesh recovered;
- 03 November 2023 – Sydney North contractor reported a large hole in the shark net at Warriewood; Suspected whale damage. All ropes, floats and mesh recovered;
- 17 March 2024 – Central Coast North contractor reported that the net at Shelly beach had the top and bottom hangers broken off at the southern end of the net. All parts of net retrieved but the damage would suggest something large went through the net.

* 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.

There were two reports of vandalism during the 2023/24 season:

- 23 September 2023, Central Coast South contractor reported damage to the net at North Avoca with a large section of the top line hangings had been cut;
- 26 September 2023, Central Coast South contractor reported that the net marker buoy and dolphin and whale pingers had been removed from the net at Terrigal Beach.

The extreme and adverse weather conditions throughout the 2023/24 season meant that on several occasions many of the contractors removed one or more of their nets from the water to reduce the chances of losing nets.

During the 2023/24 meshing season there were four reports of nets or part of nets being lost:

- 01 November 2023 – Illawarra contractor reported that the net at Garie had been extensively damaged and broken off, and that approximately seven floats were missing;
- 30 November 2023 – Illawarra contractor reported that the net at Wattamolla had been snapped and approximately 100m of net including seven floats were missing. On 12 December 2023, the Illawarra contractor reported that the missing section of net had been recovered roughly halfway between Wattamolla and Garie beaches;
- 23 March 2024 – Sydney North contractor reported that that net at Warriewood had sustained a large amount of damage with a hole of approximately 2.5m – 4m in size. Upon further examination the contractor also reported that some of the net mesh had not been recovered;
- 07 April 2024 – Sydney Central contractor reported that due to the adverse sea condition the shark net at Freshwater could not be found. The full net was recovered on 08 April 2024.

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, three people were initially employed as 'observers' for the eight months of the SMP: two observer positions being full-time (one permanent and one full-time temporary); and one employed on a casual basis. The two full-time observers conducted their duties predominantly in the Hunter, Central Coast North, and Central Coast South regions, with the casual observer primarily covering the Sydney North, Sydney Central, Sydney South regions. The Illawarra region was infrequently covered by the permanent observer. The full-time temporary observer role was not filled for approximately half the meshing season with this employee seconded to another section within DPIRD Fisheries.

Overall observer coverage was reduced again this meshing season due to several factors including one less casual observer which significantly reduced hours across Illawarra region; and reduced hours of one of the permanent positions due to secondment during the first half of the meshing season. Observers assisted with the maintenance and upkeep of SMART drumline equipment and shark incident response vessels when not performing their on-water observer duties. Observers also assisted the Shark Scientist with collation of data, dissections, 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 regards to seagoing skills, assisting in the release of entangled animals and performing animal dissections and tissue sampling.

Due to delays in the procurement process and subsequent delays in awarding Shark Meshing Program contracts for the 2023/24 meshing season, no preseason meeting was possible prior to the start of the meshing season.

Number of Observer Days

Observers were present for 16.5% of all net inspections by contractors during the 2023/24 season. A breakdown by region of observer coverage is provided in Table 2.

Table 2 Total net inspections by region during 2023/24 meshing season.

Meshing Region	Total No. of net Inspections	No. of net inspections with observer present	% of net inspections observed
Hunter	727	84	12%
Central Coast North	721	147	20%
Central Coast South	728	161	22%
Sydney North	728	112	15%
Sydney Central	832	184	22%
Sydney South	832	136	16%
Illawarra	716	49	7%
Total	**5284**	**873**	**16.5%**

Outcomes of Observer Program

Outcomes of the Observer Program for the 2023/24 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.
2. The observers confirm accurate details for all witnessed net inspections are recorded by the contractor in the DPIRD Fisheries app (iPad), while also having access to iPhones equipped

with a customised data recording application. 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 DPIRD and DCCEEW via a monthly report.
4. Collection of 117 biological samples from 94 animals and 16 whole animals.

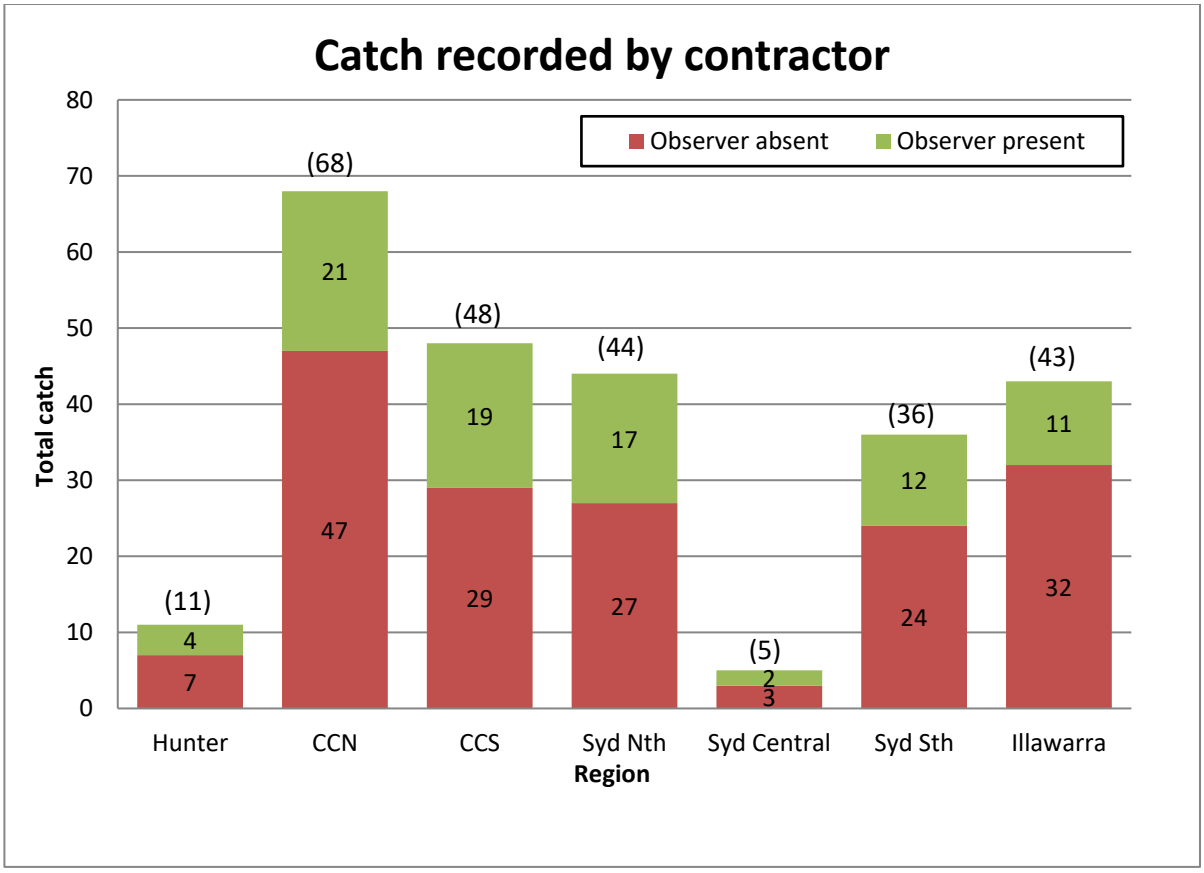

Figure 2 Catch recorded by contractor when observer present or absent during 2023/24.

1.3 Compliance Plan

The 2023 Management Plan has removed the Fisheries Compliance Units Compliance Plan, and compliance and auditing are solely administered within the Shark Meshing Program team.

Audit and Compliance Checks in 2023/24

Net inspections were not undertaken prior to the 2023/24 meshing season.

- Pre-season checks of the contractors' nets could not be conducted prior to the commencement of the meshing season. Delays in the awarding of contracts for the 2023/24 meshing season until August 2023 did not allow time for net inspection to be completed. Observers randomly checked net mesh sizes throughout the season while conducting normal observer such as, but not limited to net cleanliness, floats appropriately marked and clean, pingers attached and operational.
- Observers conducted 873 (see Table 2) inspections of the contractors' operations throughout the meshing season.

The contractors must comply with a range of specifications under the contract outside of routine inspections such as 72hr net inspections, VMS active on all trips, net pingers deployed and working, and the 1-hour reporting timeframe for all catch.

- During the 2023/24 meshing season there was one matter of non-compliance identified in November 2023, with the Illawarra contractor not reporting catch within the contractual timeframes. The Senior Manager Shark Programs discussed the matter with the Contractor and a written direction/warning was subsequently issued for the breach.
- Contractors are required to check their set nets every 72 hours weather permitting. This commitment was met on most occasions with 91% of set net inspections taking place within the 72-hour timeframe. The occasions where this requirement was not met, was due to severe weather conditions; and two occasions being due to a boat breakdown. The 72-hour inspection timeframe aims to potentially increase the chances of survival of any marine life caught in the nets.
- The compliance rate for dolphin pinger and whale alarms presence and their placement on nets was 100%.

All potential issues and the actual non-compliance issue in 2023/24 were resolved to the satisfaction of the Senior Manager Shark Programs.

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 3 provides details of the SRMP research topics and their current status.
- Table 4 provides the outcomes of the SMP Monitoring Program for 2023/24.

Table 3 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.	Status: **Complete** *Activities in 2023/24*: SMP research and information needs were included in an overall review of shark hazard mitigation research needs in the 2021/22 Annual Performance Report.

Level 2: Data collection and review of existing data	
Level and Topic	**Status and Comment**
2.1 Review and refine data collection methods	Status: **Ongoing**. ***2.1.1: Review data collection methods used in the SMP.*** *Activities in 2023/24*: Online real-time reporting continued with the implementation of data forms via the Fisheries application as used by the SMART drumline contractors over previous years. There was no change in species identification methods as onboard photography for species confirmation has proved efficient and effective and is included in the mobile device app. *Previous*: Data collection methods are regularly reviewed and adapted as technology and applicable uses are identified. Following the successful implementation of photographing each animal captured during the 2015/16 SMP season, this technique to confirm species identification continued during the period reported herein. ***2.1.2: Develop refined catch data forms and identification resources.*** *Activities in 2023/24*: Real-time online catch data forms were continued via the Fisheries mobile application. No new relevant species identification resources were identified, so no updates to the contractor and observer materials were implemented. The 2022/23 catch and tagging data form for Cownose Ray catches continued to be used to enable collection of additional information, especially for animals released alive carrying an acoustic tag as part of a PhD study via Macquarie University *Previous*: Catch data forms and instructions for use were dispensed at the pre-season training days for observers and contractors. New skate and ray, dolphin, sea turtle and Mobulid identification aids were supplied to contractors in 2016/17, 2017/18, 2018/19 and 2019/20, respectively. These identification guides aim to assist in correct identification for the catch records at sea. The Hammerhead Shark identification guide developed by DPIRD Fisheries was also incorporated in the species identification guide distributed to all contractors.

Level 2: Data collection and review of existing data	
	2.1.3: Identify associated training programs for observers and contractors. *Activities in 2023/24*: The most important training required for the 2023/24 meshing season for observers and contractors was reiterating tagging procedures for nominated shark species, especially regarding deployment of acoustic tags on the three target shark species, plus Cownose rays, and pop-up satellite archival tags (PSATs) on Greynurse Sharks. Acoustic tags were supplied to each contractor to ensure every opportunity of deployment on sharks released alive. The release of 36% of animals alive from the SMP nets highlights the relevance and importance of protocol reviews. Disentanglement procedures for non-target species from the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) were reviewed and discussed with observers to remind them of protocols for Passive Integrated Transponder (PIT) tag deployment in turtles. These skills were subsequently passed on to contractors via on-board sessions with the shark meshing observers.
2.2 Review genetic samples to compare with reported species identification.	Status: **Ongoing**. **2.2.1*: Review shark genetic samples held by DPIRD and cross-reference with reported species identification.*** *Activities in 2023/24*: No further review of reported catch using genetic identification was conducted during the period being reported on following the 100% correct identification of various Hammerhead Shark catches in the SMP as reported in the 2017/18 Annual Performance Report. *Previous*: General research has continued into molecular forensics for captures in the SMP and led to analyses of species composition and reporting for the 2016/17 SMP season. The 100% correct identification of Hammerhead Shark species was reported on in the 2017/18 Annual Performance Report. Genetic samples are also used for longer term projects and are made available on request to researchers from around the world. The 100% record in correct species identification for Hammerhead Sharks using catch photography to confirm species ID and the ability to obtain good quality photographs and sharing via mobile phone technology for rapid confirmation by scientists has exceeded genetic technique capabilities for rapid confirmation of catch data accuracy. **2.2.2*: Identify associated training programs/resources for observers and contractors.*** *Activities in 2023/24*: All the observers and seven SMP contractors were ongoing appointments. Logistical complexities led to an inability to conduct the usual annual pre-season training day for contractors and observers, however, observers were reminded of priority project requests for samples and/or tag deployments (e.g., acoustic tag deployments on Australian cownose rays and target sharks, plus PSAT deployments on grey nurse sharks) and requested to reiterate these to the contractors, *Previous*: Training of contractors and observers is designed to improve accuracy of catch identification. The use of the DPIRD publication '*Identifying Sharks and Rays, A Guide for Commercial Fishers*' is revisited during the annual pre-season training day for observers and contractors to ensure all team members are proficient in identification of species caught in the SMP. Each contractor is provided with an updated copy of the identification book and the purpose made in-house SMP Marine Species Identification Guide. The latter guide is updated annually (see Section 2.1.2) and incorporates any new information added for groups of species identification and/or research project sampling protocols. Each observer is also issued with an updated version of our SMP Marine Species Identification Guide.

