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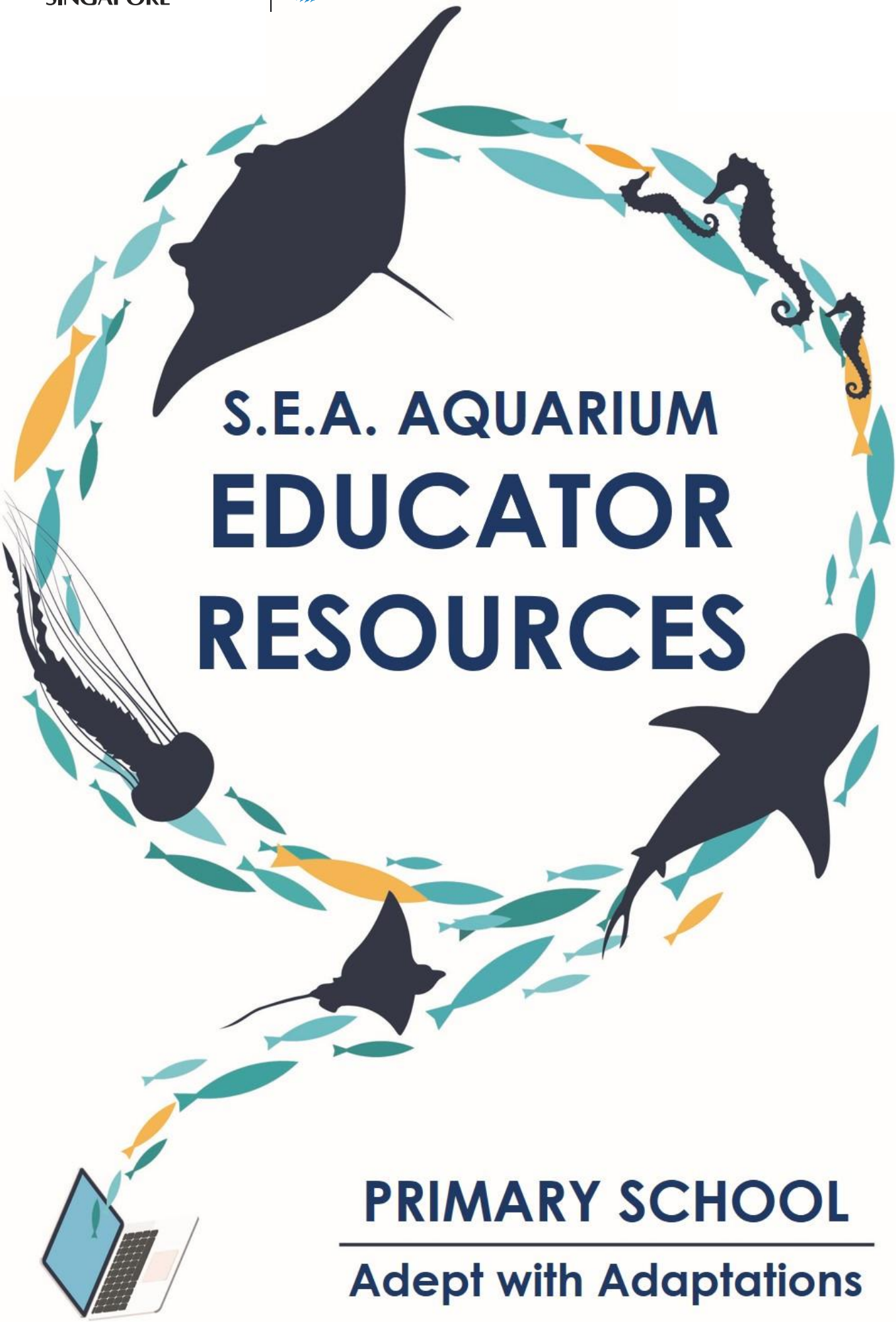


S.E.A. AQUARIUM
EDUCATOR RESOURCES

PRIMARY SCHOOL

Adept with Adaptations

Adept with Adaptations

This ***Adept with Adaptations*** resource covers the topic of *Adaptations* and aims to support teachers with Primary 5 and 6 Science Syllabus: *Interactions within the Environment*. Using marine animals as examples, this series aims to show students that all living things possess adaptations that carry out specific functions to enhance their survival in their natural habitats.

