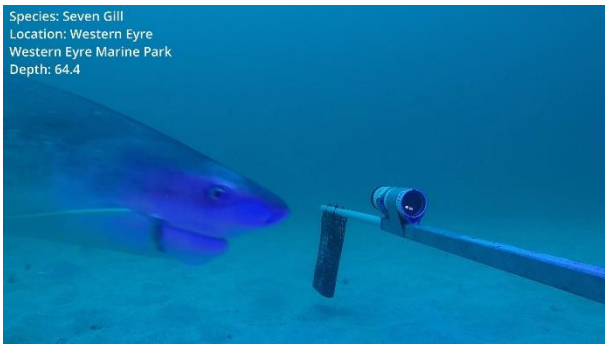
# Shark and Ray Exploration in SA Teaching Notes

## Overview

South Australia is home to a rich diversity of shark and ray species, both in its offshore waters and along its coastline. In this lesson targeted at year 7 science students in South Australia, students will be given a unique opportunity to view and analyse recently collected video footage of sharks and rays captured by scientists in State and Commonwealth Marine Parks using BRUVS (Baited Remote Underwater Video Systems) technology.





This resource is designed to involve minimal preparation time and to be easily implementable. There are 2 x 5 minute videos which can be used to introduce the lesson and associated activities. Within these teacher notes you will find all the relevant background information, presentation slides, curriculum links, learning intentions, success criteria, student worksheets and suggested answers.

## Resource Summary

# Background

Collectively known as **elasmobranchs**, sharks and rays are a unique group of fish in that their skeleton is not made of bone but is made of cartilage. Cartilage is less dense than bone, allowing these animals to move quickly through the water without using too much energy. Sharks and rays also have a large fatty liver filled with oil which helps them increase buoyancy.

Other adaptations of sharks and rays include specialised scales called **denticles** and 5-7 modified gill slits which enables them to improve their ability to ventilate and extract oxygen from the ocean. Sharks and rays also have very powerful sensory systems thanks to their **electroreceptors** called **Ampullae of Lorenzeni.**

Sharks and rays play critical roles in the ocean ecosystem, serving as **keystone species** that help to maintain the balance of marine communities. Sharks and rays help to keep the populations of other predatory and herbivorous species in check, preventing any one species from becoming too abundant.

Healthy shark populations are an indicator of a thriving food chain and a diverse ecosystem. This is because sharks feed on a wide range of species, from small fish to large mammals, and they require a rich and varied food source to survive. The presence of a diverse and abundant food source for sharks suggests that the overall ecosystem is healthy and that the populations of both prey and predator species are in balance.

By understanding sharks and rays better we also help to ensure the persistence of a wide range of species and the overall health of the ocean.

**BRUVs**

BRUVS (Baited Remote Underwater Video Systems) are a commonly used tool in marine science for monitoring and studying the abundance and diversity of marine life, particularly near the seafloor. BRUVS consists of a camera housed in a waterproof casing, attached to a weighted frame with bait attached. The bait is used to attract fish to the camera's field of view, allowing researchers to observe and record their behaviour.

The system is deployed on the seafloor or near the surface, and the resulting footage is analysed to identify, count and even measure the length of the species present. This method provides valuable information on the distribution and behaviour of marine animals, as well as monitoring any change over time and helps scientists to better understand the health and function of marine ecosystems.

BRUVS are particularly useful for studying species that are difficult to observe in their natural habitats, such as those living at deeper depths, in remote locations, or with shy behaviours. They are also a cost-effective alternative to more expensive and time-consuming methods, such as diving surveys.

Much of the BRUVS footage from the second video was captured during deployments throughout South Australia in both **Commonwealth Marine Parks** and **State Marine Parks**, areas of the ocean that are protected for their ecological, cultural, and recreational values.

BRUVS can be a useful tool for studying sharks and rays but may not provide a complete picture of shark populations. The presence of sharks in an area may be highly seasonal and behaviour and the data should be used in conjunction with other methods, such as tagging and tracking studies, to provide a more complete understanding of these animals and their role in the ecosystem.

## Teaching Sequence

This resource could be implemented over a duration of from just a single lesson or up to several weeks worth of lesson time. It is suggested that this resource is used as a tool as a part of a unit on the Great Southern Reef and/or South Australian Marine Parks. You will find links to other complementary resources at the bottom of the teacher notes.

**Ocean Literacy Principle Focus**

Ocean Literacy Principle #5: The ocean supports a great diversity of life and ecosystems.

## Learning Intentions

Students will...

