# ROCKY SHORES

This book is a part of the Honavar coastal ecosystem series

#### Activities on a rocky shore by

Dakshin Foundation

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One state. Many worlds. Department of Tourism

| MY NAME IS:     |  |
|-----------------|--|
| I LIVE IN:      |  |
| I AM IN CLASS:  |  |
| I GO TO SCHOOL: |  |



## WHAT ARE ROCKY SHORES?

Rocky shores are sections of the coast where rocky outcrops meet the sea. On the west coast of India, rocky shores are found wherever the Western Ghats meet the Arabian Sea. Rocky shores form in coastal, intertidal regions between the extreme high and low tide marks. They can range from steep, inaccessible cliffs to wide, gently sloping platforms or extensive boulder beaches.

Regions of the rocky intertidal zone that are closer to land are exposed for longer periods of time and are covered only during high tide. Conversely, regions that are closer to the sea are submerged for longer periods of time and are exposed only during low tides. This change in being exposed to the air and being covered with water create differences in living conditions for organisms, causing distinct bands of where they might be found.

HIGH TIDE LINE UPPER INTERTIDAL MIDDLE INTERTIDAL LOWER INTERTIDAL Known as zonation, this banding is typically labelled as upper intertidal, middle intertidal and lower intertidal. In general, the upper limit of where an organism will be found is set by its ability to be exposed to air for long periods of time. On the other hand, the lower limit of an where an organism lives is controlled by predation and competition with other organisms, for space on the rocks.

### **ORGANISMS ON A ROCKY SHORE**

More stable than sandy beaches, these solid rocks are still exposed to wave surges when submerged, and extreme heat when exposed. As if this weren't enough, organisms can also be eaten by land animals, like birds, during low tide, and sea animals, like fish, during high tide. Even though conditions in these environments are harsh, rocky shorelines support a wealth of biodiversity.





## SCANNING ROCKS AND ROCKPOOLS

Divide yourself into groups of five and explore different areas of the rocky coast, walking from the water's edge further up. Do you see any trends in the location of different organisms? Use the list below to fill in which zone these organisms are most likely to be found in (upper intertidal, middle intertidal or lower intertidal). Use your observations. If you haven't seen the listed organism, use its description to decide where it should go. The last one has been left blank for other organisms that you find!



1.

I am a sea anemone. I am a predatory animal and use my tentacles to help capture my dinner or depend on algae in my body to help make food. I prefer being covered in water but can handle air exposure for a little while as long as it isn't too hot outside.

2.

I am a crab and have 10 legs and walk sideways over the rocks in the intertidal. I can breathe outside the water as long as my gills stay moist.





I am a sea urchin, and I need to move around looking for algae to feed on. I like to be covered in water. I can, however, handle exposure for a little while. I have a hard shell with spines that are used to protect me from predators, of which there are plenty where I live.

4. \_

3.

I am a sea star and have hard skin but no shell so I dry out quickly, especially on a hot day. I really prefer to stay wet or moist. I am carnivorous and like to stay right below the oysters and mussels so that I can move up and eat them when the tide comes in.



5.

I am a periwinkle, a soft-bodied animal with a hard, shell. I like to graze on algae when the tide is out and you will often find me high above the water line. 6. \_

I am an oyster, a soft-bodied animal that is protected by two hard shells. I am a filter feeder , filtering sea water for plankton! I do not like to be outside the water for too long.



I am a barnacle and have little trouble with hot and dry days. I am one of the only species that does well when exposed to air for long periods of time.

8.

I am a limpet and am not a regular looking snail! I like to find cooler areas such as crevices but also like dry areas in which the sea water only reaches me once in a while.





9.

I am sea weed and make my own food. I do like being covered with water most of the time and you will find me in large groups, a technique I use to stay moist and cool.

\_\_\_\_\_

10. \_\_\_\_\_



After the activity, spend 10 minutes to share and discuss your findings with your classmates, friends or family.

Read the next section to learn some more about the adaptations that these organisms have that help them survive on a rocky shore.

## Adaptations of organisms on Rocky shores

Abundant as they are, rocky shore creatures have to hold on tight to prevent themselves from being washed away or smashed up. Hard outer shells help to protect some organisms from the waves, while others hide in cracks, crevices and tide pools between the rocks, helping them stay cool and preventing them from drying out.