This resource is recommended to be used as a re-cap for students to apply what they have learnt about adaptations. Students will learn to recognise and differentiate between structural and behavioural adaptations. They will also discover different ways in which adaptations enable animals to survive in their habitats.

Target Group: Primary 5 & 6

Duration: 60 minutes

- Topic 1: 15 minutes
- Topic 2: 20 minutes
- Topic 3: 25 minutes

Learning Objectives

- Recognise various adaptations of different animals.
- Differentiate between structural and behavioural adaptations.
- Identify and explain how adaptations enhance an animal's survival.

Required Resources:

- Corresponding *Adept with Adaptations* slides
- Writing materials

Note for educators: Educators need not complete entire lesson in one sitting and can spread them out across 2 to 3 class periods if preferred.

Topic 1: Introduction to Adaptations (15 minutes)

Introduction

Slides 2 – 3:

Define adaptations: "Adaptations are **special characteristics** of an organism that **enhance its survival** in its environment".

Explain that each animal possesses specific adaptations that aid its survival using the following examples:

- Octopus
    - Has **tentacles** with suckers to hold on to substrates as well as grip prey.
    - Is able to change its color and to **camouflage** with its surroundings in order to hide from predators and ambush prey.
- Dolphins
    - Breathe through the **blowholes** on their heads as they surface.
    - Engage in **social behavior** work together with other dolphins to hunt for food.

Class Activity (~ 5 minutes)

This activity requires students to match the adaptations to the right animal.

Prompt students: "Let's try to match the adaptations accordingly to how these animals appear or behave."

Slides 4 – 5:

Students are shown the 3 different organisms and 6 different adaptations in slide 4. Educators may give the students 1 to 2 minutes to match the adaptations to the correct animal.

Educators are recommended to encourage class participation and allow students to explain how they arrived at their answers.

Organisms and adaptations to match:

Stingray

Surgeonfish

Seahorse

Long snout

Burrowing into the sand

Prehensile tail

Stinging barb

Bright coloration

Schooling with other fish

Answers:

Stingray

Surgeonfish

Seahorse

Stinging barb

Bright coloration

Long snout

Burrowing into the sand

Schooling with other fish

Prehensile tail

Post Activity

Educators can facilitate further discussions by asking students to identify other adaptations that these organisms have. Educators may also refer to the *Appendix* for more information.

Topic 2: Structural and Behavioural Adaptations (20 minutes)

Introduction

Slide 6:

There are different types of adaptations and we will focus on 2 types: structural and behavioural adaptations.

Define structural and behavioral adaptations for students:

- Structural adaptations:
    - **Physical features** an organism **has** that enhance its survival in its environment.
- Behavioural adaptations:
    - **Specific actions** an organism **does** that enhance its survival in its environment.

Slide 7:

Educators can give examples of structural and behavioural adaptations using the animals provided.

Examples of structural adaptations:



- **Walking legs** of some crabs allow them to travel on land to feed on animals that may hide under the sand in intertidal areas.
- **Stinging barb** of stingrays enables the stingrays to sting predators as a defensive mechanism.
- **Hard shell** of sea turtles is extremely durable and protects them from physical harm such as shark bites.

Examples of behavioural adaptations:

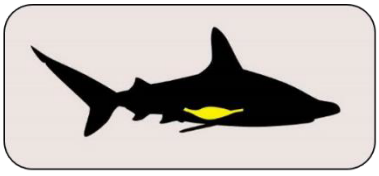


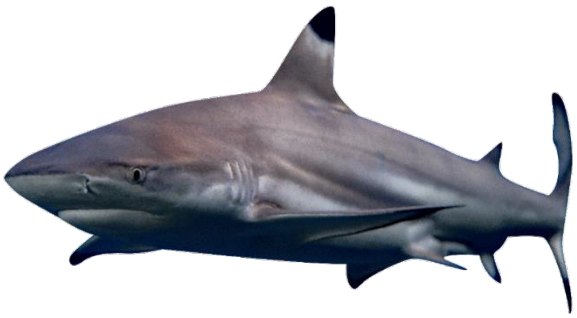
- Cryptic behaviour, such as **nocturnality,** observed in many shark species - sharks are more active at night and hunt for their prey more effectively in dark conditions.
- **Schooling** behaviour of reef fishes allows the group to find food and mates easily while gaining protection against predators as a group.
- **Social behaviour** in dolphins. Dolphin groups (known as pods) actively communicate and work together to round up schools of fish in order to hunt efficiently.