- Analyse footage to identify and describe the unique features and characteristics of shark and rays
- Use and develop classification tools to identify species
- Discuss the benefits and limitations of using BRUVS to study sharks and ray and investigate other methodology for studying sharks and rays.
- Investigate the locations and significance of several South Australia's state and commonwealth marine parks.
- Use examples of shark and ray specific species to describe the role of keystone species in an ecosystem.

## Success Criteria

Students can...

- Demonstrate their understanding of classification tools
- Describe the benefits and limitations of using BRUVS to study sharks and rays and compare to other methodology for studying these species.
- Explain the ecological role of sharks in the ecosystem and their importance in food webs.
- Identify the IUCN red list categories and describe their significance for conservation of species.

## V9 Australian Curriculum Links

Year 7 - Science Understanding - Biological Sciences - **AC9S7U01** - investigate the role of classification in ordering and organising the diversity of life on Earth and use and develop classification tools including dichotomous keys.

Year 7 - Science Understanding - Biological Sciences - **AC9S7U02** use models, including food webs, to represent matter and energy flow in ecosystems and predict the impact of changing abiotic and biotic factors on populations

Year 7 - Science as a Human Endeavor - Nature and Development of Science - **AC9S7H01** explain how new evidence or different perspectives can lead to changes in scientific knowledge.

Year 7 - Science as a Human Endeavor - Use and Influence of Science - **AC9S7H04** explore the role of science communication in informing individual viewpoints and community policies and regulations

# Starter - Is a shark a fish?

For this lesson starter, you can begin by posting the following question to the class: “Is a shark a fish?” This question can spark an interesting discussion and encourage critical thinking among students.

To start the lesson, you can provide a definition of what a fish is and its characteristics. You can explain that fish are aquatic animals that have fins, gills, and scales. Fins are used for swimming and manoeuvring in the water, gills are used for breathing, and scales provide protection.

Then, you can show a definition of a shark, which is a type of fish that belongs to the group of cartilaginous fishes. You can explain to students that sharks have distinct physical and biological characteristics that set them apart from other types of fish. For example, sharks have a cartilaginous skeleton instead of bones, and they have multiple rows of teeth that they shed and replace continuously throughout their lives.

Finally, you can encourage students to participate in a class discussion or debate about whether or not a shark is a fish. Ask students to provide evidence to support their arguments, and encourage them to listen to and consider each other's viewpoints. This can be a great opportunity to develop critical thinking skills and scientific literacy.

# Activity 1 - Characteristics of elasmobranchs

**Play video "Characteristics and Sharks and Rays"**

https://www.youtube.com/watch?v=5Bzfnawxzd0

Introduce the term **elasmobranch** to the class; a group of cartilaginous fish that include species such as sharks, rays, and skates.

Students will summarise the differences between elasmobranchs and fish in a table using knowledge from the video and presentation slides:

| **Characteristic** | **Fish** | **Elasmobranch** |
|---|---|---|
| Skeleton | | |
| Swim Bladder | | |
| Sensory Organs | | |

Allow students to re-watch the video at their own pace or use the video transcript and presentation slides to help find the answers.

Suggested answers:

| **Characteristic** | **Fish** | **Elasmobranch** |
|---|---|---|
| Skeleton | Bony | Cartilaginous |
| Swim Bladder | Present | Absent |
| Sensory Organs | Lateral line system | Ampullae of Lorenzini |

Students will summarise the differences between sharks and rays in a table:

| **Characteristic** | **Sharks** | **Rays** |
|---|---|---|
| Body Shape | | |
| Fins | | |
| Gills | | |
| Eyes | | |

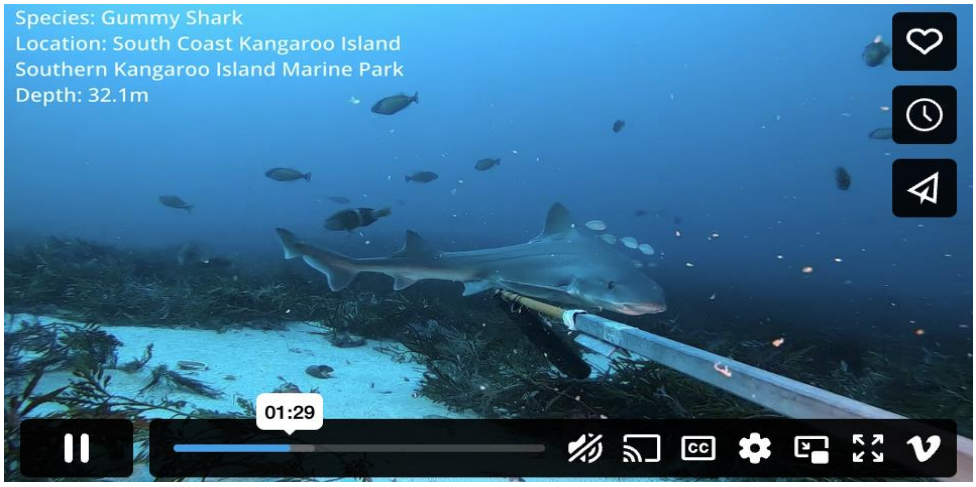
Suggested answers:

