# River of Words

MUSINGS ON THE
PORT ROYAL SOUND
THROUGH
ART AND POETRY

# BENTHIC ZONE

# Block Printing

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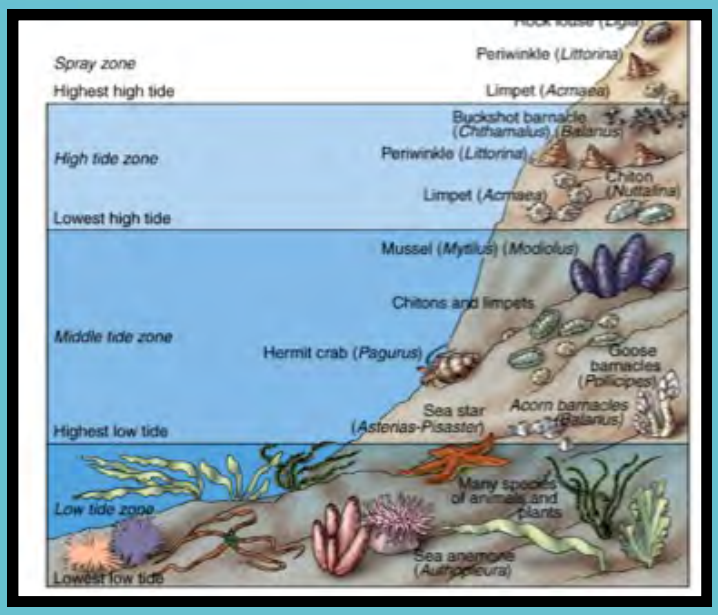


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# Lesson Overview

Using the APPENDIX students will learn the definition and characteristics of the **Benthic Zone**. Students will learn about bottom dwelling marine invertebrates such as **Mollusks** and **Aquatic Arthropods**, including similarities and differences in each.

Next, students will choose one Benthic Zone inhabitant to use as inspiration for their artwork, then will create a series of prints using a foam plate and washable markers.

# The Art of Printmaking

The Art of printing was born in **China** during the Han Dynasty (a print on fabric can be dated 220 AD), although some artifacts have been discovered in Egypt dating from the sixth or seventh century BC.

A print, by definition, is a picture made by applying ink or paint to one surface then "stamping" it onto another surface. If you have ever used store bought stamps or even made a "handprint" by applying paint on your hand, then you have used the printmaking process! The term "plate" refers to the original surface you are creating to "stamp". Usually, plates can be used over and over to create multiple pieces of art. Some of the oldest plates were made my carving an image into wood. Other printing techniques involve the use of a metal or linoleum plate.

Styrofoam makes an inexpensive and safe alternative to linoleum block printing. Rather than using sharp tools to engrave the design, students will use a pencil to create the relief. In addition, the use of markers eliminates the need for a brayer or specialty printing ink.

# MATERIALS

- 4” x 6” Piece of soft styrofoam such a plate, meat tray, or commercial foam “printing plate”
- 9x12 art paper
- 4”x6” White sketch paper
- Tape
- Pencil
- Water-based markers
- Spray Bottle
- Paper Towels


# PROCEDURES

**STEP 1:** Choose a plant or animal from the Benthic Zone and sketch it LARGE on the 4”x6” sketch paper. Consider zooming in and cropping to create a unique composition. Be sure to add lots of detail.

**STEP 2:** Use a small piece of tape to take the sketch on top of the foam “plate”.

**STEP 3:** Use pencil to trace over the entire image. Use FIRM PRESSURE when tracing.

As you are pressing hard on the paper, you are making an impression of the design into the foam beneath.

# PROCEDURES (cont.)

**STEP 4:** Carefully remove the tape and sketch and throw it away. Use a pencil to trace the impressions to make them even deeper.

**STEP 5:** Use water based markers to color the entire plate. Try blending colors to create intermediate colors.

**STEP 6:** Fold 9x12 paper into fourths so that only 1/4 of the paper is showing. Squirt with water, allow to absorb a few seconds, then blot with a paper towel. You want the paper very damp but not too shiny.

# PROCEDURES (cont.)

**STEP 7:** Lay the marker covered plate face down on the damp paper and burnish with the side of your pencil.

**STEP 8:** Pull off the plate to reveal your first print!

**STEP 9:** Repeat the process until you have 4 prints on the 9x12 paper. Experiment with changing up the colors for each!