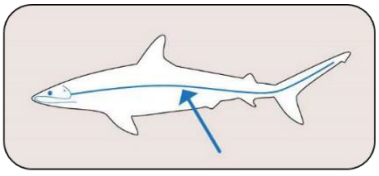
Class Activity (~ 5 minutes)

Slides 8 – 9:

In this activity, students are to group the adaptations of sharks as either structural or behavioural.


Oil-filled liver




Lateral line

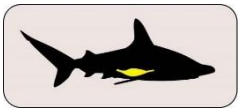
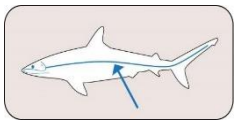

Nocturnality


Rolling back of eyes


Ampullae of Lorenzini


Test biting

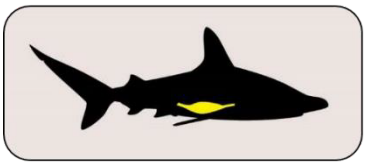
Educators may refer to the table provided below for supplementary information of the adaptations of sharks. The information provided may be used to prompt students and help them to correctly identify the adaptations as structural or behavioural.

 Oil-filled liver Helps in providing buoyancy, as oil is less dense than water.	 Test biting Sharks use their teeth to bite and sense their food.
 Lateral line A line that runs along the body of the shark, helping it to sense vibrations in the water.	 Ampullae of Lorenzini Organs near the mouth of the shark that can sense electric signals emitted from the muscle movements of animals nearby.
 Nocturnality Sharks hunt at night where the dark conditions help it to hunt more effectively.	 Rolling of eyes Shark roll their eyes back during a bite to protect them from injury

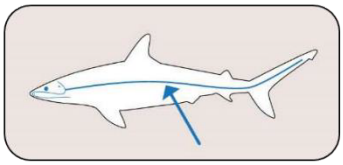
Answers:

Structural Adaptations

Behavioural Adaptations



Oil-filled liver



Lateral line

Test biting

Rolling back of eyes

Ampullae of Lorenzini

Nocturnality

Conclusion

Re-cap and ask students: "How did you deduce which adaptations are structural and which adaptations are behavioural?"

Topic 3: Functions of Adaptations (25 minutes)

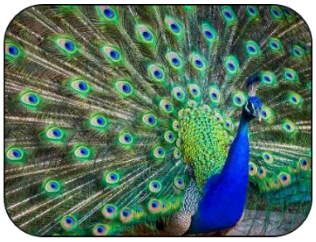
Introduction

Slide 10:

Explain that every adaptation carries out a specific function that enables the organism to survive better in its environment. Examples of some main functions of adaptations include:

Feeding

Movement



Mating

Defence

- For **feeding/foraging** efficiency
  - Nose of the anteater, located at the end of its long snout, serves as a sensory organ to probe and search for food.
- For **movement** and **locomotion**
  - Wings enable the eagle to lift off the ground and evade predators, or fly for long distances to seek food and shelter.
- To find **mates**
  - Bright plumage of the feathers of male peacocks serves to attract mates.
- For **defence** and **protection**
  - Hard shell of the sea turtle protects it from physical harm.