| **Characteristic** | **Sharks** | **Rays** |
|---|---|---|
| Body Shape | Torpedo shape, elongated | Flattened, disk |
| Fins | Dorsal (back) fins, pectoral fins and well developed caudal (tail) fin. | Large, wing like pectoral fins, small dorsal fins (if present), whip like tail |
| Gills | On side of head | On underside of body |
| Eyes | On side of head | On top of body |

# Activity 2 - Classification and conservation status of sharks

**Play video "Researching sharks and rays"**

https://youtu.be/UayUYhg9dmM




Video 2 only shows the **common names** of the shark and ray species from the videos. In this activity, students will research the scientific name for these species, their Order and IUCN Red List category. When assigning this task, you use the notes below to provide background information to students.

| Common Name | Scientific Name | Order | IUCN Red List |
|---|---|---|---|
| | | | |
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**Part A) Explain the significance of using the scientific (binomial nomenclature) name when identifying species.**

When we talk about animals or plants, we use scientific names that are like a special code for each one of them. This code is called binomial nomenclature. It helps us to identify each species easily and without confusion.

Scientific names are like a pair of names. The first name is like the family name that is shared by all members of a group, while the second name is like the personal name that is unique to each individual. This makes it easy for scientists to talk about specific animals or plants and understand which one they are referring to.

Ask students what may be advantages of researchers and conservationists using binomial nomenclature when referring to local species?

1. It can helps scientists identify each species easily and without confusion, as scientific names are like a special code for each one of them.
2. It allows scientists to communicate more effectively because scientific names are the same all over the world, so everyone can understand which species we are talking about.
3. It helps scientists understand how different species are related to each other through evolution, which means we can learn more about the history of life on Earth and how different species are connected.

**Part B) Explain the significance of 'Order' in classification.**

In the world of biology, scientists like to put living things into different groups based on their characteristics, like how they look and act. These groups are called "taxa" and "order" is one of them.

Think of it like a big library where all the books are sorted into different sections. Each section has books that are related to each other, like all the science books are in one section, and all the storybooks are in another.

Now imagine that the library is like the animal kingdom. The "order" is like one of the big sections of the library, and it's where all the animals that are alike in certain ways are put together.

For example, let's look at the order "Cetacea". This group includes animals like whales, dolphins, and porpoises, because they all live in the ocean and have certain things in common, like having a streamlined body shape, flippers or fins for swimming, and the ability to hold their breath underwater.

So just like the library helps us find the books we're looking for, classification helps scientists organise living things so they can learn more about them and how they're related to each other in the ocean.

**Part C) Explain the significance of the IUCN Red List in classification.**

The IUCN Red List is a comprehensive database that evaluates the conservation status of species around the world. It provides information on the extinction risk of species and their current population trends, as well as the threats they face and their distribution. The Red List is used by conservationists, policymakers, and researchers to guide conservation efforts and make informed decisions about the management and protection of species and their habitats. It is widely recognized as the most authoritative source of information on the status of threatened and endangered species globally.

The IUCN Red List categorises species based on their conservation status, with nine different categories ranging from least concern to extinct. These categories are:

1. **Least Concern** - Species that are widespread and abundant, not currently facing significant threats to their survival.
2. **Near Threatened** - Species that are not yet considered vulnerable but are likely to become so in the near future without conservation efforts.
3. **Vulnerable** - Species that are facing a high risk of extinction in the wild due to factors such as habitat loss, population decline, or other threats.
4. **Endangered -** Species that are facing a very high risk of extinction in the wild, often due to rapid population decline or severe habitat loss.

5. **Critically Endangered** - Species that are facing an extremely high risk of extinction in the wild, often with very few individuals remaining or facing immediate threats to their survival.
6. **Extinct in the Wild** - Species that are no longer found in their natural habitat, but still exist in captivity or as reintroduced populations in protected areas.
7. **Extinct -** Species that no longer exist, with no surviving individuals in the wild or in captivity.
8. **Data Deficient** - Species for which there is not enough information available to accurately assess their conservation status.
9. **Not Evaluated** - Species that have not yet been assessed for their conservation status by the IUCN.