# CURRICULUM CONNECTIONS

**Visual Resources:**

**https://www.dnr.sc.gov/marine/mrri/shellfish.html**

**Participate in the Coastal Discovery Museums Live Virtual Marine Invertebrate Experience**

**https://www.coastaldiscovery.org/home/discover-and-learn/school-programs/**

**Register for the Coastal Discovery Museums Online Resource - Habitats**

**https://www.coastaldiscovery.org/home/discover-and-learn/school-programs/**

# REFERENCES


www.dnr.sc.gov/marine/mrri/acechar/biological/benthicinvertebrates.html

www.inaturalist.org/guides/5536

Portroyalsoundfoundation.com

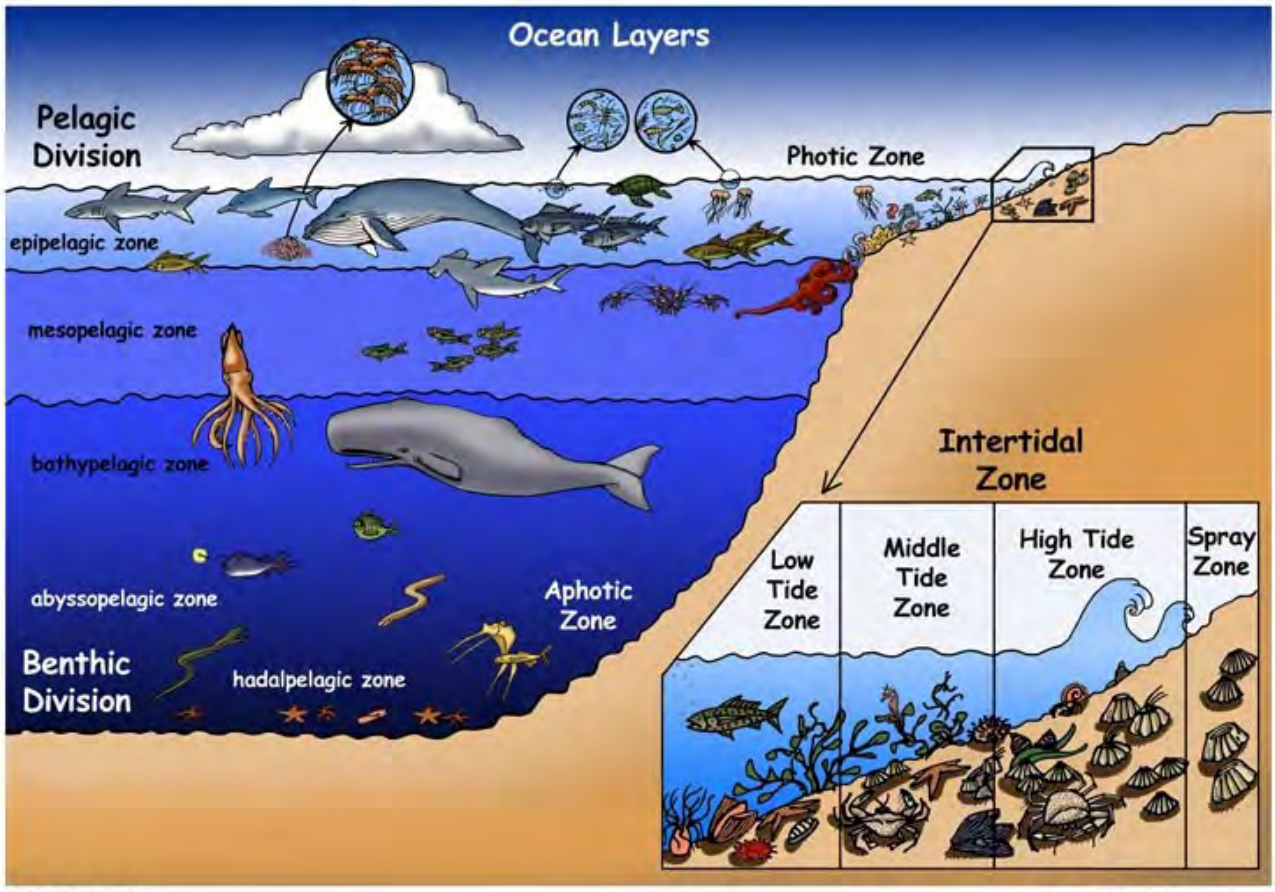
Dnr.sc.gov

# APPENDIX

# What is the Benthic Zone?

The term **BENTHIC** refers to anything associated with or occurring on the bottom of a body of water. The animals and plants that live on or in the bottom are known as the **BENTHOS.** Benthic Zone is an ecological system and its habitats cover about 70% of the earth's surface. Of the marine species, 98% live on or in the ocean floor.

Plants that live in the Benthic Zone such as algae and kelp play a vital role in the ocean's food chain. Animals that inhabit the Benthic Zone can be microscopic like plankton or large like a horseshoe crab.



# Benthic Invertebrates

Benthic invertebrates are the small animals, such as clams, worms, and crustaceans that live on or in the bottom substrate of a water body. These organisms are an important food source for many fish and crustaceans, including many recreationally and commercially important species.