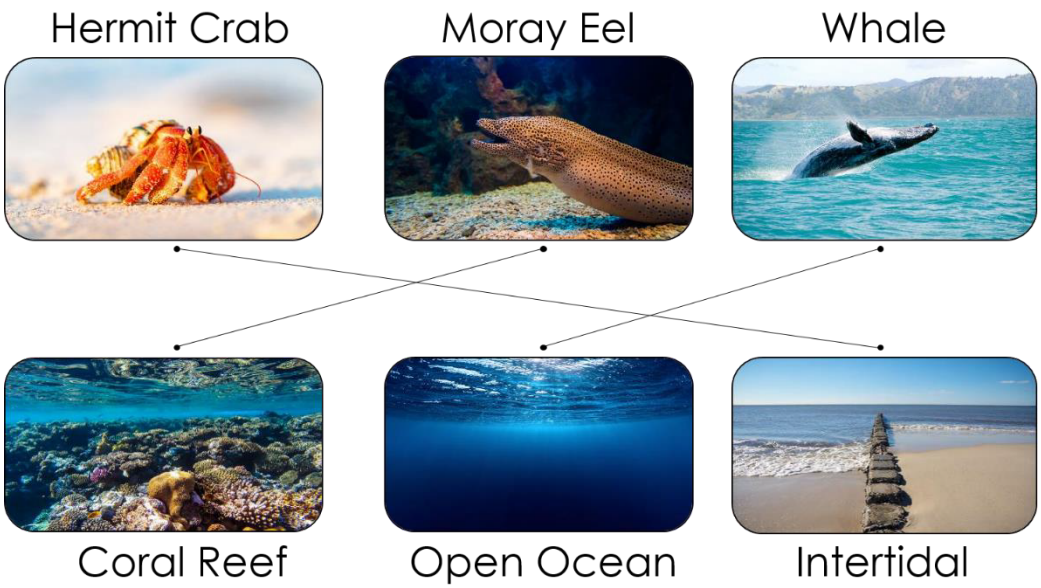
Activity 2a (~ 5 minutes)

Slides 11 – 12:

As a class, students are to analyse 3 different habitats and assess which of the given animals would be best suited to live in those habitats.

Students are shown 3 marine habitats and 3 marine animals. As a class, they are to analyse the 3 habitats and match the animals that are best suited to live in those habitats. Educators are recommended to have students volunteer to respond.

Answers:



Educators may refer to the *Appendix* to provide more information on the habitat types and animals for the students to make a better assessment.

Activity 2b (~ 10 minutes)

Slides 13 – 17:

In this activity, students are to identify and explain adaptations of the animals shown in *Activity 2a*.

1. Split students into groups of 4 or 5.
2. Students are shown the following 3 animals:

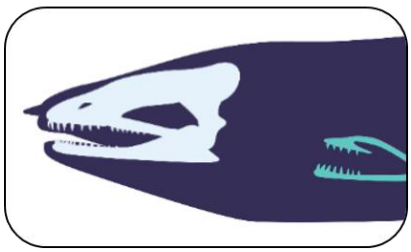
3. In their own groups, students are to list as many adaptations as they can for each animal on a piece of paper.
4. Students are to write down and explain the use of the adaptations which they have listed.
5. At the end of the activity, educators are recommended to discuss the possible answers.
6. Educators may refer to the additional information below

Hermit crab

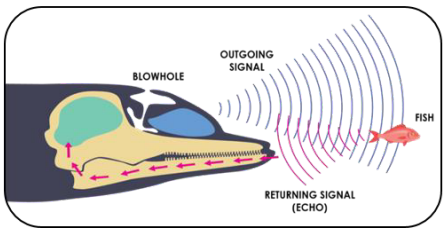
- Closely related to lobsters, crayfish, and prawns.
- Adapted to live in the intertidal zone with walking legs, which enable it to move about on land.
    - Unlike most crabs, the hermit crab does not have a hard, calcified shell to protect its soft body.
    - Actively searches for empty shells to live in and hide from predators.
- Adapted to anchor into the inside of shells with a spirally-curved abdomen and hook-shaped tail.

Moray eel

- A type of fish with a long extended fin on its back, giving it a snake-like appearance.
- Adapted to swim into and hide in crevices of coral reefs with its slender body shape.
- May be brightly-coloured to camouflage with similarly coloured corals, or have spotted patterns to blend into rocky surroundings of crevices.
    - Effective camouflage helps the moray eel to ambush prey and hide from predators.
- Jaws are equipped with sharp needle-like teeth to capture prey.



Whale



- One of the largest mammals in the world.
- Possesses a thick layer of fat, known as blubber, to keep warm.
    - Blubber also helps with buoyancy.
- Breathes through blowholes on the top of their heads.
    - Takes in large amounts of air in one breath and can stay underwater for long periods of time before needing to surface.
- Able to echolocate by sending out ultrasonic clicks.
    - Echolocation helps whales to communicate with other whales, locate food, as well as find mates.