These categories provide a standardised way of assessing and communicating the conservation status of species, which is essential for prioritising conservation efforts and making informed decisions about the management and protection of biodiversity.

Governments, such as the Australian and South Australian Government use this information, as well as scientific knowledge on populations at a more local level to make their conservation listing of species under relevant government legislation. These can sometimes be slightly different, depending on how a species may be tracking at a more local level (State level for example), compared to the population as a whole as per the IUCN Red list.

**Worksheet**

| **Common Name** | **Scientific Name** | **Order** | **IUCN Red List Category** |
|---|---|---|---|
| Bronze Whaler | *Carcharhinus brachyurus* | | |
| Great White Shark | *Carcharodon carcharias* | | |
| Gummy Shark | *Mustelus antarcticus* | | |
| Port Jackson Shark | *Heterodontus portusjacksoni* | | |
| Southern Saw Shark | *Pristiophorus nudipinnis* | | |
| School Shark | *Galeorhinus galeus* | | |
| Seven Gill Shark | *Notorynchus cepedianus* | | |
| Smooth Ray | *Bathytoshia brevicaudata* | | |
| Southern Eagle Ray | *Myliobatis tenuicaudatus* | | |
| Southern Fiddler Ray | *Trygonorrhina dumerilii* | | |
| Spotted Wobbegong | *Orectolobus maculatus* | | |
| Whiskery Shark | *Furgaleus macki* | | |

**Suggested Answers**

| **Common Name** | **Scientific Name** | **Order** | **IUCN Redlist** |
|---|---|---|---|
| Bronze Whaler | *Carcharhinus brachyurus* | Carcharhiniformes (ground sharks) | Near Threatened |
| Great White Shark | *Carcharodon carcharias* | Lamniformes (mackarel sharks) | Vulnerable |
| Gummy Shark | *Mustelus antarcticus* | Carcharhiniformes (ground sharks) | Least Concern |
| Port Jackson Shark | *Heterodontus portusjacksoni* | Heterodontiformes (bullhead sharks) | Least Concern |
| Southern Saw Shark | *Pristiophorus nudipinnis* | Pristiophoriformes (Sawsharks) | Least Concern |
| School Shark | *Galeorhinus galeus* | Carcharhiniformes (ground sharks) | Critically Endangered |
| Seven Gill Shark | *Notorynchus cepedianus* | Hexanchiformes (frilled and cow sharks) | Vulnerable |
| Smooth Ray | *Dasyatis brevicaudata* | Myliobatiformes (stingrays) | Least Concern |
| Southern Eagle Ray | *Myliobatis tenuicaudatus* | Myliobatiformes (stingrays) | Near Threatened |
| Southern Fiddler Ray | *Trygonorrhina dumerilii* | Rhinopristiformes (guitarfishes) | Least Concern |
| Spotted Wobbegong | *Orectolobus maculatus* | Orectolobiformes (carpet sharks) | Near Threatened |
| Whiskery Shark | *Furgaleus macki* | Carcharhiniformes (ground sharks) | Least Concern |

# Activity 3 - Exploring shark diversity and classification

**Part A**

Start with the two questions "How are some sharks different from others?" If you are identifying a shark what physical characteristics help tell them apart? Divide students into small groups and allocate either question 1 or 2. Give groups 5 minutes to create some bullet points which they will then read out to another group or the rest of the class.

Students will then use footage of sharks in video 1 to create a list of common physical characteristics of sharks. Some answers may include: Size, body shape, snout shape, tail shape, colouration, number of dorsal fins.

| Species Name | Common Name | Body Shape | Size | Colouration | Dorsal Fin(s) | Snout Shape |
|---|---|---|---|---|---|---|
| | | | | | | |

The above characteristics will be used as table headers in Part B of this activity below.

Conclude this activity with the question, is this information alone enough to tell the difference between shark species?

**Part B - Features of shark species worksheet**

Students will work in small groups, pairs or independently to re-watch the video at their own pace and record the unique visual features of each of the shark species observed in the footage captured with the BRUVS. Students can also be encouraged to get additional information from the internet and fill out the table as a research task.

Differentiation: Give students a modified version of this table of suggested answers to get started OR print out unmatched answers on a separate piece of paper and have students cut out and match the appropriate answers.

1. Divide the class into pairs or small groups and provide them with the table of species information.
2. Instruct the students to use the information in the table to design a classification tool. They can choose the format of the tool (e.g. decision tree, flowchart, etc.) but it should be clear and easy to follow. Encourage them to think about the most important characteristics of each species and how to differentiate them.
3. After the students have completed their classification tools, have them exchange them with another group or student to test them. The testing group should try to classify the species using the tool and provide feedback to the designers on how clear and effective it was.