Level 2: Data collection and review of existing data	
2.3 Review data on temporal and spatial factors affecting the operation of the SMP.	Status: **Ongoing.** ***2.3.1: Review research being conducted on White Shark movements.*** *Activities in 2023/24*: A total of nine White Sharks were released alive carrying telemetry tags during the past SMP season. Five were externally tagged with an acoustic tag whilst three others were already acoustically tagged and released from SMP nets after recording those tag details. The nineth White Shark was released following tagging with a pop-up satellite tag (PSAT). These SMP-released White Sharks will be detected on acoustic listening stations administered through DPIRD Fisheries and/or the IMOS Animal Tracking Facility. No new research on White Shark temporal and spatial factors affecting the operation of the SMP were published during the past year; although a study investigating the use of artificial reefs by white sharks highlighted their transient nature whilst investigating man-made inclusions in the nearshore environment and corroborated previously published research on seasonal movements of white sharks along the NSW coastline (Becker et al., 2024). Research investigating the post-release movements of 36 white sharks following capture on SMART drumlines (Butcher et al., 2023) indicated that released white sharks initially travel offshore, after which they slowly move back to shore but tend to stay an average of 1.9 km off the beaches. These results imply that released white sharks from the shark nets are likely to exhibit similar behaviour and dispute the concerns that released target sharks may pose an immediate ongoing risk to water users at beaches in the vicinity of the release. Maintaining the current protocol of releasing all live animals is therefore warranted, although use of PSATs on released target sharks should be a priority to confirm these assumptions. Research conducted off Central California has corroborated our understanding of varying habitat use by different age cohorts of white sharks, where juveniles stayed close to shore and in shallow depths, whilst sub-adult and adult sharks occupied deeper waters (Jewell et al., 2024), implying that white sharks in different ocean basins occupy similar habitats that are potentially based on physiological requirements and/or their foraging strategies based on prey type. *Previous*: Historically, the DPIRD has worked closely with the CSIRO White Shark Project, supplying data from White Sharks caught in the SMP and data of tagged sharks detected on DPIRD Fisheries arrays of underwater acoustic listening stations. The CSIRO research results showed that the main aggregations of juvenile White Sharks in NSW occur north of Stockton Beach and therefore outside the SMP area of operation. Juvenile White Sharks appear to occur in the Stockton Bight region from mid-August through early January and are in Victoria from January through April (Bruce et al., 2019). Since the start of the NSW Shark Management Strategy in 2015 more than 1150 White Sharks have been tagged following capture on SMART drumlines. DPIRD Fisheries now runs the largest White Shark tagging program in the world. The success of external deployment of acoustic tags by contactors on White Sharks released from the SMART drumlines led to development of similar tags and tagging procedures to implement in the SMP since 2018/19. Data collected via tagged White Sharks indicates that they travel large distances of ~10,000 km per annum and across ocean basins (Spaet et al., 2020b**)**. White Sharks can be found in a large range of water temperatures but appear to optimise in ~20°C (Lee et al., 2021), with abundance and distribution likely linked to ocean-influenced distributions in potential prey (Spaet et al., 2020a). Analysis of vertical diving behaviour and spatial dynamics of immature White Sharks tagged with pop-up satellite archival transmitting and acoustic tags corroborated the importance of the NSW coast for immature sharks with seasonal peak abundance in NSW coastal areas from October to December (Spaet et al., 2022), validating the periods of highest White Shark catch in the SMP (Reid et al., 2011). A NSW tagging study targeting large White Sharks (430-388 cm TL) indicated these size cohorts displayed a preference for offshore habitats (Coxon et al. 2022), confirming why large White Sharks are seldomly caught in the NSW shark nets (Niella et al., 2021b). White Sharks are more likely to exhibit area-restricted movement when sea surface temperatures are between 19 and 23°C, with moderate to high surface Chlorophyll-α concentrations and thermal and productivity fronts increasing their likely presence (Lee et al., 2021), with nearshore activity exhibiting predictable patterns of slow (~2.2km.hr^{-1}) movement parallel to the shoreline and typically behind the surf

Level 2: Data collection and review of existing data	
	break (Colefax et al., 2020). Although there is no evidence that White Sharks are 'resident' off NSW beaches, an increased occurrence of juvenile White Sharks within the SMP region has been postulated in response to changes in the East Australian Current (SMP Annual Performance Report 2021). This may lead to increased catches and highlights that ongoing efforts to tag and release all live sharks will minimise negative impact the net catches could have on the East Australian White Shark population, particularly since post-capture recovery period is relatively rapid at ~10 hours (Grainger et al., 2022). ***2.3.2 : Review existing data on other species (e.g., Tiger Shark, Bull Shark).*** *Activities in 2023/24*: During the past year, there have been no published research on bull or tiger sharks that may affect the operation of the SMP. Research in NSW has shown that the distribution of tiger and bull sharks is expanding southward with warming oceans (Niella et al., 2020; 2021a). These changing oceanographic conditions include the well-documented occurrence of marine heatwaves yet little research has historically been conducted on climate change-induced shifts in extreme cold events such as wind- and current-induced upwelling. Bull sharks tagged in the NSW Shark Management Program have contributed to a study showing how this species alters its migratory patterns and dive profiles when transiting through upwelling cells (Lubitz et al., 2024). These cold events are increasing in both frequency and intensity, to the extent that they have contributed to so-called 'killer events' inshore of the East Australian Current and Agulhas Current that have included mortalities of bull sharks (Lubitz et al., 2024) and warrant further monitoring to determine their effect on nearshore presence of target sharks in NSW. Target sharks released alive from the SMP are externally tagged with acoustic tags, as per procedures used by SMART drumline contractors in NSW. Ten of the twelve White Sharks caught during the 2023/24 season were released alive, of which five were tagged with new acoustic telemetry tags and one with a satellite tag (PSAT). Another four White Sharks caught were already tagged with DPIRD acoustic tags (i.e., they were recaptures) and three of these animals were released alive. No bull sharks were caught this past year and all three tiger sharks were deceased when retrieved. More than 475 Tiger Sharks have now been acoustically tagged by DPIRD as part of the NSW Shark Management Program (SMP and SMART drumline caught individuals combined). Analysis of movement data from 16 Tiger Sharks equipped with satellite tags indicated that they moved offshore after release from the SMART drumlines and then headed north off the continental shelf (Lipscombe et al., 2020). It is likely that Tiger Sharks released from the SMP shark nets react in a similar manner to their release; however, deployment of mini-PSATs on SMP-released sharks should be considered to confirm post-release survival and subsequent behaviour. Continued collection of biological and genetic samples from Tiger Sharks caught in the SMP, and tagging of animals released alive from the nets, is therefore imperative to elucidate the population structure and ecology of Tiger Sharks occurring in nearshore waters within the SMP region. No Bull Sharks were caught during the 2023/24 meshing season, but Bull Shark movement research did continue with individuals being tagged as part of the SMART drumline program. Over 200 Bull Sharks have been acoustically tagged by DPIRD Fisheries with various iterations of analysis of movement data currently underway to better understand nearshore abundance, distribution and movements to assist in developing data-driven shark bite mitigation messaging. Historical analyses have highlighted the role of water temperature in regulating bull shark distribution and movements, with emphasis on the potential of climate-induced warming seas increasing the temporal and spatial distribution of bull sharks along the NSW coast (Niella et al., 2020). Substantial research effort has focussed on the increasing prevalence heat waves associated with climate change; however, upwelling cells of cold water are believed to be intensifying globally due to climate change-driven shifts in pressure systems and ocean currents. Using data from bull sharks tagged via the Shark Management Program recent analysis has indicated that bull sharks alter their migratory patterns and change their dive patterns in an attempt to avoid these extreme cold water events (Lubitz et al., 2024). Ongoing tagging of bull sharks released alive from the nets are imperative to determine their post-release behaviour and survivorship, although the low numbers of bull sharks caught in the SMP are unlikely to impact overall population sustainability.

Level 2: Data collection and review of existing data	
	Previous: Previously, there were few studies on Tiger and Bull Sharks that provided new knowledge that would affect the operations of the SMP; however, research conducted over the past few years on the population structure, movements and SMP catch characteristics have indicated that ongoing sampling and tagging of sharks caught and released from the nets is imperative to enhance our understanding of potential impacts of these catches, plus the role of climate-induced warming of the East Australian Current on changing the distribution and abundance of these two target species for the SMP. Telemetry tracking of Tiger Sharks off the east Australian coast revealed that water temperature change, particularly at higher latitudes, was the most influential environmental factor regulating shark movements (Niella et al. 2021a). This study predicted that the range for Tiger Sharks along the east coast of Australia will extend ~3.5° south by the year 2030, potentially increasing the risk of interactions with humans in nearshore waters within the SMP region. Bites attributed to Tiger Sharks has historically been low in NSW waters (Riley et al. 2022), a factor likely due to low nearshore presence. In fact, Tiger Shark catches in the SMP nets have historically been low (Reid et al, 2011), with probability of catch higher at beaches with deep water closer to the nets (Lee et al. 2018); however, predicted changes in distribution and nearshore abundance of this species could result in future increases in capture. Implementing alternative shark bite mitigation gear, as suggested by Niella et al. (2021b), will have minimal impact on Tiger Shark catch due to the two high catch beaches (Wattamolla and Garie) being too far from suitable launch sites for contractors to respond to alerts from catches on SMART drumlines. Tiger Sharks released from SMART drumlines initially moved offshore, where-after they traversed temperate, sub-tropical and tropical waters (Lipscombe et al., 2020) in a manner consistent with previously reported movements (Holmes et al., 2017). It is likely that Tiger Sharks released from the SMP shark nets would undergo similar post-release movements; however, post-release survivorship and subsequent movements of net-caught Tiger Sharks should be investigated through deployment of mini-PSAT tags. Historical genetic research including SMP samples, implied that there was no genetic structuring within the Indo-Pacific Ocean basin (Holmes *et al*., 2017). It was therefore hypothesised that the small annual Tiger Shark catch in the SMP was unlikely to substantially affect the viability of this large homogeneous east Australian population. These results appeared to corroborate the findings of large-scale movements of tagged Tiger Sharks in eastern Australia with individuals of all size classes moving between the SMP region, southern Queensland and New Caledonia *(*Holmes *et al.,* 2014*).* The apparent preference of Tiger Sharks for deeper waters (Holmes et al., 2017) corroborated analyses indicating Tiger Shark catch increased at localities where shark nets were in close proximity to deep waters (Lee et al., 2018). Recent genetic analyses using historical and contemporary samples has elucidated the potential for two distinct populations of Tiger Shark to have occurred off the eastern coast of Australia (Manuzzi et al., 2022). These authors hypothesize that one population, possibly a nearshore south-eastern Australian eco-type, has all but disappeared and highlight the important role of dedicated sampling programs. Tiger shark catch rates decreased over the six decades examined in Reid et al. (2011), with low annual levels in the recent vicennium precluding robust analysis of potential correlates to catch (Lee *et al*., 2018). Similarly, catches of Bull Sharks were historically low and confounded by poor species identification in early years hampering robust analysis of potential correlates to catch (Lee et al., 2018). There has therefore been a reliance on using movements of acoustically tagged Bull Sharks to determine factors that influence their abundance and distribution in NSW coastal waters. Initial research focussed on the Sydney waterways following a serious shark bite in the harbour. Scientific manuscripts detailing patterns of occurrence of sharks in Sydney Harbour have been published (Smoothey *et al*., 2016; 2019) while larger-scale examination of environmental factors affecting Bull Shark movements and abundance along the south-east coast of Australia are published as Lee et al. (2019). Subsequently, these Sydney-tagged Bull Sharks were included in larger-scale research amalgamating all Bull Sharks tagged along the east coast of Australia. This collaboration has revealed that Bull Sharks tagged by DPIRD Fisheries in the Sydney region are travelling beyond Townsville, while Bull Sharks tagged in Queensland are unlikely to travel into the SMP region. This collaboration has resulted in publication of two manuscripts investigating these latitudinal differences in bull shark movements (Heupel *et al*., 2015; Espinoza *et al*., 2021). Analyses indicate that movements of Bull Sharks varied according to their tagging location, with sharks tagged in Sydney exhibiting seasonal movements and limited residency times, while 35% of the sharks

Level 2: Data collection and review of existing data	
	tagged in the tropics exhibited year-round residency on tropical reefs (Espinoza et al., 2021). Network analyses complemented these findings by revealing different seasonal habitat preferences between regions. Movement patterns of Bull Sharks tagged in Sydney Harbour were driven by seasonal temperature change, while tropical individuals appeared more driven by biological needs such as reproduction. These seasonal movements to and/or from distant bays and estuaries highlights the need for regional conservation approaches, and improved understanding of the degree of connectivity between habitats and latitudes. Analysis of tagged Bull Shark and prey fish movements around Sydney waterways highlighted the importance of rainfall in the catchment. Both teleosts and sharks exhibited varying responses to water flows, with males Bull Sharks responding most promptly to high rainfall by moving upstream within a day, followed by teleost movements between 2-7 days, and female Bull Sharks after 4 days (Niella et al., 2021d). Variability in Bull Shark space use suggested spatial segregation by sex and size. Although individuals target similar prey, they appear to do so in different areas or at different times, enabling them to exploit different resources when in the same habitats (Niella et al., 2021d). Analysis of juvenile Bull Shark use of different habitats within a nursery riverine system, the Clarence River in northern NSW, highlighted the reliance of young sharks on prey associated with salt marshes (Niella et al., 2022). This is a threatened habitat type due to anthropogenic pressures and underscores the potential threat of climate-induced habitat changes to both predators and prey. Australia-wide acoustic tracking data for 1,491 individuals of seven teleost and seven shark species, including Bull, Tiger, and White Sharks, were used to assess stock structure and connectivity, and compared to findings from genetic and conventional tagging. Network analysis revealed previously unknown population connections in some species, and in others bolstered support for existing stock discrimination by identifying nodes and routes important to connectivity, e.g., for Bull and White Sharks the network analysis showed movement patterns consistent with previous understanding of stock structure derived using genetic approaches whilst Tiger Sharks show structure within Australian waters, despite genetic evidence indicating panmixia, with individuals not connecting between east and west coasts of Australia (Lédée et al., 2021). Using SMP and commercial catch data for Bull Sharks, it was determined that increase in occurrence of Bull Sharks over time was associated with seasonal variability of thermal gradients larger than 21°C and westward coastal currents stronger than 0.2 $m.s^{-1}$ (Niella et al., 2020). Predictive models using these results overlayed on CSIRO predicted change in oceanographic conditions along the east coast of Australia subsequently indicated that there will be an approximately 1° southward shift in the optimal thermal habitats favourable for year-round Bull Shark occurrence over the next 12 years (Niella et al., 2020). This will lead to a three month increase in the availability of favourable sea surface temperatures along the coast of NSW (i.e., from January-February to December-April) which could have implications for bather safety from shark bite. Analysis of SMP catch data has corroborated previous conclusions that bull sharks can be caught throughout the SMP region and, as a result, only large-scale changes to replace shark nets with alternative gear will reduce potential impact of the shark net catches on this population of sharks (Niella et al., 2021b). Although global analysis of genetic structuring of Bull Shark populations using mitochondrial analyses has highlighted reproductive isolation of the Indo-West Pacific, with mitogenome differentiation showing three separate clusters within Australia (western, northern and eastern Australia) (Devloo-Delva et al., 2023), it is unlikely that the low levels of catch in the SMP will impact overall population sustainability. This information has subsequently been used in NSW DPIRD Fact Sheets and SharkSmart outputs, plus television documentaries, to educate public about sharks and shark hazard risks. **2.3.3: *Review existing data on spatial and temporal movements of non-target species.*** Additional analyses incorporating updated environmental data have been performed on the helicopter sightings of Australian Cownose Rays (*Rhinoptera neglecta*). These rays were more likely to occur along the NSW coast during the warmer months (i.e., spring and summer) with increased sea temperatures supporting larger groups which inevitably swam further from shore (Chan et al., 2024). Although Australian Cownose Rays were seen more frequently in the northern half of NSW, group sizes were larger in the southern half and suggest seasonal migration events may be occurring, possibly related to reproduction as female rays caught in the SMP appear to be gravid (Chan, 2021). As the species consistently exhibit high catch, albeit that historically over 60% are released alive, there has been concern about the post-release survivorship of these gravid females