Summary

Slide 18:

Summarise what was learnt about adaptations:

- Adaptations are **special characteristics** of an organism that **enhance its survival** in its environment.
- Structural adaptations refer to **physical features** of an organism.
- Behavioural adaptations refer to **specific actions** taken by an organism.
- Every adaptation has a **function** to help an organism survive in its habitat.

Appendix

Additional information for Educators

Topic 1: Introduction to adaptations

Additional adaptations of 3 marine animals:

Blue spotted stingray

- **Stinging barb:** Located near the stingray's tail, the barb (or spine) of a stingray is actually a modified scale known as dermal denticles and is used for defence. In addition to causing excruciating pain to its victim/attacker, the spine also contains venom.
- **Burrowing behaviour:** A form of cryptic behaviour, where the stingray burrows underneath the sand to hide from predators.
- **Flattened body:** Having a flattened body allows the stingray to remain inconspicuous after burrowing underneath the sand.
- **Cartilaginous skeleton:** The skeleton of the stingray is made up of cartilage. The durable nature of cartilage provides structural support to the stingray, while its flexible characteristics allow the stingray to swim easily in an undulating fashion.
- **Mouth on the underside:** As the stingray often spends its time on the seafloor, its mouth is located on its underside for it to feed easily on bivalves hiding in the sand.
- **Electroreception:** A feature also found in sharks, the stingray has electric receptors known as the Ampullae of Lorenzini, which are found near its mouth. These receptors allow the stingray to detect electrical signals of its prey hiding in the sand.

Blue tang

- **Bright colouration:** Coral reef fish are often very colourful, which allows them to camouflage easily amongst the brightly-coloured coral reefs. In addition, this bright colouration may also help certain species of fish to recognise mates.
- **Shoaling/schooling:** Shoaling refers to the behaviour of fishes that stay together in a group, while schooling refers to the behaviour of fishes that swims together with a group of other fishes in a coordinated manner. In a shoal/school, fishes are able to find food and mates easily, and

individuals in the group are less likely to be preyed upon (by diluting the chance of individual capture by predators)

- **Slim body shape:** The slim body of reef fishes allows the fish to maneuver in the water quickly as well as to hide in the crevices of corals in order to escape predators. This slim body shape also aids in reducing drag as it swims in the water.
- **Hiding in crevices of reefs:** A form of cryptic behaviour, many reef fish adapt to living in coral reefs by frequently hiding in the fissures and crevices of coral reefs, where they can find safety against larger predators.
- **Spines:** Certain fishes, such as the surgeonfish and foxface rabbitfish has sharp spines that are erected and locked in place to defend itself from predators. These spines may be venomous (e.g. foxface rabbitfish). Spines also allow reef fish to anchor itself within the crevices of coral reefs (e.g. triggerfish).

<u>Seahorse</u>

- **Prehensile tail:** A prehensile tail allows seahorses to grasp and anchor itself to structures such as seagrass and coral reefs to avoid being swept away by currents in the water.
- **Long snout:** The snout of the seahorse is long and pronounced, enabling it to feed on shrimps that hide within small rocks and crevices of coral reefs.
- **Camouflage:** Several seahorses can change the colour of their body to resemble seagrass and corals as a form of camouflage.
- **Bony exterior:** The exterior of the seahorse is covered in a series of bony plates that may deter predators as its bony exterior makes the seahorse hard to swallow.
- **Unique vision:** Seahorse has excellent eyesight and its eyes can move independently of each other like a chameleon. This allows the seahorse to better spot prey and predators alike in the water.

Topic 3: Functions of Adaptations

Information of habitat types:

Intertidal habitat

Examples: beaches, mangroves.

An area that is periodically **exposed to air** and subjected to constantly **changing water levels**. When exposed, intertidal habitats are often dry and hot.

Coral reef habitat

Coral reefs are often found in **shallow regions**, where the environment is **well-lit**. Corals display **bright colouration**, and the **crevices and holes** in reefs serve as shelter for many marine organisms.

Open ocean habitat

The open ocean habitat is characterised by **deep and cold** waters. The depths of the ocean habitat means that the open ocean is **poorly lit** and colours are usually **dull**.