**Part C (extension)**

1. Have each student choose one species from the table (or a different one if they prefer) and research it in detail. They should find out about its habitat, diet, behaviour, threats to its survival, and current conservation efforts. They can use any reliable sources they can find and take notes on the information they gather.
2. Once the research is complete, have the students create a flyer to promote the conservation of their chosen species. The flyer should include an eye-catching title, a picture of the species, and information on why it is important to protect it. They should also suggest actions that people can take to help the species, such as choosing sustainable seafood, reducing waste, using eco-friendly products, or supporting conservation organisations.
3. When the classification tools and fliers are completed, have the students share them with the class or in small groups. Encourage them to give feedback to each other on what they liked and what could be improved.

Assessment:

- The classification tools can be assessed on how well they differentiate between the different species and how clear and easy to follow they are.
- The fliers can be assessed on how well they present the information about the species, how eye-catching they are, and how persuasive they are in promoting conservation.

| Common Name | Species | Body Shape | Size | Colouration | Dorsal Fin(s) | Snout Shape | Other features |
|---|---|---|---|---|---|---|---|
| **Bronze Whaler** | *Carcharhinus brachyurus* | | | | | | |
| **Great White Shark** | *Carcharodon carcharias* | | | | | | |
| **Seven Gill Shark** | *Notorynchus cepedianus* | | | | | | |
| **Gummy Shark** | *Mustelus antarcticus* | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **School Shark** | *Galeorhinus galeus* | | | | | | |
| **Port Jackson shark** | *Heterodontus portusjacksoni* | | | | | | |
| **Spotted Wobbegong** | *Orectolobus maculatus* | | | | | | |
| **Whiskery Shark** | *Furgaleus macki* | | | | | | |
| **Smooth Ray** | *Dasyatis brevicaudata* | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Southern Fiddler Ray** | *Trygonorrhina dumerilii* | | | | | | |

Suggested answers

| **Common Name** | **Species** | **Body Shape** | **Size** | **Colouration** | **Dorsal Fin(s)** | **Snout Shape** | **Other features** |
|---|---|---|---|---|---|---|---|
| **Bronze Whaler** | *Carcharhinus brachyurus* | Robust, elongated, fusiform | 2-3.3m | Bronze-grey with a white underbelly | 2; large first, smaller second | Pointed | Hooked teeth |
| **Great White Shark** | *Carcharodon carcharias* | Stout, conical fusiform | 3.5-6.1m | Grey to blue-grey with a white underbelly | 2; triangular, large first | Pointed | White colour extends to flanks |
| **Seven Gill Shark** | *Notorynchus cepedianus* | Broad, heavy-set fusiform | 1.8-3 m | Grey or brown with dark spots | 1; low, angular | Broad, rounded | Seven gill slits |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Gummy Shark** | *Mustelus antarcticus* | Slender, torpedo-shaped | 0.8-1.7 m | Grey to bluish-grey with white spots | 2; first larger, triangular | Short, blunt | Pavement-like teeth, long tail |
| **School Shark** | *Galeorhinus galeus* | Slender, elongated fusiform | 1-1.9 m | Grey to bronze-grey, white underbelly | 2; first large, second smaller | Pointed | Interdorsal ridge |
| **Common Name** | **Species** | **Body Shape** | **Size** | **Colouration** | **Dorsal Fin(s)** | **Snout Shape** | **Other features** |
| **Port Jackson shark** | *Heterodontus portusjacksoni* | Heterodontiform, cylindrical | 0.8-1.6 m | Grey-brown with dark harness-like markings | 2; first dorsal fin larger | Short and blunt | Spines on both dorsal fins |
| **Spotted Wobbegong** | *Orectolobus maculatus* | Flattened, carpet shark | 1.5-3 m | Light brown with dark spots and saddles | 2; first larger, both with spines | Short, wide | Elongated skin flaps around mouth |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Whiskery Shark** | *Furgaleus macki* | Slender, elongated | 0.8-1.5 m | Grey to brown with white underbelly | 2; first larger, both low | Long, narrow | Whisker-like barbels on snout |
| **Smooth Ray** | *Dasyatis brevicaudata* | Rhomboidal, flat | 1.4-2.2 m disc width | Dark grey or black with white underbelly | 1; long, whip-like tail | Short, blunt | Smooth skin, no thorns on |
| **Southern Fiddler Ray** | *Trygonorrhina dumerilii* | Rhomboidal | 0.8-1.2 m disc width | Light grey to brown with dark blotches | 1, small located on tail | Short, blunt | Large, rounded pectoral fins, white-edged 'fiddler' markings on wings |

# Activity 4- State and Commonwealth Marine Parks

**Part A**

State and Commonwealth Marine Parks are important for protecting the ocean and its wildlife, and that we all have a responsibility to respect these protected areas and the rules that apply within them. State marine parks are managed by the South Australian Government, while Commonwealth marine parks are managed by the Australian Government. Both State and Commonwealth marine parks have different zones where different activities are allowed. Some zones allow some types of fishing and other activities, while other zones have stricter rules and prohibit some activities altogether. These zones may have different names, but they have similar functions across both State and Commonwealth marine parks.