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	and the potential impact of shark net catches. An acoustic tagging program was subsequently initiated in 2022, however, only six Australian Cownose Rays have been tagged with acoustic transmitters to date (three last SMP season and three this 2023/24 season). A further four released Greynurse Sharks were tagged with mini-PSATs during the 2023/24 season. This contributes to a total of 27 Greynurse Sharks tagged with these satellite telemetry tags and will be sufficient to confirm level of post-release survivorship and associated movements. A population viability analysis (PVA) for leatherback turtles has been completed that included retrospective model fitting based on empirical nest counts to examine population persistence into eh future under various bycatch scenarios (Williamson et al., 2024). These analyses imply that even minimal mortality (2/year) from bycatch in the SMP significantly exacerbates the risk of extirpation by approximately 40% within 10 generations (Williamson et al., 2024). Genetic analysis of SMP caught leatherback turtles identified individuals as originating from three different nesting populations (Solomon Islands, Costa Rican Pacific coast and Malaysia, see Frankham 2022) corroborating the review of the importance of south-east Australian waters as a global hotspot for leatherback turtle foraging (Hays et al., 2023). A poleward shift in distribution is anticipated with climate-induced warming oceans (Hays et al., 2023), with sea temperature also correlated to increased bycatch of leatherback turtles in New Zealand fisheries (Dunn et al., 2023), thereby implying that future years of shark net deployment could lead to higher leatherback turtle catches. These data all highlight the urgent requirement to initiate bycatch mortality reduction measures in fisheries, including the SMP. *Previous*: The scientific literature on spatial and temporal movements of non-target species is reviewed where possible given available resources. Biological samples from Hammerhead Sharks have recently substantially contributed to knowledge gains for all three species caught in the NSW shark nets. Examination of Great Hammerhead Shark diets highlighted their important link between food webs off eastern Australia (Raoult et al., 2019). The geographic range of Great Hammerhead Sharks was subsequently investigated via stable isotope analysis using these same samples which suggested that this species is not resident off the NSW coast, but rather spends most of its time off Queensland (Raoult et al., 2020). As such, the SMP is unlikely to significantly impact the conservation status of this species, although a watching brief on potential increasing catches with warming oceans through climate change is recommended. SMP catch data contributed to a National Stock Assessment for Scalloped Hammerhead Sharks (*Sphyrna lewini*) (Saunders *et al.*, 2021). Several analyses and two population structures were modelled to ensure all potential scenarios were accounted for. The results indicate that the biomass of all stocks of Scalloped Hammerhead Shark in Australian waters are considerably higher (less depleted) than previously reported and that the current Total Allowable Catch (TAC - not applicable in NSW where the species is listed as 'endangered' under the *Fisheries Management Act 1994*) for this species is well below the levels required to cause stock declines (Saunders *et al.*, 2021). Notwithstanding these results, Scalloped Hammerhead Sharks has been listed as *Endangered* under the EPBC Act by the Australian Department of Agriculture, Water and the Environment and will therefore affect the SMP. A study using the SMP catch data to investigate ecological and environmental drivers for juvenile Smooth Hammerhead Shark distribution in temperate NSW was completed as a chapter in a Masters Degree through the University of Newcastle (Wray-Barnes, 2017) and is being prepared for scientific journal publication. This new information will not affect the operation of the SMP. A PhD on Broadnose Sevengill Sharks (*Notorynchus cepedianus*) was completed through University of Tasmania (Schmidt-Roach, 2018). Acoustic tracking data indicate that both neonate and other life-stages tagged in Port Philip Bay, Victoria, travel to NSW and Tasmania. These results corroborate their genetic findings that there is likely a single population for the south-east coast of Australia. Genetic material collected from the SMP will contribute to publication of these data. These results imply that few catches of this species in the SMP is likely to have minimal impact on the population viability of Broadnose Sevengill Sharks. Several projects linked to the DPIRD Fisheries testing of drone technology as an aerial surveillance tool for mitigating shark interactions have led to publications incorporating abundance and distribution of non-target species (Kelaher *et al*., 2019; Tagliafico *et al*., 2019), but these studies were not within the SMP region.

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Pelagic rays represent a substantial portion of the bycatch in NSW shark nets. Carcasses of pelagic rays contributed to a Master in Research study via Macquarie University that investigated the spatio-temporal distribution and trophic ecology of Australian Cownose rays (*Rhinoptera neglecta*) (Chan, 2021). Comparing stable isotope samples from Cownose Rays and Whitespotted Eagle Rays (*Aetobatus ocellatus*) indicated substantial trophic niche overlap between these two Myliobatiform rays (Chan et al., 2022). The data showed that Australian Cownose Rays may be more susceptible to ecological perturbations impacting prey populations (possibly including small pelagic and benthic fishes) than Whitespotted Eagle Rays, but, because both species require similar prey resources off NSW, any management options that seek to maintain prey biodiversity will have similar effects on populations of both species, and that these might extend among other similar, regional ray species.

2.4 Review data on shark interactions and beach usage.

Status: **Ongoing.**

2.4.1: *Access / review data collection by various organisations*

DPIRD Fisheries cross-references data held by the Australian Shark Incident Database (Riley *et al*., 2022) and the International Shark Attack File to report on any incidents associated with meshed beaches. The Australian Shark Incident Database will continue to receive NSW DPIRD shark attack reports to enter into the standardised database. These data were used to assess the efficacy of NSW shark bite mitigation measures and concluded that the stochastic nature of shark bites and their spatio-temporal variability led to an inability to statistically prove whether the measures employed by the NSW Shark Management Program were effective (Huveneers et al., 2024). This analysis did not take into consideration temporal changes in beachgoer numbers and activities. Inclusion of trends in NSW swimmer and surfer numbers may enable better insight into the efficacy of the NSW Shark Management Program and should be considered as an important focus for research. Data collected by Surf Life Saving NSW, plus aerial data (drone & helicopter) of beach and water users are potentially an important source to enable these future analyses.

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

Shark sightings										
Region	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
Hunter	60	28	8	1	4	18	32	18	5	33
Central Coast	29	24	1	3	0	8	12	20	1	14
Sydney	46	58	8	1	9	25	45	53	17	16
Illawarra	4	7	0	1	0	3	11	13	2	5
Total	139	117	17	6	13	54	100	104	25	68

A decline in the number of shark sightings in the SLS NSW database between 2016/17 and 2018/19 reflects a change in the way SLS NSW records shark sightings on patrolled beaches. This was because the number of reported sightings impacted 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. These procedural changes along with the increased use of drones by SLS NSW to conduct aerial surveillance over patrolled beaches over the past five years has resulted in greater accuracy in the number of shark sightings, albeit that shark species identification still requires confirmation by NSW DPIRD shark scientists. The initial increase in shark sightings since 2019-20 is unlikely to represent an increase in sharks along NSW beaches, but more likely to highlight the value of drone aerial surveillance in detecting sharks (Butcher *et al*., 2019). The subsequent

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decrease in shark sightings for the past two years is likely due to inclement weather conditions and associated highly turbid nearshore waters precluding ability to see sharks.

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

From 2006 to 2036 the NSW population is projected to grow by over 2.3 million due to natural increase and net overseas migration, while Sydney's population is projected to grow by 1.7 million people (DECCW, 2009). An increase in beach usage across the SMP region is expected into the foreseeable future given these predictions and recent data collected by SLS NSW.

SLS NSW provided the following beach visitation figures for the past 10 years for the regions 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 summer beach visitation within the area of the SMP over the last 10 years averaged approximately 5.5 million people per annum. The drop in beach attendance in 2019/20 and 2021/22 may be related to reduced outdoor activities and travel in the latter months of these periods as a result of government initiatives to reduce the spread of Covid-19, whilst the rebound in beach visitations for the 2020/21 period reflects the success in managing Covid-19 outbreaks in NSW and subsequent abilities for NSW residents and domestic visitors to enjoy our beaches and waterways prior to new restrictions coming into effect at the start of 2022. Since that time, beach visitation rates have remained fairly stable, potentially influenced by two summers of unusually inclement weather that may have reduced expected beach visitations.

Visitations										
Region	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
Hunter	690,343	728,803	764,529	729,592	714,965	656,794	619,769	599,050	773,270	796,033
Central Coast	1,241,243	1,145,309	1,173,890	736,021	1,182,741	943,798	1,312,599	1,062,130	1,355,769	1,221,609
Sydney	3,897,491	3,681,255	3,743,419	3,526,008	4,679,380	2,970,793	3,255,870	2,455,210	1,801,351	1,759,273
Illawarra	392,447	363,194	380,299	343,473	297,351	252,013	436,677	268,050	426,869	389,411
Total	**6,221,524**	**5,918,561**	**6,062,137**	**5,335,094***	**6,874,437**	**4,823,398**	**5,624,915**	**4,384,440**	**4,357,259**	**4,166,326**

* Patrol period for 2017-2018 was between the 23 September to 29 April

DPIRD Fisheries supported research into unmanned aerial vehicle applicability for marine and coastal research has demonstrated that drones are an effective assessment tool to quantify beach users across a range of environmental conditions and thereby improve coastal management decisions (Provost *et al.*, 2019). DPIRD Fisheries have supported SLS NSW with drones and training of lifesavers and it is envisaged that these will be used for beach management purposes, including beach counts, as well as water safety.

Level 2: Data collection and review of existing data	
2.5 Review effectiveness of fishing operations used in shark control programs	Status: **Ongoing.** **2.5.1: *Review NSW shark meshing net configurations.*** *Activities in 2023/24*: Analysis of catches comparing shark nets with SMART drumlines indicate that SMART drumlines are more effective in catching White Sharks, however very few Bull or Tiger Sharks are caught in either gear (Butcher et al., in press). Results support previous analyses of South African and Queensland bather protection programs which suggested a combination of nets and baited hooks (drumlines) represent the most effective shark catching methodology (Dudley, 1997; Gribble et al., 1998). The analyses also reiterate the high bycatch incurred by the shark nets compared to SMART drumlines, and support the concept of replacing nets with SMART drumlines off high bycatch beaches (Niella et al., 2021b). Due to potential for proximal captures, it is recommended that 2-3 drumlines would provide similar fishing effort to a net (Butcher et al., in press). While not every beach that has a net currently has a SMART drumline, across the entire SMP region, the current configuration of SMART drumlines is consistent with that recommendation, i.e. there are 51 nets and 138 SMART drumlines. Samples of twine taken from regions where breaks in the net were recorded were collected and will be analysed once sufficient samples have been collected to warrant the costs & effort for genetic analysis. *Previous*: Analysis of catch trends in the far north coast shark net trials has been completed and published as Broadhurst and Cullis (2020). They conclude that nets should be checked every 72-96 hours to optimise efficiency for target species whilst minimising the absolute mortality of rays. This implies that no changes in the current JMA are required regarding regularity of checking the SMP shark nets. Amendments to net configurations would be outside the scope of existing contracts for the SMP, however, further research on SMP net configurations will be undertaken pending contractor cooperation. **2.5.2: *Review the application of other shark control measures for use in NSW (e.g., drumlines).*** *Activities in 2023/24*: The investigation into the efficacy of shark nets, SMART drumlines, drones and VR4G shark listening stations in reducing shark-human interactions, highlighted the difficulty of allocating statistical significance to mitigating against incidents like shark bites which are so few and far between (Huveneers et al., 2024). *Previous*: refer to the 2022/23 Annual Performance Report **2.5.3: *Use the outcomes of those reviews to trial gear-related modifications of the SMP.*** *Activities in 2023/24:* SMART drumline deployments were continued off eight beaches in the Newcastle region (https://www.sharksmart.nsw.gov.au/__data/assets/image/0006/1393548/Map-SMART-drumlines-Newcastle-web.png), six beaches in the Lake Macquarie region (https://www.sharksmart.nsw.gov.au/__data/assets/image/0003/1393563/Map-SMART-drumlines-Lake-Macquarie.png), sixteen beaches in the Central Coast region (https://www.sharksmart.nsw.gov.au/__data/assets/image/0007/1403746/SD-Map-Central-Coast-Nth-Sth.png) , twenty-one beaches in the Sydney Northern Beaches region, eight beaches in the Sydney East region (https://www.sharksmart.nsw.gov.au/__data/assets/image/0008/1393568/Map-SMART-drumlines-Randwick-Waverley.png), six beaches in the Sutherland region (https://www.sharksmart.nsw.gov.au/__data/assets/image/0007/1393279/Sutherland-web-map.png), and thirteen beaches in the Wollongong region (https://www.sharksmart.nsw.gov.au/__data/assets/image/0010/1393570/Map-SMART-drumlines-Wollongong.png). These SMART drumlines continued to fish year-round (weather permitting), including throughout the 2023/24 shark meshing season. Catches on these

Level 2: Data collection and review of existing data	
	SMART drumlines will be compared with SMP catch to determine relative efficacy of the two different gears in catching both target sharks and non-target marine fauna. The NSW Shark Management Program for 2023/24 continued to support the pilot training and use of drones at beaches patrolled by SLS NSW. Every coastal LGA along the NSW coastline one had at least one UAV patrol location, with fifty beaches provided aerial shark surveillance via certified SLS NSW drone operators over the 2023/24 summer holidays. *Previous*: refer to the 2022/23 Annual Performance Report.
2.6 Develop methodologies for standardising fishing effort and analysing comparative CPUE data.	**Status: Completed** **2.6.1: *Investigate the feasibility of standardising soak-times for shark nets.*** 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 2023/24 season. **2.6.2: *Develop alternative approaches to standardised soak-times.*** No alternative approaches were developed.

