

A guide to supporting students completing the workbook:

## The science of the NSW Shark Management Strategy

This workbook focusses on the work of the NSW Shark Management Strategy (SMS). The work, trials and research of the strategy are good examples of how science informs our world, the role of government and careers in marine science. This guide contains sample answers to questions excluding those that ask students to state opinion or suggest alternatives.

The workbook can be completed using:

- The SharkSmart website (<https://www.sharksmart.nsw.gov.au/>) and embedded videos
- The NSW DPI Fisheries YouTube channel (<https://www.youtube.com/user/NSWFisheries/playlists>)
- The NSW DPI Fisheries Facebook page (<https://www.facebook.com/NSWDPIFisheries/>)
- The NSW Department of Primary Industries website (<https://www.dpi.nsw.gov.au/>)

Many of the answers to the activities will also be available on other websites as there is a lot of information published about sharks and the marine environment. This is a good exercise in online research for students, but always ensure that reputable websites are being used. Check the publisher is a person or organisation with the qualifications or experience to have made the claim and, whether they have validated their claims. The ability to critically evaluate research material found online is an essential skill that students need to develop for their personal and academic development.

### Page 4 and 5 The role of DPI in the management of marine environments

This section can be completed using the DPI Fisheries website (<https://www.dpi.nsw.gov.au/fishing>) the following answers are taken directly from the website:

#### Recreational fishing

DPI Fisheries provides information to fishers on safe and sustainable fishing in NSW waters. They administer the NSW Recreational Fishing Fee which is placed into the Recreational Fishing Trusts and spent on a wide range of salt and fresh water projects that directly benefit the recreational fishing sector. Fisheries is also responsible for ensuring compliance with the rules and regulations associated with fishing in NSW.

## **Compliance**

DPI has responsibility for administering fisheries laws governing the fisheries resources of the state, through the Fisheries Compliance Unit. Stealing fish and black marketing, as well as damage to fish habitats are serious problems and can impact on the sustainability of our fish stocks across NSW. Fisheries Officers spend many hours on patrol, detecting and preventing illegal fishing and damage to fish habitats.

## **Aboriginal fishing**

For many Aboriginal people fishing is an integral component of connection to their traditional country. Protecting and promoting cultural fishing activities of Aboriginal communities is recognised in managing our fisheries resources with measures that provide for continued access to and involvement of Aboriginal people in management of the NSW fisheries resource.

## **Commercial fishing**

The NSW commercial fisheries are carefully managed. The resource is shared amongst over 1,000 commercial fishers who catch fish for the whole community to enjoy. The industry has recognised the challenges in making fisheries sustainable and has led many of the changes introduced to improve environmental performance. DPI Fisheries works in the following areas to assist management: informing fishers and enforcing fisheries closures, restrictions and permits, consulting stakeholders, environmental assessments and fishery management strategies and administering FishOnline - the department's web-based system for administering commercially related fishing activity.

For more detail about commercial fishing in NSW download the Commercial fishing Primefact ([https://www.dpi.nsw.gov.au/\\_data/assets/pdf\\_file/0009/631098/Commercial-fishing-in-New-South-Wales.pdf](https://www.dpi.nsw.gov.au/_data/assets/pdf_file/0009/631098/Commercial-fishing-in-New-South-Wales.pdf))

## **Aquaculture**

With increasing demand for high quality seafood, aquaculture is a growing industry in NSW. The Aquaculture Management and Research sections of NSW Department of Primary Industries are responsible for working with aquaculture industries, the community and other agencies to ensure aquaculture develops in a sustainable manner.

## **Pests and Diseases**

NSW DPI has responsibilities for the conservation and management of the fish and marine vegetation of NSW, and this includes the management of pest species and diseases.

More information about marine pests and diseases in NSW is available at <https://www.dpi.nsw.gov.au/fishing/pests-diseases/marine-pests>.

## **SharkSmart**

The NSW Government is trialling measures to make NSW beaches safe, as part of the NSW Government's Shark Management Strategy.

The Department of Primary Industries (DPI) conducts research, or partners with other researchers to:

- investigate shark safety technologies; and
- research shark biology and ecology to inform future shark safety measures.

The Shark Management Strategy Annual Grants Program and PhD and Postdoc Program has provided opportunities for new and emerging technology and research to be supported by experts outside DPI.