Play the video "How zoning works: Australian Marine Parks" and direct students to the South-West Marine Parks Network and SA Marine Parks pages to learn more.

Students will research the differences between state and commonwealth marine parks.

| **Category** | **State Marine Parks** | **Commonwealth Marine Parks** |
|---|---|---|
| **Management** | | |
| **Regulations and Zoning** | | |
| **Boundaries** | | |
| **Purpose** | | |

**Suggested answers**

| Category | State Marine Parks | Commonwealth Marine Parks |
|---|---|---|
| **Management** | Managed by the South Australian (State) Government | Managed by the Australian (Federal) Government |
| **Regulations and Zoning** | Four zone types with varying degrees of protection.<br>General Managed Use Zone -most sustainable activities allowed<br>Habitat Protection Zone – protects seafloor habitats, but other sustainable activities allowed (that don't impact the seafloor)<br>Sanctuary Zone -no extractive activities allowed<br>Restricted Access Zone – no access allowed | Three zone types with varying degrees of protection.<br>Multiple Use Zone (blue zone) – most sustainable activities allowed<br>Habitat Protection Zone (yellow zone) – protects seafloor habitats, but other sustainable activities allowed (that don't impact the seafloor)<br>National Park Zone – no extractive activities allowed |
| **Boundaries** | Limited to South Australia's territorial waters – coastal waters from 0 to 3 nautical miles | Within Australian waters extending from the state waters boundary (3 nautical miles) to the Exclusive Economic Zone (200 nautical miles). Commonwealth marine parks may also span different states as they are not governed by states. |
| **Purpose** | Aim to protect and conserve the marine environment and its biodiversity | Aim to protect and conserve the marine environment and its biodiversity |

For more in depth learning about South Australia's State and Commonwealth Marine Parks you may like to utilise the in depth resource – Understanding more about Marine Parks in South Australian waters.

**Part B**

NatureMaps is an initiative of the Department for Environment and Water that provides a common access point to maps and geographic information about South Australia's natural resources in an interactive online mapping format.

GPS, or Global Positioning System is a helpful tool for marine research because it helps scientists know exactly where they are in the ocean. This is important for tracking the movements of sea creatures, studying underwater habitats, and monitoring changes in the environment. With GPS, scientists can collect accurate data and better understand the mysteries of the ocean.

| GPS Coordinates | Marine Park Name | State or Commonwealth? |
|---|---|---|
| 137.62, -36.037 | | |
| 133.32, -32.510 | | |
| 134.40, -33.814 | | |
| 136.34, -36.019 | | |
| 138.07, -34.373 | | |
| 138.28, -35.783 | | |
| 133.12, -32.391 | | |

**Suggested Answers**

| GPS Coordinates | Marine Park Name | State or Commonwealth? |
|---|---|---|
| 137.62, -36.037 | Southern Kangaroo Island (MP) | State |
| 133.32, -32.510 | Nuyts Archipelago (MP | State |
| 134.40, -33.814 | Western Eyre Special Purpose Zone | Commonwealth |
| 136.34, -36.019 | Western Kangaroo Island Special Purpose Zone | Commonwealth |
| 138.07, -34.373 | Upper Gulf St Vincent Marine Park | State |
| 138.28, -35.783 | Encounter Marine Park | State |
| 133.12, -32.391 | Great Australian Bight Special Purpose Zoning | Commonwealth |

Use NatureMaps to find the details of the parks from the BRUVS surveys.

- Step 1, click on Layers
- Step 2 **tick protected areas and the plus icon** to expand the list
- Step 3 **tick marine** and expand list with the **plus** icon
- Step 4 **tick protected areas** (gazetted) and expand list with **plus** icon
- Step 5 **tick "Australian Marine Parks"** as well as "**SA's Marine Park Network**"
- Step 6 students can use the search box (top right) to add GPS coordinates of marine parks from the video. Marine parks listed in green as "Australian Marine Parks" are Commonwealth Parks and parks listed as part of the "South Australian Marine Park Network are State Parks.