Common Benthic Invertebrates of our watershed include:

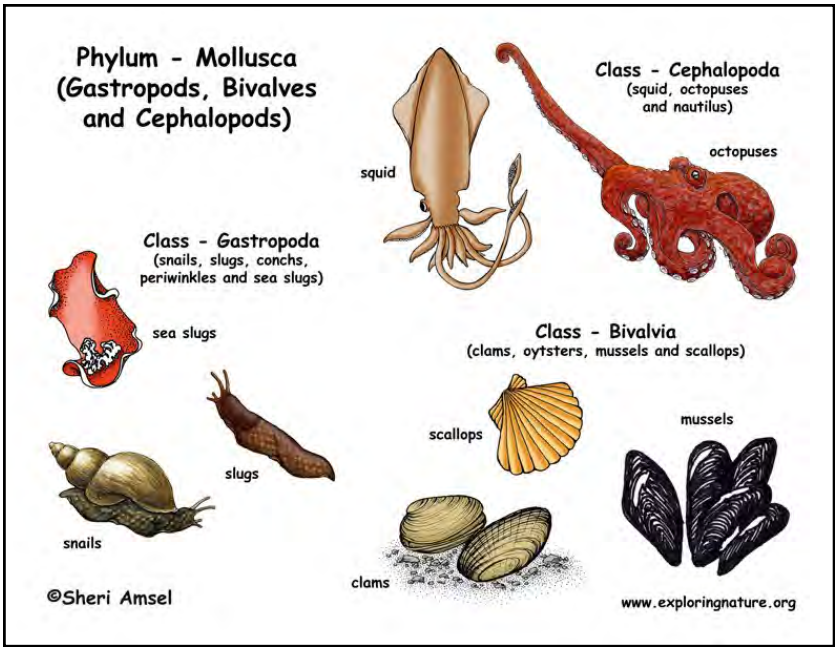
- American Oyster
- Blue Crab
- Fiddler Crab
- Grass Shrimp
- Hard Clam
- Horseshoe Crab
- White Shrimp

Blue Crab

# Mollusks

Some Benthic Invertebrates belong to the **Phylum Mollusca.** Mollusks are one of the organisms that can have an **exoskeleton,** which is made of **chitin,** such as the shells of snails. Although they are very diverse in shape, and have, for example, from one foot on a snail to 8 feet on an octopus, they all seem to retain some patterns, such as **all seem to have an area for their head distinctly separated from the area with their feet**.

Mollusks are also major parts of almost every ecosystem, for example in some cases up to 3,000 species have been found in one coral reef. One of the reasons for this is that they have **highly variable diets.**




**There are 3 types of mollusk. The first two, Bivalves and Gastropods, live in the BENTHIC ZONE.**

1. **BIVALVES:** have 2 shells with a hinge like an Oyster.

2. **GASTROPODS**: are like sea snails. They only have one shell like a Whelk.

3. **CEPHALOPODS**: No shell like Squid and Octopi.

# Arthropods

Some Benthic Invertebrates belong to the **Phylum Arthropoda,** which takes up 3/4 of all living and fossilized organisms.

Like mollusks, arthropods are all covered in an **exoskeleton made of chitin**. Chitin is what makes organisms in this phylum so crunchy- such as ants, crabs, crayfish, and lobster. The phylum gets its name because of the way the chitin joints the appendages together.

Horseshoe Crab

## Examples of Marine Arthropods

- Lobsters
- Crabs (e.g., green crab, spider crab, hermit crab)
- Horseshoe crabs
- Sea spiders
- Barnacles
- Copepod
- Isopods
- Amphipods
- Skeleton shrimp
- Barnacles
- Krill

# Arthropods (cont.)

## Characteristics of Arthropods

### *All Arthropods*

- **Jointed legs:** Jointed legs allow arthropods to travel quickly regardless of their method of transportation. Whether swimming or scurrying across the ground, arthropods are speedy because of their jointed legs.
- **A segmented body:** An arthropod's body can be divided into one, two, or three main sections. If they have one section, it is called a trunk. If they have two sections, these are called the cephalothorax and abdomen. If they have three sections, the third section is the head.
- **A hard exoskeleton:** The exoskeleton of an arthropod is made of a strong material called chitin. This hard shell protects the animal, retains moisture, and sometimes even plays a role in reproduction.
- **Compound eyes:** Compound eyes allow arthropods to take in their environment in a variety of ways. Arthropods can see through a very wide lens and use their compound eyes to detect the slightest of motions and perceive any depth.

### *Aquatic Arthropods*

Like land-dwelling arthropods, aquatic arthropods require adaptations that make living wholly or partially underwater possible.

- **Gills:** Just as book lungs allow for terrestrial respiration, gills allow for aquatic respiration. Marine arthropods use their gills to take in water and absorb its oxygen into their bloodstream.
- **Cement Glands:** Cement glands are unique adaptations that allow barnacles to adhere to nearly any surface. The adhesive secreted helps barnacles cling to rocks, ships, and other organisms and is so strong that scientists study its properties as inspiration for new materials.
- **Swimmerets:** Swimmerets allow some species of aquatic arthropods to swim, a movement that closely resembles running quickly through the water. In some species, a pair of swimmerets is used to inseminate mates.

# Phylum Arthropoda

## Class Crustaceans

Crustaceans form a large, diverse **ARTHRPOD** taxon which includes animals such as crabs, lobsters, crayfish, prawns, krill, woodlice, and barnacles.

Crustaceans are a group of animals that have a **hard exo-skeleton, jointed legs**, and a **segmented body** that is bilaterally symmetrical. They have two pairs of sensory antennae, one pair of mandibles (for chewing food), and two pairs of maxillae (to help the mandibles in positioning the food).

Shrimp

Acorn Barnacles

Mottled Purse Crab

Ghost Shrimp