Regardless of where an organism is found, it has multiple adaptations to help it survive the harsh conditions of the rocky intertidal!

#### Adaptations to exposure due to low tide

Sea anemones can be found in rock pools and crevices where it stays cool and wet. They can also be found in large groups to help retain moisture! Anemones out of water generally have their tentacles retracted into their bodies to prevent drying out, and may appear to be little more than wet, squishy lumps.



Periwinkles have a shell that protect them from predators. They also have a shell plate, called an operculum, so when it gets too hot and dry, they can withdraw their body into their shell and seal its opening with a gatelike operculum in order to stay moist. When crawling about, they secrete a mucus that prevents them from drying out.





Crabs close off their gills in a protected cavity to keep them moist in order to breathe when out of water.

Barnacles and other shelled organisms that are attached to rocks shut their shells tightly when the tide goes out, to prevent themselves from drying out.







Organisms like mussels secrete byssal threads, only the size of a human hair, to attach themselves strongly on to solid surfaces such as rocks.



Algae are either very short and close to the rocks or are able to bend with the waves, to avoid them from being torn.

Can you spot the organisms that use one muscular foot to hold on tight to rocks?

## ACTIVITY 2

| A DAY IN THE LIFE  | Draw yourself here: |
|--|---------------------|
| Select an organism of your choice and write a<br>story from its point of view. Visualize yourself in<br>the rocky intertidal experiencing long periods<br>of time in and out of the water, first pounded<br>by waves, then baked by the sun. Think about<br>questions such as: |                     |
| 1. How do you protect yourself from crashing waves?  |                     |
| 2. How do you prevent yourself from drying out?  |                     |
| 3. How do you find and eat food?   | • • • •             |
| 4. What do you do when you sense a predator approaching ?  |                     |
| 5. Who do you meet when the tide is high?  | 0<br>0<br>0         |
| 6. Who would you see when the tide is low?   |                     |
| What are some other things you would want to write about yourself?   |                     |

\_

Write your story here:

\_\_\_\_\_ 

## MOLLUSCS

All seashells are made by a group of organisms called molluscs, a large group that can be found in different habitats in different shapes and sizes. Molluscs are characterised by a shell, a muscular foot and a specialised type of toothed tongue called a radula.

Shells are hard protective covers, made by soft and fragile creatures that live inside them. Made of calcium carbonate, these shells provide protection and prevent the organisms living inside from drying out.

A radula is used to scrape algae off rocks if they are herbivores, or to drill through the shell of their prey if they are carnivorous.

Molluscs that have two shells that are hinged together are called **bivalves**. They can be found buried in the sand or attached to hard surfaces such as rocks.



Oysters



**Mussels** 

**Gastropods**, (gastro means stomach and poda means foot), or organisms with a body structure where the foot is attached to the stomach, are a diverse group of organisms that have one shell instead of two (some of them have no shells!). The shells come in various colours and shapes.







Limpets

Cone shell



Frog whelks

**Polyplacophora** have a shell which is composed of eight separate plates that overlap somewhat at the front and back edges. These plates provide them with protection while allowing them to move over uneven surfaces. They also allow the animal to slowly curl up into a ball if they are dislodged.





**Cephalopod,** where cephalo means head and poda means foot, are molluscs that do not have an external shell and their muscular foot has evolved into arms! If you are lucky you might spot an octopus in a rock pool.



## SHELL SEARCH

Explore the rocky intertidal and observe as many different kinds of shelled organisms as you can. Don't forget to look in crevices and in tide pools, but be careful while doing so.

1. How many different types of shells did you come across?

2. How many of them are bivalves and how many are gastropods?

3. Did you come across any live shells? How did you know if it is alive or dead?

4. Did you come across any shells with crabs in them? These are called hermit crabs! What type of shell did you find them in?



## **IMPORTANCE OF ROCKY SHORES**

Rocky shores, found in long stretches along Karnataka's coast, are some of the harshest, yet most biologically abundant coastal environments. They play an important role by providing a safe home to hosts of organisms that you have now seen for yourself and read about in this book.