**Part C**

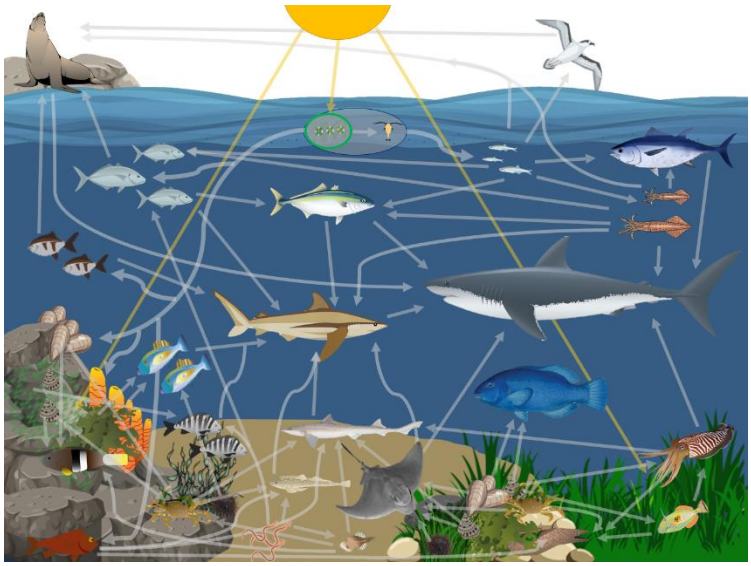
Direct students to the Fab Five story map website. Students can choose one specific marine park or animal, research it in detail and design a banner to promote the marine park or animal.

# Activity 5 - Food webs and food fraud

Discuss with students the interconnections of species in a food web and how sharks and rays play a vital role in maintaining balance (see notes in background section of this document).

Use these food web graphics packages to aid your teaching which can also be found in the Presentation slides, highlighting the key points:

1. The ocean food web is a complex network of relationships between different organisms that live in the ocean.
2. At the base of the food web are small, single-celled plants called phytoplankton. These organisms use sunlight to create energy through a process called photosynthesis.
3. Seaweeds, which are a type of macroscopic marine algae, also play an important role in the temperate ocean food web. They provide habitat and food for a variety of animals, including sea urchins, snails, and crabs.
4. Phytoplankton, are then eaten by small animals called zooplankton, which are in turn eaten by larger animals like fish, crustaceans, and squid.
5. At the top of the ocean food web are apex predators like sharks and killer whales, which feed on other large marine animals.
6. Some animals, like sea turtles and certain species of fish, feed on multiple levels of the food web, making them omnivores.
7. The ocean food web is connected to other ecosystems, such as the land and the atmosphere, through processes like nutrient cycling and the exchange of gases.
8. Human activities, such as overfishing and pollution, can disrupt the ocean food web and have serious impacts on the health of marine ecosystems.



Have students write a paragraph about the flow of energy through the food web using the diagram.

You may like to include an additional lesson for the students to conduct the following student-led research activity using the Great Southern Reef website. https://greatsouthernreef.com/food-webs

Provide students with a study / news article on the sale of endangered shark meat in South Australia. Have them read and analyse the article and discuss the implications of this practice. Have students brainstorm ways to address the issue of illegal shark fishing and the sale of endangered shark meat.

Explain the importance of correctly labelling seafood. Discuss the risks associated with mislabeling and the impact it can have on the environment and human health. Have students analyse examples of seafood labels and packaging to identify potential issues.

Students can also research how sustainable different items of seafood are in Australia using the Sustainable Seafood Guide. https://goodfish.org.au/sustainable-seafood-guide/

Explain to students why it is important to release sharks and rays back into the water if caught accidentally. Discuss the negative impacts of overfishing and how it can disrupt the balance of the ecosystem. Have students brainstorm ways to reduce overfishing and ensure the survival of shark populations.

## Assessment:

Essay Question or Presentation topic #1

Why should we protect sharks and rays? Discuss the ecological, economic, and cultural reasons for protecting these species."

In your essay or presentation, you should:

- Explain the role of sharks and rays in the ocean ecosystem.
- Describe why we should protect sharks and rays, such as their importance for maintaining balance in the ocean and their role in the food chain.
- Discuss the consequences of losing these species, such as impacts on the ocean ecosystem and the livelihoods of people who rely on them.
- Provide examples of why sharks and rays are special and worth protecting, such as their unique features and behaviours.
- Use simple and clear language to express your ideas.

Remember to structure your essay with an introduction, body paragraphs, and a conclusion. Use examples and illustrations to support your points and present your ideas clearly and logically.