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).	Status: **Ongoing** **3.1.1*: Distribution, abundance, biology, and ecology of target species affected by the SMP.*** *Activities in 2023/24:* A University of Sydney student, in collaboration with colleagues from the CSIRO, has analysed White Shark tooth morphometric data using White Sharks collected throughout their Australian range, including those caught in the SMP, to determine the role of tooth shape and strength in ontogenetic dietary changes. A manuscript is in preparation as part of her PhD. Although several studies are using cloacal and mouth swabs to determine prey ingested by sharks via eDNA methods (Clarke et al., 2023; van Zinnicq Bergmann et al., 2021), little research has been conducted to understand how representative this technique is. To facilitate understanding of foraging ecology, SMP carcasses are contributing via collection of eDNA swabs from five regions of the digestive tract for comparison with stomach contents. Results will contribute to a more wholistic understanding of the diet of target species, particularly for Bull Sharks which, to date, have not been analysed and will be the focus for ongoing collaborations through the University of Sydney. Analysis of VR4G shark listening station detections of 233 acoustically tagged Bull Sharks provided the first assessment of their diel patterns of habitat use in coastal NSW waters. Results corroborate previous studies showing that large (>1.75m total length) Bull Sharks are present more in latitudes north of 32°S extending southward during the summer and autumn (Smoothey et al., 2023). Bull shark nearshore occurrence was greatest from midday to 04:00, when water temperatures were higher than 20°C, after >45 mm of rain and when swells were between 1.8 and 2.8 m. These results support

Level 3 Establish/support collaborative research (e.g., CSIRO, other government agencies and universities)	
	historical shark smart advice, although messaging about times of increased Bull Shark presence should be modified from “dawn and dusk” to instead refer to afternoon and low-light periods (Smoothey et al., 2023). Collaboration with a suite of researchers from Australian and international affiliations has continued work on a manuscript describing age and growth of Australian White Sharks, incorporating length data from White Sharks recaptured on SMART drumlines. Queensland Shark Control Program (SCP) data were used to determine the long-term declines in the functional diversity of sharks in eastern Australian coastal waters (Henderson et al., 2024). Although they identify that the SCP catches were unlikely to be solely responsible for declines in shark numbers as many sharks are caught in much larger numbers in regional commercial fisheries, the analyses do highlight the substantial changes in shark functional richness that correspond with declining ecological functioning (Henderson et al., 2024). The recommendation to reduce anthropogenic impacts on shark populations to recover the stability of coastal ecosystems includes reducing shark catches in the shark netting programs along the eastern seaboard of Australia. *Previous*: refer to the 2022/23 Annual Performance Report ***Distribution, abundance, biology, and ecology of non-target species affected by the SMP.*** *Activities in 2023/24*: Fifteen whole carcasses of non-target animals caught in the SMP were collected during the 2023/24 period. Two deceased Broadnose Sevengill Sharks (*Notorynchus cepedianus*), two Smooth Hammerhead Sharks (*Sphyrna zygaena*), and a Bronze Whaler (*Carcharhinus brachyurus*) were collected to contribute to collaborative studies through Macquarie University. Necropsies of marine mammals and sea turtles caught in the SMP were conducted in collaboration with Taronga Zoo, NSW DCCEEW and the NSW Parks and Wildlife Service (NPWS) during the 2023/24 SMP season. These included assessing options for telemetry tag placements for future research into post-release survivorship and subsequent movements of sea turtles. The deployment of Passive Integrated Transponder (PIT) tags and or ‘V’ notching flippers in carcasses taken offshore to assist in determining the percentage of SMP bycatch that wash ashore and get reported as strandings. Two deceased Greynurse Sharks were retrieved whole to contribute to the ongoing DPIRD Fisheries research program on this species. Samples for a genomics study were collected from all six deceased Greynurse Sharks. Ten non-target species were tagged prior to release during the 2023/24 SMP period (see Table 4) *Previous*: refer to the 2022/23 Annual Performance Report
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 2023/24:* Collaboration for a genomic analysis of SMP-collected samples was continued during the past year as a DPIRD collaboration with the National Environmental Science Program (NESP) project on Greynurse Sharks. A new collaboration with QLD DAFF scientists has been established incorporating SMP-collected genetic samples to analyse population structure of Spinner Sharks (*Carcharhinus brevipinna*) on the Australian east coast. Genetic samples from all deceased animals were collected to contribute to future collaborations, particularly for priority species to determine stock size & structure. *Previous*: refer to previous Annual Performance Reports

Level 3 Establish/support collaborative research (e.g., CSIRO, other government agencies and universities)	
	3.2.2*: Develop SMP DNA library.* A shark DNA library incorporating material from the SMP has been developed by DPIRD Fisheries and currently contains over 1,250 samples. Accessioning of new material from the SMP is ongoing. For further details, refer to previous Annual Performance Reports
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 2023/24:* The NSW Shark Management Program has initiated substantial research effort into better understanding factors influencing shark attacks (https://www.sharksmart.nsw.gov.au/). 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. All these studies and data streams are being collected to identify high-risk elements and will be analysed during the life of the Program. A suite of publications on these topics have been published during the past year (see publications in the supplied list of References). An assessment of the efficacy of beach-focussed shark bite mitigation measures employed by the NSW Shark Management Program was concluded during the past year. Analysis of 198 unprovoked shark-human interactions since 1900 indicated that bites shifted from predominantly being on swimmers to 79% on surfers by the 1980s (Huveneers et al., 2024). Shark bites reduced from an average of 1.4 bites per year to -0.25 bites per year following installation of shark nets, but since 2017 increased to 1.2 bites per year. The low incidence and variable geographical distribution of shark bites did not enable calculating a statistical difference between netted and non-netted beaches during the past 22 years; however, it should be noted that the number of swimmers/surfers was not taken into consideration in these analyses. Similarly, no statistical change in shark bite incidents at beaches incorporating the 'new' technologies (e.g., drones, SMART drumlines, VR4G shark listening stations) could be determined (Huveneers et al., 2024). Results highlight that area-based protection alone is insufficient to reduce shark-human interactions and that surfers need to embrace responsibility in using proven personal protection devices, especially when surfing at remote beaches. An in-depth analysis of NSW shark attacks has been completed and is also being prepared for publication. The SMS has supported a new industry-linked post-doctoral position to develop a scientifically driven risk analysis for unprovoked shark-human interactions. This analysis has been expanded to include data from acknowledged global shark attack hotspots and is being prepared for publication in a high-impact scientific journal. *Previous*: A review of alternative systems to shark nets was conducted as part of the NSW SMS (Cardno, 2015). This review was subsequently updated for publication in a peer-reviewed scientific journal (McPhee *et al*., 2021). Data are regularly being reviewed and assessed for potential inclusion in a database proposed to incorporate all activities and environmental conditions in both temporal and spatial fields. It is anticipated that further research in this area will be initiated in due course. **3.3.2*: Apply standard risk assessment model (i.e., AS/NZ: 4360).*** *Activities in 2023/24:* More data has been collected to assist in this application. The collaborative project with an independent company, Risk Frontiers, to use DPIRD Fisheries data for modelling potential risk to shark attack has continued and broadened to include shark-human interactions from several areas around the world to test the reliability of the model in predicting potential increased risk. *Previous*: refer to previous Annual Performance Reports.

Level 3 Establish/support collaborative research (e.g., CSIRO, other government agencies and universities)	
3.4 Conduct morphometrics on sharks and other species caught in the SMP.	Status**: Ongoing** **3.4.1*: Identify need for morphometrics in meeting the needs of the SMP.*** Quality morphometric data is needed to assess the efficacy of the shark nets in reducing interactions with target sharks. 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. These data have been used in an analysis of ontogenetic changes in White Shark body shape using 130 individuals collected over 33 years. No differences in relative sizes were found between the east Australia and southern-western Australia nominal White Shark populations (Hunt et al., in press). This analysis is the first to present regression equations that will allow future conversion between different length or weight measures by researchers unable to obtain all measures and subsequently assist in monitoring population health of this threatened species. **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.

Table 4 SMP Monitoring Program

SMP Monitoring Program – Outcomes for 2023/24	
1. Shark Meshing Contractor Catch Report	All contractors are supplied with an iPad to report daily activities via the NSW Fisheries app. Contractors submit activity reports which include net inspection activities for the day and any catch data (including photographs). This information is uploaded and saved into the EnviroComms data base for analysis by the Senior Manager Shark Programs. Contractors also submit live catch information via email.
2. Shark Meshing DPIRD Catch Summary Report	Monthly catch summary reports were submitted to the Fisheries Scientific Committee, the NSW Scientific Committee and DPIE-EES. Catch across each region is shown in Appendix 2.
3. Tagging program	The tagging program continued in 2023/24 with 13 of the 25 sharks released alive being tagged this meshing season. Tagged sharks included: 5 White Sharks (acoustic tag); 4 Greynurse Sharks and 1 White Shark (mini-PSATs); and 2 Dusky Whalers and 1 Bronze Whaler (spaghetti tags). Another five sharks with pre-existing tags were also removed from the nets; 4 White Sharks (3 released alive, 1 dead) and 1 Shortfin Mako (dead). Prior to 2019 DPIRD Fisheries protocols did not support the tagging of Greynurse Sharks, however, with the purchase of mini-PSATs the tagging of Greynurse Sharks commenced in February 2019. Twenty-seven Greynurse Sharks released from the shark nets have been tagged with mini-PSATs to date. Three Australian Cownose Rays were tagged with acoustic tags as part of a University research project. One Green Turtle was tagged in 2023/24 with a Passive Integrated Transponder (PIT) tag. One Indo-Pacific Bottlenose Dolphin, three Green Turtles and one Leatherback Turtle were tagged with a PIT tag prior to being disposed of at sea.

SMP Monitoring Program – Outcomes for 2023/24

For further details refer to Appendix 2.

4. Routine DNA sampling and verification

Routine biological sampling of 90 dead and 4 live animals was undertaken in situ by contractors or observers in 2023/24, with sixteen whole animals also being collected during 2023/24 (for further details refer to 'monitoring parameter 5' below). All whole animals were necropsied in May 2024.

Sampling DNA from live sharks and ray was undertaken in 2023/24 as part of the SMP tagging program and University research projects.

Species identification was not genetically verified during 2023/24 following the Australian Museum analysis indicating 100% correct identification of hammerhead sharks (Frankham, 2017). All turtle samples were sent to the Australian Museum on behalf of the DCCEEW.

5. Biological Sampling
(sample types are dependent on the requirements from new and on-going research projects and may vary each meshing season)

Biological samples (Isotope, Genetics, Anal Swab, Vertebrae, Blubber, Whole) were taken from 110 animals during the 2023/24 season (4 from alive, 106 from deceased), and these are listed below:

Common Name	Sample Type and Number	Total Number Dead
Australian Cownose Ray	Isotope = 1, Genetics = 2*, Anal Swab = 1	8
Broadnose Sevengill Shark	Whole = 2	3
Bronze Whaler	Isotope = 2, Genetics = 5, Vertebrae = 2, Whole = 1	8
Common Blacktip	Genetics = 2, Vertebrae = 1	3
Common Dolphin	Whole = 1	1
Dusky Whaler	Genetics = 6, Vertebrae = 3	8
Great Hammerhead	Genetics = 3, Vertebrae = 3	3
Green Turtle	Genetics = 2, Whole = 4	8
Greynurse Shark	Genetics = 4, Vertebrae = 2, Whole = 2	6
Hawksbill Turtle	Whole = 1	1
Indo-Pacific Bottlenose Dolphin	Genetics = 1, Blubber = 2, Whole = 1	4
Leatherback Turtle	Genetics = 4	5
Loggerhead Turtle	Whole = 1	2
Shortfin Mako	Genetics = 2, Vertebrae = 1	3
Silky Shark	Genetics = 1, Vertebrae = 1	2
Smooth Hammerhead	Genetics = 44, Whole = 2	56
Smooth Stingray	Genetics = 1	2
Southern Eagle Ray	Isotope = 1, Genetics = 10, Vertebrae = 2	28
Spinner Shark	Genetics = 1, Vertebrae = 1	1
Tiger Shark	Isotope = 1, Genetics = 1	3
White Shark	Isotope = 1, Genetics = 3*, Whole = 1	2

*** some genetic samples were taken from animals that were 'released alive' as part of the SMP tagging program or University research projects. Samples taken from live animals included: 2 Australian Cownose Ray samples, and 2 White Shark sample.**

SMP Monitoring Program – Outcomes for 2023/24	
6. Monitoring of all shark attacks	When an attack occurs in NSW the DPIRD Fisheries 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 responders/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 Shark Scientist also provides key media support following shark attacks in NSW providing balanced information to the community on the reasonable level of threat. While the focus of this annual report is on interactions at meshed and unmeshed ocean beaches during the meshing season, DPIRD monitors all incidents in NSW waters and the following details are for all incidents in the 2023/24 financial year. A total of 6 shark interactions were reported and investigated by DPIRD in NSW waters during 2023/24. These interactions included: two interactions with White Sharks (Watonga Rocks, Port Macquarie (severe injury), and Old Bar (minor injury)); one with a Galapagos Whaler shark leading to no injuries, although the surfboard was bitten (Lord Howe Island), two with wobbegong sharks (Avoca Beach and Brunswick Heads Beach) leading to minor injuries, and one with a Bull Shark at Elizabeth Bay in Sydney Harbour that resulted in serious injuries. Only one of these interactions (Wobbegong at Avoca Beach) occurred at a meshed beach during the eight-month netting season.
7. Monitor technological advances in shark control measures	Reviews of alternative, non-lethal, shark management technologies have been published in a peer-reviewed scientific journal (McPhee *et al.*, 2021) and online (Cardno, 2021). Monitoring of technological advances in shark control measures is ongoing in this rapidly developing field.
8. Patterns of movements of non-target marine animals	DPIRD Fisheries continues working with relevant agencies and reviewed available information during 2023/24 and is not aware of any new information that would necessitate any changes to the SMP.
9. Population trends and patterns of movements of dangerous sharks and attack behaviour	DPIRD Fisheries has sourced information from relevant agencies during 2023/24 and is continuing collaborative research into trends and patterns of movements of target sharks (refer to Table 3 section 2.3). Information available to date does not necessitate any changes to the SMP. As reported in the 2020/21 Annual Performance Report, 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), and the total population size was estimated at 5,460 individuals (uncertainty range 2,909-12,802) with a high survivorship of approximately 93% (Bruce *et al.*, 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). This apparently stable population has been corroborated by Davenport et al. (2020) who used genetic samples of White Sharks to determine that the effective number of breeders in the population was comparable over the four years between 2010 and 2013.
10. Patterns of recreational water contact activities in marine waters	DPIRD Fisheries has reviewed the information that is available from relevant agencies for 2023/24 (refer to Table 3 section 2.4). DPIRD Fisheries collected some data on recreational water contact activities at SMP beaches during UAV aerial surveys conducted by SLSNSW. Information collected to date does not necessitate any changes to the SMP.
11. Threatened species recovery plan reviews	With the exception of a Population Viability Analysis for Leatherback Turtles (unpublished) which highlighted the precarious status of this species and the urgent need to reduce human-induced mortalities, no new recovery plans were prepared in 2023/24 and DPIRD Fisheries is not aware of any new information that would necessitate any changes to the SMP.
12. Contractor compliance	One non-compliance issue was identified during the 2023/24 season relating to a contractor failing to report catch within the contractual 1-hour time period. All non-compliance issues in 2023/24 were resolved to the satisfaction of the Senior Manager Shark Programs (for further details refer to section 1.3 Compliance Plan).