List the priority fisheries research programs from the DPI website at <https://www.dpi.nsw.gov.au/content/research/fishing-aquaculture>

- Threats to fishery resources
- Sustainable fish harvest
- Ecosystem assessment
- Aquatic biodiversity
- Sustainable aquaculture
- Fishery enhancement
- Fish habitat improvement

### **Where are the two major fisheries research centres in NSW and what are their areas of research?**

Port Stephens Fisheries Institute undertakes all areas of fisheries research and is a production hatchery for a number of native fish and molluscs. Fisheries research at Port Stephens includes aquaculture marine ecosystems, freshwater ecosystems, fisheries resource assessment, aquaculture, and aquatic environment.

Narrandera Fisheries Centre is an inland freshwater fisheries research centre and a production hatchery for a number of native fish species. The Centre fulfils a number of roles including breeding, conservation, environmental surveys, NSW rivers management, aquaculture, reporting on illegal activities and community education.

## **Page 6 – 9 Meet the team**

Information and videos about the SMS team is available on the Our Scientists page of the SharkSmart website. Link: <https://www.sharksmart.nsw.gov.au/our-scientists>.

The questions are aimed at encouraging student's deeper consideration of the work of the SMS.

## **Page 10 What is a shark?**

Dr Amy Smoothery answers this in the Video **Shark Adaptions and identifying sharks**. The video is located on the Education page of the Shark Smart website or on this direct link. Link: <https://youtu.be/7Ot5XVILLvI>

## **Page 12 – 15 Sharks in Australian waters**

These pages can be completed using the content of the **About Sharks** page on the SharkSmart website. Link: <https://www.sharksmart.nsw.gov.au/about-sharks>.

## Page 16 and 17 Sharks in the environment

The links for these pages are included in the document. The aim of this section is for students to understand that important part that sharks play in maintaining a balanced, healthy marine environment. Link: <https://youtu.be/eck7FUvUZPs>.

## Pages 18 and 19 Key findings of the shark research

This content is on the SharkSmart website and in the videos.

'Bull sharks have been tagged as part of a research program that initially focused on ~~the Great Barrier Reef / Sydney Harbour~~. This research first began in ~~2009 / 2019~~.

The data has shown that Bull sharks are ~~the only / one of the many~~ predatory sharks that occur in Sydney Harbour and their presence is ~~unpredictable / predictable~~. The presence of large Bull sharks is predicted by water temperature of ~~34°C / 22°C~~.

Bull sharks travel down from the Great Barrier Reef at the start of summer (December/January) and stay ~~until late April early May / only a week or so~~. These animals travel ~~huge / insignificant~~ distances - around 1700km one way per year between Sydney and the Queensland.

In the beginning researchers were only catching large male sharks in Sydney Harbour so they reached out to local fishing communities around Ballina and Yamba ~~north of Sydney region/south of Sydney region~~ and found they were catching juveniles.

The research has since established that pregnant females and juveniles are found in the rivers and estuaries. They appear to stay there until they are around 5-6 years and ~~large / sensible enough~~ to join the adult populations in the ~~larger rivers / open ocean~~.

Fast forward to ~~2015 / 2020~~ and the implementation of the Shark Management Strategy.

Dr Paul Butcher and the team began tagging and tracking sharks captured on SMART drumlines.

Sharks tagged with acoustic tags are detected for ~~10 years / months~~ around the Australian coastline as they pass by a ~~VR4G listening station / surf club~~. This data is collated and provides information on their movements around Australia.

Sharks have ~~also / not~~ been tagged with satellite tags which sends a message about the shark's location whenever it comes close to the surface. This data maps shark movements around the ~~world / country~~.

Data is also collected for age and growth as well as genetic samples for population data when sharks are captured.

Data shows that the majority of tagged White sharks move up and down the Victorian, NSW and QLD coast seasonally but some individuals cover ~~minor / huge~~ distances including one that has been to Western Australia and back three times and another that has been to New Zealand and Papua New Guinea.

Hopefully the research will provide scientific evidence of what drives White sharks up and down the east coast.'

## Page 20 to 23 How has the research informed the SharkSmart recommendations

This content is on the SharkSmart website and also in the video Sharks: myths and facts. Link: <https://youtu.be/2LxM6mesguU>

The SharkSmart recommendations are backed by the results of the trials and research. This section asks students to comment on the evidence for each recommendation. Some examples are listed below.

- Do not rely on sightings of dolphins to indicate the absence of sharks. *Sharks and dolphins often feed together on the same food.*
- Do not swim/surf near or interfere with shark nets. *Nets are designed to entangle sharks so it's best to keep clear.*

Avoid murky water, waters with known effluents or sewage. The nutrient in murky water and water containing effluent may attract small fish.

The rest of the workbook asks students to research organisations that work towards protection of the marine environment and to examine the way popular media influences the public opinion about sharks. Answers will vary.