#### A rocky shore food web

The rich diversity of life supported by the rocky shore serves as a great food resource for other organisms higher up in the food chain. Not permanent residents at a rocky shore, fish and birds come through to feed on the organisms that live here. This also includes man, who is often found amongst the rocks looking for a meal.

#### Nurseries

The tidal pools and shallow sub-tidal areas that are found amongst the rocks provide a nursery area for many fish and crustaceans. The rocks themselves are vital roosting and breeding areas for local and migratory bird species.

#### Protecting the coast

Rocky shores are able to absorb the energy of the waves that crash against them, helping protect the sediment that lies behind them, thus preventing coastal erosion.

#### For science

Due to their accessibility, and great diversity of organisms, rocky shores are some of the best studied ecosystems worldwide. They are used by scientists to observe behaviours and study interactions between organisms.



## **THREATS TO ROCKY SHORES**

Rocky shores are not immune to the threats faced by other ecosystems. Here as well, threats can be created by humans or can be natural.

#### Collection

Molluscs have been collected for centuries for their shells and their meat. The over-collection of these and others such as sea urchins and sea cucumbers has led to a significant decline in their numbers, leading to instability of the entire food web.

#### Trampling and habitat disturbance

People are often found visiting and exploring rocky shores. While manageable in small numbers, large crowds trample and destroy algal beds which are feeding grounds for organisms that live here. Rocks that are turned around can crush some organisms and make those that have been exposed more vulnerable to the heat of the sun and the actions of waves.

#### **Trash and Pollution**

Discarded fishing nets often kill or injure fish and birds that visit or live in this area. Pollutants, on the other hand, from the release of untreated sewage or from oil spills in the sea are also known to harm organisms found on the rocks.

#### **Global Warming**

Sea level rise negatively impacts organisms that are adapted to live in a specific zone of the intertidal, many of which are permanently attached to the rocks. Ocean acidification on the other hand may make molluscan shells, which are made of calcium carbonate, weak and fragile.



## **PROTECTING ROCKY SHORES**

The creation of a protection plan for an ecosystem requires complete knowledge of the ecosystem and its inhabitants, and the ways in which people are using and affecting them. One way to understand the significance of the rocky shore is to survey the ecosystem yourself, and another is to interview people who might use or visit this area often.

Devise a plan to assess the impacts of humans on the rocky shores that surround you. Think of all the people involved and the different activities that can be carried out to help protect this ecosystem. Talk to parents, teachers, village elders and each other to come up with a plan of action!



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#### FEEDBACK

Attached is a postcard addressed to Dakshin Foundation, the organisation that put this activity booklet together. We would love to hear about your experience in the rocky intertidal. Complete the activity and write us a note at the back. Mail it to us from the nearest post office. We look forward to hearing from you!

| 1. An octop              | us has 8, but a T has only 5. <b>(1 and 9)</b>   |
|--------------------------|--|
| 2. Cephalop              | ods are the only organisms without shells that belong to a large group of organisms called   |
|                          |  |
| 3. A<br>and croaks.      | G L L is a predatory snail that shares its first name with an amphibian that jumps (4)   |
| 4. I have 8 s            | eparate but overlapping shell plates and can curl into a ball. I am a $\boxed{2}$ T N. (7)   |
| 5. An _ D _              | PN helps an organism survive in its environment. (2 and 8)   |
| 6. Barnacles<br>permaner | are permanently attached to rocks and are related to crabs and lobsters. I am also<br>ntly attached to rocks but am a bivalve. I am anT (5)  |
| 7. I sound th            | ie same as the parts of your body that are used when you lift weights. I am a $M_{-}$ $L_{-}$ IL. (10  |
| 8. Sometime<br>because   | es seen wearing a labcoat,<br>   |
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| Г                        |  |
| $\leq$                   | TREAD CAREFULLY AT THE $1 \overline{2} \overline{3} \overline{4} \overline{5} \overline{6} \overline{7} \overline{8} \overline{9} \overline{10}$   |
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|                          | you solve each clue, place the letter from the circle in the   |
| final a                  | nswer based on the number provided at the end of that  |
| clue.                    | or clues 1 and 5, since there are two numbers are given,   |
| that le                  | ttor will be used twise. And for elue 8, there are multiple  |
| A Prenidic Id            | tter will be used twice. And for cide 6, there are multiple  |