SMP Monitoring Program – Outcomes for 2023/24	
13. Monitor net locations by GPS	GPS location of nets was completed at the start of the 2023/24 meshing season with net locations being checked by observers throughout the meshing season. Net location GPS marks will vary slightly throughout the season due to the process of setting a net in an active environment. All nets were in similar positions to those reported in previous years.
14. Shark Meshing Program Annual Performance Evaluation.	The 2023/24 Annual Performance Report provides an evaluation of the performance of the SMP under the Management Plan. The JMA and Management Plan were reviewed in 2022 as per clause 9 of the JMA, with a new 2023 Management Plan being introduced into the SMP during the 2023/24 season.

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 2023/24.

1.5.1 Objective 1 - reduce the risk to humans from shark bites 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. There was one shark-human interactions at a meshed beach (Avoca Beach) during the 2023/24 meshing season resulting in a female surfer suffering minor injuries to her lower leg, so the trigger point was not tripped during 2023/24.

Table 5 Shark interactions per meshing season at ocean beaches of the SMP 2008/09 to 2023/24

Meshing Period	Fatal	Serious	Minor	No injury	Total Fatal / Serious	Total interactions
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	0	1	0	0	1
2018-19	0	0	2	0	0	2
2019-20	0	0	2	2	0	4
2020-21	0	0	0	3	0	3
2021-22	1	0	1	2	1	4
2022-23	0	0	0	0	0	0
2023-24	0	0	1	0	0	1

Note: Interaction information was cross-referenced with the Australian Shark Incident Database (ASID)

During the 2023/24 meshing season there was one reportedly unprovoked shark-human interaction at a meshed beach of the SMP. A female surfer reportedly suffered minor injuries to her lower left leg from what is believed to have been a wobbegong shark at Avoca Beach in November 2023, noting that DPIRD was unable to formally verify the incident. As the injuries sustained during this interaction were minor the trigger point for '*reducing the risk to humans from shark attacks at beaches of the SMP*' was not tripped.

During the 2023/24 meshing season, there were two verified, unprovoked shark-human interactions at unmeshed ocean beaches along the NSW coastline. Both interactions were outside of the SMP area of operation and occurred at: Old Bar Beach, Old Bar in the Mid North Coast region (minor injuries to leg), and Brunswick Heads Beach, Brunswick Heads on the Far North Coast (minor injuries to foot and ankle). A third unprovoked interaction did occur within the SMP region of operation but was not at an ocean beach, it was in a coastal estuary at Elizabeth Bay, Sydney Harbour (serious injuries sustained to lower leg). There was also a fourth unprovoked interaction at Lord Howe Island, where a surfer's board was bitten by a small Galapagos Whaler.

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

The trigger point for this objective is:

- *Trigger Point 1: Entanglements of Endangered or Critically Endangered Species, Populations or Ecological Communities in a single meshing season exceed the average catch plus two*

standard deviations of the catch data that is within two standard deviations of the preceding 10 years average for those species;

- *Trigger Point 2: Entanglements of Vulnerable Species or Ecological Communities in a single meshing season exceed the average catch plus three standard deviations of the catch data that is within two standard deviations of the preceding 10 years average for those species;*
- *Trigger Point 3: Entanglements of other Protected Species over 2 consecutive meshing seasons exceed twice the average catch of the catch data that is within two standard deviations of the preceding 10 years average for those species;*
- *Trigger Point 4: The listing of a new species, or a change to the status of an already listed threatened species, population or ecological community under the Fisheries Management Act 1994 or Biodiversity Conservation Act 2016 that may be directly and detrimentally affected by Shark Meshing.*

Catch records indicate that 255 animals were reported entangled in the nets during the period from 1 September 2023 to 30 April 2024 (Table 7), and that 240 (94%) were non-target animals (Tables 7 and 8) under the 2017 JMA whereby only White, Bull and Tiger Sharks are identified as 'target' species.

Sixty-five of those 255 interactions were with threatened or protected species, including:

- 14 Greynurse Sharks (6 dead, 8 released alive)
- 13 Green Turtles (8 dead, 5 released alive)
- 12 White Sharks (2 dead, 10 released alive)
- 11 Leatherback Turtles (5 dead*, 6 released alive)
- 5 Indo-Pacific Bottlenose Dolphins (4 dead, 1 released alive)
- 3 Loggerhead Turtles (2 dead, 1 released alive)
- 3 Great Hammerhead Sharks (dead)
- 1 Common Dolphin (dead)
- 1 Humpback Whale (released alive)
- 1 Olive Ridley Turtle (released alive)
- 1 Hawksbill Turtle (dead)

In addition, there were 187 interactions with other non-target species, including:

- 90 Rays (38 dead, 52 released alive)
- 57 Smooth Hammerheads (56 dead, 1 released alive)
- 11 Dusky Whalers* (8 dead, 3 released alive)
- 10 Bronze Whalers* (8 dead, 2 released alive)
- 3 Broadnose Sevengill Sharks* (dead)
- 3 Common Blacktips* (dead)
- 3 Shortfin Makos* (dead)
- 3 Australian Bonito (dead)
- 2 Silky Sharks* (dead)
- 1 Australian Angel Shark (released alive)
- 1 Spinner Shark* (dead)
- 1 Longtail Tuna (dead)
- 1 Mulloway (dead)
- 1 unidentified hammerhead species (dead)

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

Batoids (rays and skates) continue to comprise the greatest proportion of catches in the SMP at 35%, followed by Smooth Hammerheads at 22%, the collective group of 'target sharks' (Bull, White, and Tiger Sharks) accounted for approximately 6%, and Greynurse Sharks accounted for 5%.

The trigger point for the objective of '*minimising the impact on non-target species and threatened species*' was tripped in 2023/24 for Leatherback Turtles, Indo-Pacific Bottlenose Dolphins, and Great Hammerhead Sharks (Table 7). Under Part 7 S45.2 of the 2023 SMP Management Plan the activation of a trigger point requires a formal review response by way of a meeting between DPIRD and DCCEEW representatives. DPIRD and DCCEEW met on three occasions during the 2023/24 meshing season (23/2/2024, 22/03/2024 & 05/04/2024), after the activation of a trigger point. 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.

Table 6 Total SMP entanglements for the 2023/24 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												
Galeocerdo cuvier	Tiger Shark					1		2		3	**3**	1.2%
Carcharodon carcharias	White Shark	1	2	6	1	1		1	10	2	**12**	4.7%
Non-Target Sharks and Rays												
Squatina australis	Australian Angel Shark						1		1		**1**	0.4%
Notorynchus cepedianus	Broadnose Sevengill Shark			1				2		3	**3**	1.2%
Carcharhinus brachyurus	Bronze Whaler	1	1	1	2		3	2	2	8	**10**	3.9%
Carcharhinus obscurus	Dusky Whaler	2	1	3	2		1	2	3	8	**11**	4.3%
Isurus oxyrinchus	Shortfin Mako			1			1	1		3	**3**	1.2%
Carcharhinus falciformis	Silky Shark		2							2	**2**	0.8%
Carcharhinus brevipinna	Spinner Shark			1						1	**1**	0.4%
Carcharhinus limbatus	Common Blacktip		2	1						3	**3**	1.2%
Sphyrna zygaena	Smooth Hammerhead Shark		26	17	10		3	1	1	56	**57**	22.4%
Sphyrna mokarran	Great Hammerhead Shark		1	1				1		3	**3**	1.2%
Sphyrna sp	unidentified hammerhead		1							1	**1**	0.4%
Carcharias taurus	Greynurse Shark	1	1	4	3		3	2	8	6	**14**	5.5%
Myliobatis australis	Southern Eagle Ray		11	4	4		14	19	24	28	**52**	20.4%
Rhinoptera neglecta	Australian Cownose Ray	3	9	2	15		4		25	8	**33**	12.9%
Dasyatis brevicaudata	Smooth Stingray			1			1	2	2	2	**4**	1.6%
Aetobatus ocellatus	Whitespotted Eagle Ray			1					1		**1**	0.4%
Non-Target Marine Mammals, Reptiles and Birds												
Delphinus delphis	Common Dolphin		1							1	**1**	0.4%
Tursiops aduncus	Indo-Pacific Bottlenose Dolphin				3		1	1	1	4	**5**	2.0%
Chelonia mydas	Green Turtle	1	3	1	1		3	4	5	8	**13**	5.1%
Caretta caretta	Loggerhead Turtle	1	1			1			1	2	**3**	1.2%
Megaptera novaeangliae	Humpback Whale		1						1		**1**	0.4%
Eretmochelys imbricata	Hawksbill Turtle		1							1	**1**	0.4%
Dermochelys coriacea	Leatherback Turtle	1	1	3	2	2	1	1	6	5	**11**	4.3%
Lepidochelys olivacea	Olive Ridley Turtle							1	1		**1**	0.4%
Non-Target Finfish												
Sarda australis	Australian Bonito		**3**							**3**	**3**	1.2%
Argyrosomus japonicus	Mulloway							**1**		**1**	**1**	0.4%
Thunnus tonggol	Longtail Tuna				1					1	**1**	0.4%
	TOTAL	**11**	**68**	**48**	**44**	**5**	**36**	**43**	**92**	**163**	**255**	**100.0%**

Table 7 Threatened species entanglements[1] for 2013/14 to 2023/24 and trigger point analysis for 2023/24.

Scientific Name	Common Name	Preceding 10 years catch data										Current reporting year	Trigger Point Threshold (number of individual entanglements)			Trigger tripped (True/False)
		13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	Critically Endangered / Endangered	Vulnerable	Other Protected	
Critically Endangered/Endangered																
Carcharias taurus	Greynurse Shark	4	4	19	17	20	9	31	9	14	16	14	**24.7**	-	-	FALSE
Sphyrna lewini	Scalloped Hammerhead	0	0	0	1	0	1	4	0	0	0	0	**1.1**	-	-	FALSE
Dermochelys coriacea	Leatherback Turtle	2	0	2	1	2	4	0	2	16	6	11	**5.9**	-	-	**TRUE**
Caretta caretta	Loggerhead Turtle	0	0	4	1	0	6	1	5	4	5	3	**7.4**	-	-	FALSE
Dugong dugon	Dugong	0	0	0	0	0	0	0	0	0	0	0	**0.0**	-	-	FALSE
Eudyptula minor	Little Penguin	0	0	1	0	0	0	0	0	0	0	0	**0.0**			FALSE
Vulnerable																
Sphyrna mokarran	Great Hammerhead	0	0	1	1	3	1	1	1	2	1	3	-	**2.7**	-	**TRUE**
Carcharodon carcharias	White Shark	6	10	31	22	26	17	42	24	28	18	12	-	**53.6**	-	FALSE
Chelonia mydas	Green Turtle	10	4	13	6	9	8	8	8	19	3	13	-	**16.8**	-	FALSE
Megaptera novaeangliae	Humpback Whale	1	0	0	0	0	0	0	2	1	0	1	-	**1.5**	-	FALSE
Pinnipedia	Seals	0	0	0	1	0	0	0	1	0	2	0	-	**1.5**	-	FALSE
Procellariidae	Shearwater	0	0	1	0	0	0	0	0	0	0	0		**0.0**		FALSE
Other Protected or Non-Target Species																
Pseudorca crassidens	False Killer Whale	0	0	0	0	0	0	0	0	0	0	0	-	-	**0.0**	FALSE
Balaenoptera acutorostrata	Minke Whale	0	0	0	0	0	0	0	0	0	0	0	-	-	**0.0**	FALSE
Tursiops aduncus	Indo-Pacific Bottlenose Dolphin	1	0	9	2	3	2	0	0	0	6	5	-	-	**3.3**	**TRUE**
Delphinus delphis	Common Dolphin	4	3	4	2	4	3	7	5	1	2	1	-	-	**6.2**	FALSE
Eretmochelys imbricate	Hawksbill Turtle	0	1	5	2	2	4	0	2	0	0	1	-	-	**3.2**	FALSE
Lepidochelys olivacea	Olive Ridley Turtle	0	0	0	0	1	0	0	1	0	0	1	-	-	**0.4**	FALSE

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

Trigger Point Analysis values are calculated as per the 2023 SMP Management Plan:

* Entanglements of Endangered or Critically Endangered species, populations or ecological communities in a single meshing season exceed the average catch plus two standard deviations of the catch data that is within two standard deviations of the preceding 10 years average for those species;
* Entanglements of Vulnerable species or ecological communities in a single meshing season exceed the average catch plus three standard deviations of the catch data that is within two standard deviations of the preceding 10 years average for those species;
* Entanglements of other protected species over 2 consecutive meshing seasons exceed twice the average catch of the catch data that is within two standard deviations of the preceding 10 years average for those species.

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 reducing the time between checking the nets from 96 to 72 hours. Table 8 compares the proportion of animals released alive pre - JMA (5 years before) and post – JMA for some major faunal groups and the total numbers of releases and captures. The data suggest that since the JMAs were implemented in 2009, there was a significant increase in the total number of animals released alive, from 27% before the JMA to a 41% average over the 15-year period from 2009 - 2024. It is important to note, however, that many of these animals are caught in very small numbers, and small changes can be reflected in greater percentages.

Table 8 Percentage of major faunal groups released alive from the SMP pre-JMA and post-JMA.

Faunal Group or Species	% released alive pre-JMA (2004-2009)	Annual percentage released alive over last five years					Overall % released alive post-JMA (2009/10 - 2023/2024)
		2019/20	2020/21	2021/22	2022/23	2023/24	
Target sharks*	**5%**	13%	13%	26%	50%	0%	**15%**
White Shark	**11%**	43%	29%	36%	44%	83%	**38%**
Greynurse Shark	**25%**	55%	67%	64%	88%	57%	**58%**
All hammerheads	**0%**	1%	3%	2%	2%	2%	**1%**
Other non-target sharks**	**48%**	15%	19%	13%	17%	18%	**19%**
All rays	**62%**	79%	74%	66%	74%	58%	**75%**
All dolphins	**0%**	0%	0%	0%	0%	17%	**1%**
All turtles	**24%**	40%	33%	48%	50%	45%	**36%**
Released/Interactions	**223/826**	**196/480**	**144/375**	**142/376**	**85/228**	**92/255**	**1884/4549**
Total % released alive	**27%**	**41%**	**38%**	**38%**	**37%**	**36%**	**41%**

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

As there were no reported OHS incidents, this trigger point was not tripped during the 2023/24 meshing season.

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 2023/24 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 2018/19 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 Greynurse Sharks, three Great Hammerheads, and two Hawksbill Turtles. DPIRD completed the

review report for those trigger points within six months of the publication of the 2017/18 Annual Performance Report.

2018/19: 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 2018/19 following the entanglement of six Loggerhead Turtles, four Leatherback Sea Turtles, four Hawksbill Turtles, and 87 Smooth Hammerheads. DPIRD completed the review report for those trigger points within six months of the publication of the 2018/19 Annual Performance Report.

