Introduction to The Rocky Shore

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In New England, we have different types of beaches
Who has been to a beach like this?

Sandy Beach
Who has been to a beach that has more rocks than sand?

Rocky Beach
Low Tide

- When the water is low on the rocks
- In New England, there are 2 low tides per day
- Rocks trap water as the tide falls, creating puddles called **Tidepools**
High Tide

• When water covers the rocks on the beach
• In New England, there are 2 high tides per day
• If the 1\textsuperscript{st} high tide today is at 9am, what time is the 2\textsuperscript{nd} high tide of the day?
What cases the tides?

• The sun and the moon – but what force?
• Gravity
• The gravitational force of the moon on the earth pulls the water in the ocean towards the moon

![Diagram showing Earth, Moon, and Sun with forces labeled Tidal Bulges, Centrifugal Force, and Gravitational Force]
Intertidal Zone

- What does **intertidal** mean?
- Inter=between, Tidal=tides
- The area in between the high and low tide line on a beach
- Exposed to air at **Low Tide**
More about the Intertidal Zone

- Covered with water at **High Tide**
- Due to the rise and fall of the tides, intertidal organisms are covered with water for half the time and exposed to air for the other half.
A Biodiverse Habitat

Many organisms live in the intertidal zone!

How many can you think of?

How do scientists classify organisms?
Molluscs

- Blue Mussel *Mytilus edulis*
- Slipper snail *Crepidula fornicata*
- Dog whelk *Nucella lapillus*
- Smooth periwinkle *Littorina obtusata*
- Common periwinkle *Littorina littorea*
- Limpet *Tectura testudinalis*
- Nudibranch (sea slug) *Aeolidia papillosa*

*RED = INVASIVE SPECIES*
Crustaceans

Acorn Barnacle
*Semibalanus balanoides*

Rock Shrimp
*Palaemon elegans*

Amphipod
Various

Green crab
*Homerus americanus*

American Lobster

Spider crab
*Libinia emarginata*

Cancer Crabs

Asian shore crab
*Hemigrapsus sanguineus*

Hermit crab
*Pagurus longicarpus*

Jonah Crab
*Cancer borealis*

Rock Crab
*Cancer irroratus*
Echinoderms

Forbes sea star
*Asterias forbesi*

Northern sea star
*Asterias vulgaris*

Blood star
*Henricia sanguinolenta*

Green sea urchin
*Strongylocentrotus droebachiensis*
Cnidarians, Chordates, Bryozoans

Frilled anemone
*Metridium senile*

Stalked hydroid
*Dynamena pumila*

Sheath Tunicate (Sea squirts)
*Botrylloides violaceus*

Lacy crust bryozoan
*Membranipora* spp.
Brown Seaweed

- Bladder wrack
  *Ascophyllum nodosum*

- Rockweed
  *Fucus vesiculosus*

- Kelp
  *Laminaria saccharina*
Red Seaweed

Irish moss
*Chondrus crispus*

Coralline algae
*Corallina officinalis*

Red stain algae
*Hindenbrandia rubra*
Green Seaweed

Sea lettuce
*Ulva lactuca*

Gutweed
*Ulva intestinalis*

Dead man’s fingers
*Codium fragile*
Remember the tides?

- Due to the rise and fall of the tides, intertidal organisms are covered with water for part of the time....
Tides make life challenging

...and exposed to air for part of the time
How could this be stressful for intertidal organisms?

How many intertidal stressors can you think of?

Are they **abiotic** (physical) or **biotic** stressors?
Intertidal Stressors

**Biotic**
- Predators: from both land and sea
- Competition: for limited resources in a tide pool
- What resources?
  - Oxygen
  - Food
  - Space
  - Mates

**Abiotic**
- Desiccation: drying out
- Change in temperature
- Change in salinity
- Wave action
Zonation

The intertidal is organized into distinct zones with different organisms living in each zone.
Rocky Shore Zonation

High Zone:
barnacles, some periwinkles, green seaweed

Mid Zone:
brown seaweed, many periwinkles, crabs

Low Zone:
red seaweed, sea stars, periwinkles, crabs, sea squirts

Which zone is the most stressful for organisms to live in?
Rocky Shore Zonation

High Zone:
barnacles, some periwinkles, green seaweed

Mid Zone:
brown seaweed, many periwinkles, crabs

Low Zone:
red seaweed, sea stars, periwinkles, crabs, sea squirts

Most stressful!
What’s so interesting about the rocky shore?
Why do scientists want to study the rocky shore?

• Easy to access
  – Don’t need a boat, or SCUBA gear or a submarine
  – Walk right to your study site

• Large amount of Biodiversity
  – Many different types of organisms live here

• Distinct zones lead to many questions to test with experiments:
  – For example, “Why do barnacles live in the high zone?” – Let’s find out!
How do scientists study the rocky shore?

**Example 1**

Document organisms living in distinct zones

- **Tools:**
  - Quadrat and transect tape to designate an area to sample
  - Clipboard, pencil, datasheet to record data
  - Field Guide to identify organisms
How do scientists study the rocky shore?

*Example 2*

Document abiotic, physical conditions in tidepools

<table>
<thead>
<tr>
<th>Tool:</th>
<th>To Measure:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermometer</td>
<td>Temperature</td>
</tr>
<tr>
<td>Hydrometer</td>
<td>Salinity</td>
</tr>
<tr>
<td>Digital pH Meter</td>
<td>pH</td>
</tr>
<tr>
<td>Dissolved Oxygen Meter</td>
<td>Oxygen content</td>
</tr>
</tbody>
</table>

Hydrometer
Who cares?

• The rocky shore
  – Is an important habitat for many organisms
  – Serves as a barrier that protects the coast from storms, wind, and waves
  – Is an excellent place for people to study diverse marine environments
  – Is a great place for tidepooling and other forms of recreation
Where did the intertidal zone go?

It’s high tide, so the intertidal zone is now covered by water!

Come back in a few hours to explore!
Thanks for exploring the Rocky Shore with us today!