Essay Question or Presentation topic #2

"Why is it important to label seafood correctly? Discuss the implications of food fraud in the seafood industry."

In your essay, you should:

- Define what food fraud is and how it can occur in the seafood industry.
- Explain why it is important to label seafood correctly, including the impact on consumer health and safety, as well as the environmental and economic consequences.
- Describe the challenges and limitations of regulating seafood labeling and detecting food fraud
- Provide examples of food fraud in the seafood industry, such as species substitution or mislabeling of origin.
- Suggest possible solutions or strategies to address the issue of food fraud in the seafood industry.
- Use clear and concise language to express your ideas.

# Essay / Presentation Assessment Rubric Guideline

| Criteria for Assessment | Below Expectations (1-2) | Meets Expectations (3-4) | Exceeds Expectations (5-6) |
|---|---|---|---|
| Content Knowledge and Understanding | Demonstrates limited understanding of the ecological, economic, and cultural importance of sharks and rays | Demonstrates adequate understanding of the ecological, economic, and cultural importance of sharks and rays | Demonstrates comprehensive understanding of the ecological, economic, and cultural importance of sharks and rays, and uses this understanding to make insightful and well-supported arguments |
| Analysis and Interpretation | Presents basic ideas without critical analysis or interpretation | Presents well-analyzed and interpreted ideas that demonstrate understanding of the complexities of the topic | Presents sophisticated and insightful analysis and interpretation of the topic, and uses evidence to support their arguments |
| Research and Evidence | Uses limited or unreliable sources to support their arguments | Uses appropriate and relevant sources to support their arguments | Uses diverse, reliable, and relevant sources to support their arguments, and incorporates primary research or original insights |
| Communication | Uses basic language, with limited coherence and grammatical errors | Communicates ideas clearly and cohesively, using appropriate language and grammar | Communicates ideas persuasively and effectively, using sophisticated language, style, and structure to engage the reader |
| Organization and Presentation | Presents ideas in a disorganized and unclear manner | Presents ideas in a well-structured and coherent essay format | Presents ideas in a sophisticated and polished manner, with attention to detail and formatting, and an engaging introduction and conclusion |

## Glossary

- **Ampullae of Lorenzeni** - a network of tiny little pores filled with mucous and contain sensory cells which can detect electrical fields in the water which help them find prey.
- **BRUVS** - acronym for Baited Remote Underwater Video Systems
- **Common name** - a non-scientific name given to an organism
- **Cartilaginous**- a flexible yet strong connective tissue - refers to the type of skeleton found in some vertebrates, including elasmobranchs. Unlike bone, cartilage does not have a blood supply, so it heals more slowly when injured.
- **Commonwealth Marine Park** – marine protected areas located within Commonwealth waters (3-200 nautical miles offshore) managed by the Australian government and cover a large portion of the country's offshore waters, out to the Exclusive Economic Zone (200 nautical miles offshore). There are 60 commonwealth marine parks in Australia.
- **Denticles** - rows of teeth like scales that help elasmobranchs reduce drag and increase speed
- **Elasmobranch** - a group of cartilaginous fish that include species such as sharks, rays, and skates.
- **Electroreceptors** - specialised sensory cells located in specialised organs that may allow an animal to perceive electric signals for navigation, communication, and hunting.
- **Food Fraud** - when food is deliberately altered, mislabeled or misrepresented for financial gain, posing a risk to public health and safety.
- **IUCN Red List -** a list that shows endangered species and how threatened they are, helps conservation efforts.
- **Keystone species** - a species that has a disproportionate impact on its environment relative to its abundance. The loss of a keystone species can trigger a chain reaction that alters the balance of an ecosystem.
- **State Marine Park** - marine protected areas managed by the State Government and protect coastal and estuarine waters out to the state waters limit (0-3 nautical miles offshore) . There are 19 marine parks in South Australia.

## Additional Links

**More information**

**www.parks.sa.gov.au**

- Student worksheet
- Student worksheet v2 (condensed)
- Presentation slides
- Food web diagrams from Neptune Islands
- Fab Five story map
- Shark anatomy poster
- Monitoring in Marine Parks poster
- Great Southern Reef Food Webs (teacher notes for year 7 lesson)
- Marine Parks of South Australian waters – including the Years 7-10 resource – Understanding more about Marine Parks in South Australian waters.
- BRUVS additional information
- BRUVS in marine parks
- Commonwealth Marine Parks
- State Marine Parks
- Seamap
- Naturemaps
- Sustainable Seafood Guide
- PIRSA Fisheries Sharks and Rays