2019/20: 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 four species during 2019/20 following the entanglement of thirty-one Greynurse Sharks, four Scalloped Hammerhead Sharks, eight Common Dolphins, and four Thresher Sharks. The trigger point for the objective of *'Minimise OHS risks associated with implementing the SMP'* was tripped with two 'minor' OHS incidents being reported. DPIRD completed the review report for those trigger points within six months of the publication of the 2019/20 Annual Performance Report.

2020/21: No trigger points were tripped in 2020/21.

2021/22: 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 two species during 2021/22 following the entanglement of nineteen Green Turtles and sixteen Leatherback Turtles. DPIRD will complete a review report for those trigger points within six months of the publication of the 2021/22 Annual Performance Report.

2022/23: 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 'seals' during 2022/23 following the entanglement of one Australian Fur Seal and one New Zealand Fur Seal. DPIRD will complete a review report this trigger point within six months of the publication of the 2022/23 Annual Performance Report.

2023/24: 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 four species during 2023/24 following the entanglement of thirteen Green Turtles, eleven Leatherback Turtles, and five Indo-Pacific Bottlenose Dolphins DPIRD and DCCEEW met on three occasions during the meshing season under S45.2 of the 2023 MP (activation of a trigger point) to discuss possible remediation actions, with increased aerial (drone) surveillance of nets being implemented toward the end of the meshing season. That additional drone surveillance led to the release of a Leatherback Turtle from the Killcare net on a day when those nets would have otherwise not been inspected by the Contractor. DPIRD/DCCEEW will complete a review report this trigger point within six months of the publication of the 2023/24 Annual Performance Report.

2 Changes to the Management Plan

In accordance with clause 9 of the JMA, the Management Plan and 2017 JMA were subject for review in 2022. The review by the Parties to the Agreement did not identify a need for any specific amendments to the 2017 JMA but specific amendments to the Management Plan were identified. A working group was established to make changes to the management Plan prior to the commencement of the 2022/23 season, with specific attention being placed on trigger point analysis of threatened species entanglements. The working group liaised with internal and external biometricians and research scientist to determine a 'better' more robust trigger point system, with the underlying feedback being that the lack of knowledge of population sizes inhibits the development of an effective analysis system. A Population Viability Analysis (PVA) system is currently being considered however this type of analysis is only done on a single species and may not be practical for the varying number of species caught in the SMP for which the population estimates are not as accurate. The complex nature of developing a new trigger point analysis system delayed the release of the updated MP. The new 2023 MP for the SMP was approved in 2023 and

implemented for the 2023/24 meshing season, with key changes being made to the trigger point analysis system and the inclusion of reporting timeframes for tripped trigger points.

In accordance with the 2017 JMA and 2023 Management Plan, trigger point review reports for threatened species need to be prepared by DPIRD within six months of the publication of this Annual Performance Report.

DPIRD Fisheries implemented the use of PSAT tagging for Greynurse Sharks at the end of the 2018/19 season and continued this throughout the 2023/24 season to determine to post-release survivorship of Greynurse Sharks caught in SMP nets. DPIRD Fisheries implemented the use of Passive Integrated Transponder (PIT) tags in 2023 for turtles released alive from the nets and deceased DCCEEW species (dolphins, turtles, seals etc). The use of PIT tags will allow for positive identification of animals that have been previously caught in the shark nets.

3 Other Programs Complementing the SMP

3.1 Aerial Surveys

Aerial surveys using helicopters to patrol the SMP region (and other coastal regions) is no longer part of the broader Shark Management Program. Aerial surveillance in the SMP region and in every coastal local government area is now provided by Surf Life Saving NSW (SLSNSW) during the peak swimming periods, which within the SMP region is spring, summer and autumn (Table 9).

Table 9 Data summary from the SLSNSW drone flights in the SMP region 2023/24

	Spring 2023			Summer 23/24			Autumn 2024		
Local Government Area	**Flights**	**Hours**	**Sharks**	**Flights**	**Hours**	**Sharks**	**Flights**	**Hours**	**Sharks**
Newcastle	181	48.13	5	377	92.38	2	187	52.03	
Lake Macquarie	272	63.08		705	168.52	2	396	130.07	1
Central Coast	708	177.52	6	1605	389.30	1	847	269.65	
Northern Beaches	450	138.18		1403	394.33	3	955	300.68	1
Waverley	118	25.53		392	94.98	1	163	46.33	
Randwick	169	36.95		373	107.70		219	61.18	
Sutherland	150	36.12		767	200.23		231	72.70	
Wollongong	367	84.02		818	183.12	1	376	125.90	3
TOTAL	**2415**	**609.53**	**11**	**6440**	**1630.57**	**10**	**3374**	**1058.55**	**5**

In addition to the contracted school holiday flights, in the latter half of the 2023/24 meshing season, the DPIRD and DCCEEW examined options to further mitigate the impacts on Leatherback Turtles. From Tuesday 19 March to 30 April 2024, SLSNSW were engaged to fly drones at some Central Coast beaches and at Palm Beach on the Northern Beaches to monitor the nets for the presence of live turtles, whales, dolphins and seals. The flights occurred every Tuesday and Thursday (the days that the net contractors don't check the nets) until 30 April 2024, in addition to the contracted flights by SLS during the Easter and autumn school holidays. Those flights enabled the early identification of an entangled Leatherback Turtle at Killcare Beach, and the timely and effective safe release by DPIRD and a contractor. The process and outcome demonstrated the proof of concept for alternative methods of increased net inspections. The DPIRD and partner agencies will continue to assess options to minimise the impact of the shark nets on marine life.

3.2 SharkSmart Public Awareness and Education Program

DPIRD continued ongoing work during 2023/24 on the SharkSmart public awareness and education program including releases of updated versions of the SharkSmart App for iPhone and Android. The website https://www.sharksmart.nsw.gov.au/ was also updated and includes a more interactive and dynamic map of the program and some data.

During the 2023/24 meshing season, three SharkSmart community engagement events were held within the SMP region, and another seven outside of the SMP region. Events included surfing competitions, music festivals, surf life saving competitions, lifestyle events, community markets, and a 10-year anniversary commemorative event for the young surfer that was killed by a tiger shark at Coffs Harbour in 2013. Collectively, the events provided direct engagement and community support with approximately 2,700 stakeholders.

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Appendix 1 – Unprovoked shark interactions while nets were operational, 1 October 1937 – 30 April 2024.

(Source: Australian Shark Incident Database, May 2024)

Date	Beach	Region*	Species Involved (Common Name)	Outcome of Interaction	Activity at time of Interaction
3/01/1938	Cronulla	Sydney South	White Shark	Uninjured	ski/kayak
13/01/1949	Mona Vale	Sydney North	White Shark	Uninjured	ski/kayak
26/02/1949	Newport	Sydney North	White Shark	Uninjured	ski/kayak
1/02/1951	Bondi	Sydney South	Unidentified	Injured	swimming
6/12/1951	Merewether	Hunter	White Shark	**Fatal**	swimming
22/12/1953	Maroubra	Sydney South	White Shark	Injured	swimming
29/12/1953	Maroubra	Sydney South	White Shark	Uninjured	ski/kayak
23/04/1957	Merewether	Hunter	Wobbegong	Injured	surfing
26/04/1996	Mona Vale	Sydney North	Wobbegong	Injured	swimming
26/04/1996	Mona Vale	Sydney North	Wobbegong	Injured	swimming
7/02/2000	Wanda	Sydney South	White Shark	Uninjured	ski/kayak
15/03/2000	Macmasters	Central Coast South	White Shark	Uninjured	surfing
3/04/2000	Maroubra	Sydney South	Whaler sp.	Uninjured	ski/kayak
12/04/2002	Bar	Hunter	Wobbegong	Injured	swimming
11/02/2003	Coogee	Sydney South	Wobbegong	Injured	swimming
21/10/2004	Stockton	Hunter	White Shark	Injured	surfing
16/04/2005	Bronte	Sydney South	White Shark	Uninjured	surfing
15/03/2006	Bondi	Sydney South	Whaler sp.	Uninjured	surfing
12/02/2009	Bondi	Sydney South	White Shark	Injured	surfing
1/03/2009	Avalon	Sydney North	White Shark	Injured	surfing
23/03/2009	Maroubra	Sydney South	Wobbegong	Injured	SCUBA
7/12/2011	Maroubra	Sydney South	Wobbegong	Injured	surfing
3/01/2012	North Avoca	Central Coast South	White Shark	Injured	surfing
18/01/2012	Redhead	Hunter	White Shark	Injured	surfing
30/12/2012	Dee Why	Sydney Central	White Shark	Uninjured	surfing
29/11/2014	Dee Why	Sydney Central	Wobbegong	Injured	swimming
5/02/2015	Merewether	Hunter	Wobbegong	Injured	swimming
8/09/2015	Shelly	Central Coast North	Unidentified	Injured	surfing
28/03/2016	Cronulla	Sydney South	White Shark	Uninjured	surfing
13/11/2017	Avoca	Central Coast South	White Shark	Injured	surfing
28/11/2018	Manly	Sydney Central	Wobbegong	Injured	surfing
21/10/2020	Queenscliff	Sydney Central	Whaler sp.	Uninjured	surfing
7/03/2021	Cronulla	Sydney South	Wobbegong	Uninjured	surfing
8/03/2022	Maroubra	Sydney South	Unidentified	Uninjured	surfing
11/11/2023	Avoca	Central Coast South	Wobbegong	Injured	surfing

Appendix 2 – Catch data by SMP region for the 2023/24 meshing season.

Region	Date	Beach	Scientific Name	Common Name	Sex (M / F / unk)	Size(m)	Status (Dead / Alive & Released)	Tagged	Samples Taken (Yes / No / Whole)
Hunter	9/09/2023	Stockton	*Carcharhinus brachyurus*	Bronze Whaler	M	2.63 FL	Dead	No	Yes
	29/10/2023	Nobbys	*Carcharodon carcharias*	White Shark	F	2.81 FL	Alive	Yes	No
	19/12/2023	Redhead	*Carcharias taurus*	Greynurse Shark	F	2.60 FL	Alive	No	No
	2/02/2024	Newcastle	*Chelonia mydas*	Green Turtle	F	0.85 CCL	Alive	Yes	No
	14/02/2024	Stockton	*Rhinoptera neglecta*	Australian Cownose Ray	F	0.80 WS	Alive	No	No
	14/02/2024	Stockton	*Rhinoptera neglecta*	Australian Cownose Ray	M	0.90 WS	Alive	No	No
	14/02/2024	Stockton	*Rhinoptera neglecta*	Australian Cownose Ray	F	0.89 WS	Alive	No	No
	29/02/2024	Stockton	*Carcharhinus obscurus*	Dusky Whaler	F	3.35 FL	Dead	No	Yes
	8/04/2024	Nobbys	*Carcharhinus obscurus*	Dusky Whaler	F	3.36 FL	Dead	No	No
	13/04/2024	Stockton	*Dermochelys coriacea*	Leatherback Turtle	unk	1.30 CCL	Alive	No	No
	13/04/2024	Redhead	*Caretta caretta*	Loggerhead Turtle	unk	0.76 CCL	Dead & Decomposed	No	No
Central Coast North	13/09/2023	Soldiers	*Sphyrna zygaena*	Smooth Hammerhead	F	1.85 FL	Dead	No	Yes
	13/09/2023	Blacksmiths	*Carcharhinus brachyurus*	Bronze Whaler	F	2.49 FL	Alive	No	No
	23/09/2023	The Entrance	*Sphyrna zygaena*	Smooth Hammerhead	F	1.15 FL	Dead	No	No
	28/09/2023	Catherine Hill Bay	*Megaptera novaeangliae*	Humpback Whale	unk	6.00 TL	Alive	No	No
	3/10/2023	Blacksmiths	*Caretta caretta*	Loggerhead Turtle	M	0.93 CCL	Dead	No	Whole
	11/10/2023	Catherine Hill Bay	*Carcharodon carcharias*	White Shark	F	1.63 FL	Alive	Yes	No
	23/10/2023	Blacksmiths	*Carcharias taurus*	Greynurse Shark	F	2.12 FL	Dead	No	Whole
	6/11/2023	Blacksmiths	*Carcharodon carcharias*	White Shark	F	1.65 FL	Alive	Yes	No
	6/11/2023	Lakes	*Dermochelys coriacea*	Leatherback Turtle	M	1.60 CCL	Dead	No	No
	9/11/2023	Blacksmiths	*Sphyrna zygaena*	Smooth Hammerhead	M	0.92 FL	Dead	No	Yes
	9/11/2023	Blacksmiths	*Sphyrna zygaena*	Smooth Hammerhead	F	0.86 FL	Dead	No	Yes
	9/12/2023	Lakes	*Myliobatis australis*	Southern Eagle Ray	F	1.50 WS	Alive	No	No
	12/12/2023	Blacksmiths	*Sphyrna zygaena*	Smooth Hammerhead	F	0.88 FL	Dead	No	Yes
	12/12/2023	Lakes	*Myliobatis australis*	Southern Eagle Ray	M	0.62 WS	Dead	No	Yes
	13/12/2023	Blacksmiths	*Myliobatis australis*	Southern Eagle Ray	F	1.02 WS	Dead	No	No

	18/12/2023	Soldiers	*Myliobatis australis*	Southern Eagle Ray	f	1.10 WS	Dead	No	No
	19/12/2023	The Entrance	*Myliobatis australis*	Southern Eagle Ray	F	0.90 WS	Alive	No	No
	29/12/2023	Blacksmiths	*Sphyrna zygaena*	Smooth Hammerhead	M	0.98 FL	Dead	No	Yes
	3/01/2024	Caves	*Carcharhinus falciformis*	Silky Shark	F	0.80 FL	Dead	No	Yes
	7/01/2024	Catherine Hill Bay	*Sphyrna zygaena*	Smooth Hammerhead	F	1.15 FL	Dead	No	Yes
	7/01/2024	Lakes	*Sphyrna zygaena*	Smooth Hammerhead	M	1.12 FL	Dead	No	Yes
	7/01/2024	Caves	*Myliobatis australis*	Southern Eagle Ray	F	0.87 WS	Alive	No	No
	9/01/2024	Blacksmiths	*Sphyrna spp*	Hammerhead (unknown species)	unk	1.30 TL	Dead	No	No
	10/01/2024	Shelly	*Sphyrna zygaena*	Smooth Hammerhead	M	1.30 FL	Dead	No	Yes
	11/01/2024	Blacksmiths	*Sphyrna zygaena*	Smooth Hammerhead	M	0.89 FL	Dead	No	Yes
	19/01/2024	Caves	*Eretmochelys imbricata*	Hawksbill Turtle	F	0.66 CCL	Dead	No	Whole
	19/01/2024	Blacksmiths	*Myliobatis australis*	Southern Eagle Ray	F	1.22 WS	Dead	No	No
	25/01/2024	Caves	*Chelonia mydas*	Green Turtle	unk	0.46 CCL	Dead	Yes	Yes
	25/01/2024	Blacksmiths	*Sphyrna zygaena*	Smooth Hammerhead	M	1.22 FL	Dead	No	Yes
	28/01/2024	Blacksmiths	*Sphyrna zygaena*	Smooth Hammerhead	M	0.91 FL	Dead	No	Yes
	2/02/2024	Soldiers	*Sphyrna mokarran*	Great Hammerhead	F	2.70 FL	Dead	No	Yes
	5/02/2024	Caves	*Carcharhinus obscurus*	Dusky Whaler	M	2.85 FL	Dead	No	Yes
	5/02/2024	Catherine Hill Bay	*Chelonia mydas*	Green Turtle	unk	0.67 CCL	Dead	No	Whole
	5/02/2024	Blacksmiths	*Myliobatis australis*	Southern Eagle Ray	M	0.60 WS	Dead	No	No
	5/02/2024	Blacksmiths	*Myliobatis australis*	Southern Eagle Ray	F	0.50 WS	Dead	No	No
	5/02/2024	Catherine Hill Bay	*Myliobatis australis*	Southern Eagle Ray	F	1.24 WS	Alive	No	No
	5/02/2024	Catherine Hill Bay	*Sphyrna zygaena*	Smooth Hammerhead	M	0.75 FL	Dead	No	No
	13/02/2024	The Entrance	*Sphyrna zygaena*	Smooth Hammerhead	F	1.10 FL	Dead	No	Yes
	16/02/2024	Caves	*Rhinoptera neglecta*	Australian Cownose Ray	F	0.60 WS	Dead	No	No
	18/02/2024	Blacksmiths	*Sphyrna zygaena*	Smooth Hammerhead	F	1.21 FL	Dead	No	Yes
	21/02/2024	Blacksmiths	*Myliobatis australis*	Southern Eagle Ray	F	0.36 WS	Dead	No	No
	7/03/2024	The Entrance	*Delphinus delphis*	Common Dolphin	M	1.39 TL	Dead	No	Whole
	10/03/2024	Caves	*Rhinoptera neglecta*	Australian Cownose Ray	M	0.88 WS	Alive	Yes	Yes
	10/03/2024	Blacksmiths	*Sphyrna zygaena*	Smooth Hammerhead	M	0.89 FL	Dead	No	Yes
	13/03/2024	Blacksmiths	*Sphyrna zygaena*	Smooth Hammerhead	M	0.90 FL	Dead	No	No

	20/03/2024	Blacksmiths	*Sphyrna zygaena*	Smooth Hammerhead	F	0.76 FL	Dead	No	Yes
	20/03/2024	Caves	*Rhinoptera neglecta*	Australian Cownose Ray	M	0.90 WS	Dead & Decomposed	No	No
	20/03/2024	The Entrance	*Sarda australis*	Australian Bonito	unk	0.63 TL	Dead	No	No
	26/03/2024	The Entrance	*Rhinoptera neglecta*	Australian Cownose Ray	M	0.97 WS	Alive	Yes	No
	28/03/2024	Lakes	*Sphyrna zygaena*	Smooth Hammerhead	F	1.50 FL	Dead	No	Whole
	28/03/2024	Lakes	*Sarda australis*	Australian Bonito	unk	0.66 TL	Dead	No	No
	7/04/2024	Soldiers	*Carcharhinus limbatus*	Common Blacktip	M	1.88 FL	Dead	No	No
	7/04/2024	Soldiers	*Carcharhinus falciformis*	Silky Shark	F	1.67 FL	Dead	No	No
	9/04/2024	Lakes	*Carcharhinus limbatus*	Common Blacktip	F	1.49 FL	Dead	No	Yes
	18/04/2024	Blacksmiths	*Sphyrna zygaena*	Smooth Hammerhead	F	0.96 FL	Dead	No	Yes
	18/04/2024	Caves	*Sphyrna zygaena*	Smooth Hammerhead	M	0.92 FL	Dead	No	Yes
	19/04/2024	The Entrance	*Rhinoptera neglecta*	Australian Cownose Ray	M	0.92 WS	Alive	Yes	Yes
	19/04/2024	Shelly	*Sphyrna zygaena*	Smooth Hammerhead	M	1.25 FL	Dead	No	Yes
	19/04/2024	Shelly	*Sphyrna zygaena*	Smooth Hammerhead	F	1.15 FL	Dead	No	Yes
	19/04/2024	Lakes	*Sphyrna zygaena*	Smooth Hammerhead	M	1.19 FL	Dead	No	Yes
	19/04/2024	Lakes	*Sphyrna zygaena*	Smooth Hammerhead	M	1.32 FL	Dead	No	Yes
	23/04/2024	The Entrance	*Rhinoptera neglecta*	Australian Cownose Ray	M	1.02 WS	Dead & Decomposed	No	No
	24/04/2024	Caves	*Sarda australis*	Australian Bonito	unk	0.62 TL	Dead	No	No
	24/04/2024	Catherine Hill Bay	*Rhinoptera neglecta*	Australian Cownose Ray	M	0.90 WS	Alive	No	No
	27/04/2024	Lakes	*Rhinoptera neglecta*	Australian Cownose Ray	M	0.88 WS	Dead	No	No
	29/04/2024	The Entrance	*Chelonia mydas*	Green Turtle	F	0.48 CCL	Dead	Yes	Yes
	29/04/2024	The Entrance	*Rhinoptera neglecta*	Australian Cownose Ray	unk	0.80 WS	Dead & Decomposed	No	No
	29/04/2024	Caves	*Sphyrna zygaena*	Smooth Hammerhead	M	0.84 FL	Dead	No	No
Central Coast South	4/09/2023	Copacabana	*Carcharodon carcharias*	White Shark	M	2.05 FL	Alive	Recapture	No
	19/09/2023	Umina	*Sphyrna zygaena*	Smooth Hammerhead	F	0.86 FL	Dead	No	Yes
	23/09/2023	Copacabana	*Carcharhinus brachyurus*	Bronze Whaler	F	2.57 FL	Dead	No	Yes
	26/09/2023	Umina	*Carcharodon carcharias*	White Shark	M	1.63 FL	Dead	No	Whole
	26/09/2023	Umina	*Notorynchus cepedianus*	Broadnose Sevengill Shark	M	1.29 FL	Dead	No	Whole
	29/09/2023	Macmasters	*Chelonia mydas*	Green Turtle	F	0.45 CCL	Dead	No	Whole
	3/10/2023	Copacabana	*Myliobatis australis*	Southern Eagle Ray	F	0.80 WS	Alive	No	No

	6/10/2023	Copacabana	*Carcharias taurus*	Greynurse Shark	F	2.38 FL	Dead	No	Whole
	13/10/2023	North Avoca	*Carcharodon carcharias*	White Shark	F	2.15 FL	Alive	Recapture	No
	13/10/2023	Macmasters	*Carcharias taurus*	Greynurse Shark	F	2.16 FL	Alive	Yes	No
	30/10/2023	Macmasters	*Dasyatis brevicaudata*	Smooth Stingray	F	1.00 WS	Alive	No	No
	30/10/2023	Copacabana	*Aetobatus ocellatus*	Whitespotted Eagle Ray	F	1.10 WS	Alive	No	No
	7/11/2023	Avoca Beach	*Carcharodon carcharias*	White Shark	M	2.46 FL	Dead	Recapture	Yes
	10/11/2023	Umina	*Sphyrna zygaena*	Smooth Hammerhead	F	0.72 FL	Dead	No	Yes
	10/11/2023	Avoca Beach	*Carcharodon carcharias*	White Shark	F	2.20 FL	Alive	Recapture	No
	14/11/2023	Copacabana	*Carcharias taurus*	Greynurse Shark	F	2.52 FL	Alive	No	No
	16/11/2023	North Avoca	*Sphyrna zygaena*	Smooth Hammerhead	F	1.09 FL	Dead	No	Yes
	18/11/2023	Terrigal	*Carcharodon carcharias*	White Shark	M	1.64 FL	Alive	Yes	Yes
	18/11/2023	Killcare	*Sphyrna zygaena*	Smooth Hammerhead	F	0.90 FL	Dead	No	Yes
	18/11/2023	Killcare	*Sphyrna zygaena*	Smooth Hammerhead	M	1.30 FL	Dead	No	Whole
	21/11/2023	Copacabana	*Carcharias taurus*	Greynurse Shark	F	1.83 FL	Alive	Yes	No
	30/11/2023	Umina	*Sphyrna zygaena*	Smooth Hammerhead	F	0.92 FL	Dead	No	Yes
	30/11/2023	Umina	*Sphyrna zygaena*	Smooth Hammerhead	F	0.93 FL	Dead	No	Yes
	30/11/2023	Umina	*Sphyrna zygaena*	Smooth Hammerhead	F	0.91 FL	Dead	No	Yes
	19/12/2023	Terrigal	*Myliobatis australis*	Southern Eagle Ray	F	1.10 WS	Dead	No	Yes
	27/12/2023	Killcare	*Carcharhinus brevipinna*	Spinner Shark	M	1.33 FL	Dead	No	Yes
	27/12/2023	North Avoca	*Sphyrna zygaena*	Smooth Hammerhead	M	1.05 FL	Dead	No	Yes
	4/01/2024	Killcare	*Carcharhinus obscurus*	Dusky Whaler	F	2.56 FL	Dead	No	Yes
	13/01/2024	Terrigal	*Isurus oxyrinchus*	Shortfin Mako	F	2.73 FL	Dead	No	Yes
	24/01/2024	Avoca Beach	*Sphyrna zygaena*	Smooth Hammerhead	M	1.23 FL	Dead	No	Yes
	31/01/2024	Terrigal	*Myliobatis australis*	Southern Eagle Ray	unk	0.60 WS	Dead & Decomposed	No	No
	16/02/2024	Killcare	*Sphyrna zygaena*	Smooth Hammerhead*	unk	- -	Dead	No	No
	19/02/2024	Avoca Beach	*Sphyrna zygaena*	Smooth Hammerhead	F	1.25 FL	Dead	No	Yes
	19/02/2024	Terrigal	*Myliobatis australis*	Southern Eagle Ray	F	0.60 WS	Alive	No	No
	21/02/2024	Copacabana	*Sphyrna mokarran*	Great Hammerhead	F	2.59 FL	Dead	No	Yes
	6/03/2024	Killcare	*Carcharhinus obscurus*	Dusky Whaler	F	1.49 FL	Dead	No	Yes
	23/03/2024	Killcare	*Carcharhinus obscurus*	Dusky Whaler	F	2.78 FL	Dead	No	Yes

	23/03/2024	Killcare	*Sphyrna zygaena*	Smooth Hammerhead	M	1.12 FL	Dead	No	Yes
	23/03/2024	Terrigal	*Rhinoptera neglecta*	Australian Cownose Ray	unk	0.60 WS	Alive	No	No
	29/03/2024	Copacabana	*Rhinoptera neglecta*	Australian Cownose Ray	M	0.80 WS	Alive	No	No
	4/04/2024	Killcare	*Dermochelys coriacea*	Leatherback Turtle	unk	1.50 CCL	Alive	No	No
	7/04/2024	North Avoca	*Sphyrna zygaena*	Smooth Hammerhead	M	1.52 FL	Dead	No	Yes
	15/04/2024	North Avoca	*Sphyrna zygaena*	Smooth Hammerhead	F	1.03 FL	Dead	No	Yes
	18/04/2024	Umina	*Dermochelys coriacea*	Leatherback Turtle	F	1.20 CCL	Alive	No	No
	22/04/2024	Killcare	*Carcharhinus limbatus*	Common Blacktip	F	1.27 FL	Dead	No	Yes
	22/04/2024	Umina	*Dermochelys coriacea*	Leatherback Turtle	M	1.40 CCL	Dead	No	Yes
	22/04/2024	Killcare	*Sphyrna zygaena*	Smooth Hammerhead	unk	1.07 TL	Dead & Decomposed	No	No
	29/04/2024	Killcare	*Sphyrna zygaena*	Smooth Hammerhead	M	0.98 FL	Dead	No	Yes
Sydney North	4/09/2023	Palm Beach	*Rhinoptera neglecta*	Australian Cownose Ray	M	0.60 WS	Alive	No	No
	6/09/2023	Bilgola	*Carcharhinus brachyurus*	Bronze Whaler	M	2.30 FL	Dead	No	Whole
	6/09/2023	Palm Beach	*Rhinoptera neglecta*	Australian Cownose Ray	M	0.70 WS	Dead	No	No
	6/09/2023	Palm Beach	*Rhinoptera neglecta*	Australian Cownose Ray	M	0.70 WS	Alive	No	No
	11/09/2023	Mona Vale	*Carcharhinus obscurus*	Dusky Whaler	F	2.00 FL	Alive	Yes	No
	13/09/2023	Palm Beach	*Rhinoptera neglecta*	Australian Cownose Ray	M	0.70 WS	Alive	No	No
	13/09/2023	Palm Beach	*Rhinoptera neglecta*	Australian Cownose Ray	M	0.70 WS	Alive	No	No
	13/09/2023	Palm Beach	*Rhinoptera neglecta*	Australian Cownose Ray	M	0.70 WS	Alive	No	No
	13/09/2023	Palm Beach	*Rhinoptera neglecta*	Australian Cownose Ray	M	0.70 WS	Alive	No	No
	15/09/2023	Palm Beach	*Sphyrna zygaena*	Smooth Hammerhead	F	1.00 FL	Dead	No	Yes
	15/09/2023	Avalon	*Myliobatis australis*	Southern Eagle Ray	F	1.10 WS	Alive	No	No
	15/09/2023	Palm Beach	*Rhinoptera neglecta*	Australian Cownose Ray	F	0.50 WS	Alive	No	No
	15/09/2023	Palm Beach	*Rhinoptera neglecta*	Australian Cownose Ray	F	0.40 WS	Alive	No	No
	15/09/2023	Palm Beach	*Rhinoptera neglecta*	Australian Cownose Ray	F	0.40 WS	Alive	No	No
	26/09/2023	Avalon	*Sphyrna zygaena*	Smooth Hammerhead	M	1.27 FL	Dead	No	Yes
	29/09/2023	Whale	*Carcharias taurus*	Greynurse Shark	F	2.30 FL	Dead	No	Yes
	3/10/2023	Avalon	*Carcharodon carcharias*	White Shark	F	1.90 FL	Alive	Yes	No
	7/11/2023	Whale	*Sphyrna zygaena*	Smooth Hammerhead	F	1.31 FL	Dead	No	Yes
	12/11/2023	Warriewood	*Carcharias taurus*	Greynurse Shark	F	3.10 TL	Alive	Yes	No

	13/11/2023	Whale	*Carcharhinus brachyurus*	Bronze Whaler	F	1.90 FL	Dead	No	Yes
	16/11/2023	Avalon	*Chelonia mydas*	Green Turtle	F	0.75 CCL	Alive	No	No
	24/11/2023	Whale	*Myliobatis australis*	Southern Eagle Ray	F	1.24 WS	Dead	No	Yes
	4/12/2023	Mona Vale	*Myliobatis australis*	Southern Eagle Ray	unk	1.20 WS	Alive	No	No
	8/12/2023	Bilgola	*Myliobatis australis*	Southern Eagle Ray	F	0.90 WS	Alive	No	No
	11/12/2023	Warriewood	*Tursiops aduncus*	Indo-Pacific Bottlenose Dolphin	M	2.40 TL	Dead	No	Whole
	19/12/2023	Palm Beach	*Sphyrna zygaena*	Smooth Hammerhead	F	0.85 FL	Dead	No	No
	2/01/2024	Palm Beach	*Sphyrna zygaena*	Smooth Hammerhead	F	1.22 FL	Dead	No	Yes
	2/01/2024	Palm Beach	*Sphyrna zygaena*	Smooth Hammerhead	F	1.29 FL	Dead	No	Yes
	7/01/2024	Avalon	*Tursiops aduncus*	Indo-Pacific Bottlenose Dolphin	F	2.30 TL	Dead	No	No
	10/01/2024	Palm Beach	*Dermochelys coriacea*	Leatherback Turtle	M	1.70 CCL	Dead	Yes	Yes
	14/02/2024	Whale	*Sphyrna zygaena*	Smooth Hammerhead	F	1.07 FL	Dead	No	Yes
	8/03/2024	Palm Beach	*Tursiops aduncus*	Indo-Pacific Bottlenose Dolphin	F	1.80 TL	Alive	No	No
	13/03/2024	Mona Vale	*Dermochelys coriacea*	Leatherback Turtle	M	1.50 CCL	Dead	No	Yes
	26/03/2024	Palm Beach	*Thunnus tonggol*	Longtail Tuna	unk	0.94 FL	Dead	No	No
	30/03/2024	Warriewood	*Rhinoptera neglecta*	Australian Cownose Ray	F	0.80 WS	Alive	No	No
	7/04/2024	Avalon	*Carcharhinus obscurus*	Dusky Whaler	M	1.60 FL	Dead	No	Yes
	7/04/2024	Avalon	*Rhinoptera neglecta*	Australian Cownose Ray	F	0.80 WS	Alive	No	No
	7/04/2024	Avalon	*Carcharias taurus*	Greynurse Shark	F	2.10 TL	Alive	No	No
	8/04/2024	Palm Beach	*Sphyrna zygaena*	Smooth Hammerhead	unk	1.40 TL	Alive	No	No
	15/04/2024	Warriewood	*Sphyrna zygaena*	Smooth Hammerhead	F	1.10 FL	Dead	No	Yes
	17/04/2024	Bilgola	*Rhinoptera neglecta*	Australian Cownose Ray	F	0.45 WS	Alive	No	No
	17/04/2024	Palm Beach	*Sphyrna zygaena*	Smooth Hammerhead	F	0.80 FL	Dead	No	No
	29/04/2024	Newport	*Rhinoptera neglecta*	Australian Cownose Ray	F	0.70 WS	Dead	No	No
	29/04/2024	Bilgola	*Rhinoptera neglecta*	Australian Cownose Ray	M	0.90 WS	Alive	No	No
Sydney Central	29/09/2023	Freshwater	*Galeocerdo cuvier*	Tiger Shark	F	3.10 FL	Dead	No	Yes
	10/10/2023	North Steyne	*Carcharodon carcharias*	White Shark	M	2.04 FL	Alive	Yes	Yes
	13/02/2024	Narrabeen	*Caretta caretta*	Loggerhead Turtle	unk	0.80 CCL	Alive	No	No
	17/03/2024	Manly	*Dermochelys coriacea*	Leatherback Turtle	unk	1.20 CCL	Alive	No	No
	17/03/2024	Dee Why	*Dermochelys coriacea*	Leatherback Turtle	unk	1.20 CCL	Alive	No	No

Sydney South	4/09/2023	Cronulla	*Carcharhinus brachyurus*	Bronze Whaler	F	2.34 FL	Alive	Yes	No
	11/09/2023	Coogee	*Myliobatis australis*	Southern Eagle Ray	F	0.75 WS	Alive	No	No
	29/09/2023	Maroubra	*Carcharhinus brachyurus*	Bronze Whaler	M	2.36 FL	Dead	No	Yes
	29/09/2023	Wanda	*Carcharias taurus*	Greynurse Shark	F	2.44 FL	Alive	Yes	No
	16/10/2023	Cronulla	*Sphyrna zygaena*	Smooth Hammerhead	M	1.33 FL	Dead	No	Yes
	19/10/2023	Maroubra	*Carcharias taurus*	Greynurse Shark	F	2.10 FL	Dead	No	Yes
	19/10/2023	North Cronulla	*Myliobatis australis*	Southern Eagle Ray	F	0.95 WS	Alive	No	No
	10/11/2023	Bondi	*Isurus oxyrinchus*	Shortfin Mako	M	1.32 FL	Dead	No	Yes
	14/11/2023	Maroubra	*Carcharhinus brachyurus*	Bronze Whaler	M	2.33 FL	Dead	No	Yes
	14/11/2023	Maroubra	*Myliobatis australis*	Southern Eagle Ray	F	0.93 WS	Dead	No	Yes
	14/11/2023	Maroubra	*Dasyatis brevicaudata*	Smooth Stingray	F	1.00 WS	Alive	No	No
	24/11/2023	Cronulla	*Myliobatis australis*	Southern Eagle Ray	F	0.95 WS	Alive	No	No
	27/11/2023	Coogee	*Myliobatis australis*	Southern Eagle Ray	F	1.20 WS	Alive	No	No
	5/12/2023	Cronulla	*Myliobatis australis*	Southern Eagle Ray	F	0.90 WS	Alive	No	No
	7/12/2023	Cronulla	*Myliobatis australis*	Southern Eagle Ray	F	0.90 WS	Alive	No	No
	11/12/2023	Bondi	*Myliobatis australis*	Southern Eagle Ray	F	0.90 WS	Dead	No	No
	13/12/2023	Bondi	*Myliobatis australis*	Southern Eagle Ray	F	0.80 WS	Dead	No	No
	14/12/2023	Coogee	*Myliobatis australis*	Southern Eagle Ray	F	1.00 WS	Dead	No	Yes
	14/12/2023	Coogee	*Myliobatis australis*	Southern Eagle Ray	F	1.20 WS	Dead	No	Yes
	19/12/2023	Bondi	*Myliobatis australis*	Southern Eagle Ray	F	0.75 WS	Dead	No	No
	29/12/2023	North Cronulla	*Sphyrna zygaena*	Smooth Hammerhead	F	1.32 FL	Dead	No	Yes
	7/01/2024	Cronulla	*Myliobatis australis*	Southern Eagle Ray	F	0.65 WS	Alive	No	No
	13/01/2024	Wanda	*Chelonia mydas*	Green Turtle	F	0.60 CCL	Alive	No	No
	24/01/2024	Wanda	*Chelonia mydas*	Green Turtle	F	1.05 CCL	Dead	No	Whole
	14/02/2024	Coogee	*Carcharhinus obscurus*	Dusky Whaler	F	0.72 FL	Alive	Yes	No
	21/02/2024	Cronulla	*Sphyrna zygaena*	Smooth Hammerhead	F	1.20 FL	Dead	No	No
	1/03/2024	Wanda	*Chelonia mydas*	Green Turtle	F	0.65 CCL	Dead	No	Whole
	25/03/2024	Cronulla	*Squatina australis*	Australian Angel Shark	M	0.85 FL	Alive	No	No
	25/03/2024	Cronulla	*Rhinoptera neglecta*	Australian Cownose Ray	M	1.00 WS	Alive	No	No
	29/03/2024	Elouera	*Rhinoptera neglecta*	Australian Cownose Ray	M	0.90 WS	Alive	No	No

	1/04/2024	Bronte	*Carcharias taurus*	Greynurse Shark	F	2.20 FL	Dead	No	Yes
	1/04/2024	Coogee	*Rhinoptera neglecta*	Australian Cownose Ray	M	0.78 WS	Dead	No	No
	9/04/2024	Bondi	*Dermochelys coriacea*	Leatherback Turtle	unk	3.00 TL	Alive	No	No
	17/04/2024	Bondi	*Tursiops aduncus*	Indo-Pacific Bottlenose Dolphin	M	2.15 FL	Dead	Yes	Yes
	19/04/2024	Coogee	*Myliobatis australis*	Southern Eagle Ray	F	0.85 WS	Alive	No	No
	24/04/2024	Bondi	*Rhinoptera neglecta*	Australian Cownose Ray	M	0.80 WS	Alive	No	No
Illawarra	18/09/2023	Austinmer	*Dasyatis brevicaudata*	Smooth Stingray	M	0.72 WS	Dead	No	Yes
	18/09/2023	Austinmer	*Carcharhinus brachyurus*	Bronze Whaler	unk	2.40 TL	Dead & Decomposed	No	No
	18/09/2023	South Wollongong	*Myliobatis australis*	Southern Eagle Ray	F	0.79 WS	Alive	No	No
	18/09/2023	South Wollongong	*Carcharhinus brachyurus*	Bronze Whaler	unk	2.47 FL	Dead	No	No
	2/10/2023	South Wollongong	*Myliobatis australis*	Southern Eagle Ray	F	1.40 WS	Dead	No	No
	10/10/2023	Garie	*Isurus oxyrinchus*	Shortfin Mako	F	1.70 FL	Dead	Recapture	No
	1/11/2023	Garie	*Galeocerdo cuvier*	Tiger Shark	unk	3.00 FL	Dead	No	No
	1/11/2023	Garie	*Chelonia mydas*	Green Turtle	unk	1.20 CCL	Dead	No	No
	3/11/2023	Garie	*Carcharodon carcharias*	White Shark	M	2.20 FL	Alive	No	No
	15/11/2023	Coledale	*Notorynchus cepedianus*	Broadnose Sevengill Shark	M	1.60 FL	Dead	No	No
	15/11/2023	Coledale	*Dasyatis brevicaudata*	Smooth Stingray	F	1.00 WS	Dead	No	No
	21/11/2023	Wattamolla	*Myliobatis australis*	Southern Eagle Ray	F	1.20 WS	Dead	No	No
	24/11/2023	South Wollongong	*Myliobatis australis*	Southern Eagle Ray	F	1.20 WS	Alive	No	No
	30/11/2023	Wattamolla	*Sphyrna zygaena*	Smooth Hammerhead	unk	1.20 FL	Dead & Decomposed	No	No
	30/11/2023	Wattamolla	*Carcharhinus obscurus*	Dusky Whaler	unk	2.60 FL	Dead	No	No
	4/12/2023	North Wollongong	*Argyrosomus japonicus*	Mulloway	unk	0.90 FL	Dead	No	No
	5/12/2023	Thirroul	*Myliobatis australis*	Southern Eagle Ray	F	1.48 WS	Dead	No	Yes
	5/12/2023	Coledale	*Myliobatis australis*	Southern Eagle Ray	F	1.10 WS	Dead	No	Yes
	5/12/2023	Coledale	*Myliobatis australis*	Southern Eagle Ray	F	1.05 WS	Dead	No	Yes
	5/12/2023	Coledale	*Myliobatis australis*	Southern Eagle Ray	F	1.00 WS	Dead	No	Yes
	5/12/2023	Coledale	*Myliobatis australis*	Southern Eagle Ray	F	0.92 WS	Dead	No	Yes
	5/12/2023	Thirroul	*Notorynchus cepedianus*	Broadnose Sevengill Shark	M	1.57 FL	Dead	No	Whole
	12/12/2023	North Wollongong	*Myliobatis australis*	Southern Eagle Ray	F	1.20 WS	Alive	No	No
	12/12/2023	Wattamolla	*Myliobatis australis*	Southern Eagle Ray	F	1.20 WS	Dead	No	No

	15/12/2023	Wattamolla	*Myliobatis australis*	Southern Eagle Ray	F	1.20 WS	Dead	No	No
	15/12/2023	Wattamolla	*Carcharias taurus*	Greynurse Shark	F	2.50 TL	Alive	No	No
	24/12/2023	Wattamolla	*Galeocerdo cuvier*	Tiger Shark	F	3.10 FL	Dead	No	No
	27/12/2023	Austinmer	*Myliobatis australis*	Southern Eagle Ray	F	1.00 WS	Alive	No	No
	27/12/2023	Austinmer	*Myliobatis australis*	Southern Eagle Ray	F	1.00 WS	Alive	No	No
	27/12/2023	Austinmer	*Myliobatis australis*	Southern Eagle Ray	F	1.00 WS	Alive	No	No
	29/12/2023	Coledale	*Myliobatis australis*	Southern Eagle Ray	F	1.00 WS	Alive	No	No
	3/01/2024	Austinmer	*Carcharhinus obscurus*	Dusky Whaler	F	3.00 TL	Alive	No	No
	3/01/2024	Coledale	*Myliobatis australis*	Southern Eagle Ray	F	1.10 WS	Dead	No	No
	25/01/2024	Austinmer	*Lepidochelys olivacea*	Olive Ridley Turtle	unk	0.55 CCL	Alive	No	No
	21/02/2024	Wattamolla	*Chelonia mydas*	Green Turtle	F	0.95 CCL	Alive	No	No
	13/03/2024	Thirroul	*Tursiops aduncus*	Indo-Pacific Bottlenose Dolphin	unk	2.30 TL	Dead	No	Yes
	18/03/2024	Thirroul	*Chelonia mydas*	Green Turtle	unk	1.20 CCL	Alive	No	No
	29/03/2024	Garie	*Dermochelys coriacea*	Leatherback Turtle	M	1.50 CCL	Dead	No	Yes
	1/04/2024	North Wollongong	*Sphyrna mokarran*	Great Hammerhead	F	2.40 FL	Dead	No	Yes
	1/04/2024	North Wollongong	*Myliobatis australis*	Southern Eagle Ray	F	1.20 WS	Dead	No	No
	1/04/2024	North Wollongong	*Chelonia mydas*	Green Turtle	unk	0.50 CCL	Dead	Yes	No
	15/04/2024	Austinmer	*Myliobatis australis*	Southern Eagle Ray	F	1.10 WS	Dead	No	No
	26/04/2024	Thirroul	*Carcharias taurus*	Greynurse Shark	F	2.45 FL	Dead	No	Yes

* sex and length could not be determined, as only the head of the shark was left in the net.