REEF ZONATION

This lesson is a part of the Reef Zonation unit, which explains the characteristics and location of the reef zones. Below is a summary of what is included in the entire unit.

UNIT CONTENTS

A. Background Information
   • Reef Zones
   • Zonation Patterns

B. Lessons

   Watch it! Coral Reef Zones
   • A worksheet to accompany the Coral Reef Zones video

   Modeling the Reef
   • An art project to research and model a coral reef

   GIS Mapping
   • An activity exploring interactive GIS mapping tools

   Read it! Let’s Name the Zones
   • A worksheet to accompany the Let’s Name the Zones, the Zones of the Reefs… of Raivavae and Tubuai field blog

STANDARDS

• CCSS: RST.9-10.1, 2, 3, 4, 5, 7, 8, 10; RST.11-12.1, 2, 3, 4, 8, 10; SL.9-10.1, 2, 3, 6; SL.11-12.1, 2, 3, 6
• NGSS: HS-ESS2-1, HS-LS2-6

ONLINE CONTENTS

• Reef Zonation Quiz
• Coral Reef Zones Video
Scientists divide coral reefs into zones. They base these divisions on location within the reef and characteristics such as depth, wave action, light intensity, temperature, and water chemistry. Zones of the reef include: lagoon, back reef, reef flat, reef crest, and fore reef.
ADDITIONAL BACKGROUND INFORMATION:
GIS stands for Geographic Information System. It is a tool used by scientists and other experts to display and analyze a large data set that is linked to a latitude and longitude. GIS mapping allows visualization of data so that patterns may become more easily visible. The data on a GIS map can often be manipulated and analyzed on the map itself, which allows it to be presented and displayed better than traditional graphs and tables. Often the data is stored in layers. For instance, the Khaled bin Sultan Living Oceans Foundation’s World Web Map starts with a map of the world and then you can choose whether to show benthic habitat data, bathymetry, and/or depth contours on top of the map. In addition, our map has videos and photos embedded into it so you can see what the coral reef looks like in specific areas of the world.

PROCEDURES:
2. In the upper-right hand corner is the menu. (If it is not already open, click on the icon.) Click on Select a Location, then French Polynesia, and then Bellingshausen, which looks like the image below. (Be patient, it may take a moment to load.)

3. In the menu, click View Legend to see what habitat each color on the map indicates. (You may need to click on Select a Location again to close that section of the toolbar.) What three habitats look like they take up the most area on Bellingshausen?

4. Use what you have learned from Unit 11: Reef Zonation to define the reef zone in the left-hand column of Table 1.

5. Use the legend to list the habitats on the Bellingshausen map that correspond with each reef zone. Fill in the second column in Table 1.
6. In the menu, click Toolbar, and then click on the icon for the Identify Tool. Now if you click on the different colors on the map, a description of the individual habitats will pop up. (You may need to zoom in to accurately click on a specific habitat. The zoom bar is on the left-hand side of the map.)

7. In Table 1, fill in the appropriate columns to compare the topography and depth range of the different habitats in each zone. NOTE: Topography and depth range are the last topics described in the Habitat Description.

8. Click on one of the video icons. (If you see an Identify Tool information box, and not the video, click on Next Feature in the top right of the pop-up window until you get to the video.) How does this visual information compare to the written information that you get from the Identify Tool?

9. In the menu, click Toolbar, and then click on the icon for the Measure Tool. Then click on the icon and change the unit to meters. Use this tool to measure the widest part of each zone. To measure the width:
   a. Change the zoom until the zone you are measuring takes up as much space on the screen as possible while still being able to see the whole thing.
   b. Click on the edge of the widest part of the zone. A green flag will appear.
   c. Without clicking again, move the mouse until a blue line has been drawn across the widest part of the zone.
   d. Double click to plant a second green flag. (If you only click once, that is ok. Without moving your mouse, double click.)
   e. You can find your Measurement Result in the menu.
   f. Record the measurement in the right-hand column of Table 1.

10. In the menu, click Toolbar, and then click on the icon for the Habitat Analysis Tool. To use the tool:
    a. Zoom out until you can see all of Bellingshausen reef.
    b. In the menu, change the radius to 3 km.
    c. Click on the icon.
    d. Move your mouse to the map. A box should tell you “Click to add a point”.
    e. Estimate where the center of Bellingshausen is and click on that spot. A red circle should appear around the entire reef.
    f. Wait a few moments for the report to appear.
    g. Excluding “Area not mapped” and “Terrestrial vegetation”, what three habitats take up the most area on Bellingshausen and how many square meters do they occupy?
<table>
<thead>
<tr>
<th>Reef Zone</th>
<th>Lagoon:</th>
<th>Reef Crest (Algal Ridge):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topography</td>
<td></td>
<td></td>
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<tr>
<td>Depth Range</td>
<td></td>
<td></td>
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<tr>
<td>Width of Habitat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reef Zone</td>
<td>Fore Reef</td>
<td>Back Reef</td>
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<tr>
<td>Topography</td>
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<tr>
<td>Width of Habitat</td>
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<tr>
<td>Depth Range</td>
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</tbody>
</table>
INSTRUCTIONS: Answer the following questions:

1. Why are the videos a helpful addition to the rest of the data?

2. Follow the procedures for using the tools again, but this time choose a different location. Fill out Table 2 and use the information in Tables 1 and 2 to answer the following questions:
   
a. What is the name of this reef?

   b. What habitats did both reefs have in common?

   c. What habitats, if any, did the second reef have that Bellingshausen did not?

   d. What habitats, if any, did Bellingshausen have that the second reef did not?

   e. Which zone had the greatest change in number of habitats between the two reefs?

   f. How did the size of each zone in the new location compare to the widths you measured in Bellingshausen?
### TABLE 2:

<table>
<thead>
<tr>
<th>Reef Zone</th>
<th>Habitats</th>
<th>Width of Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lagoon</td>
<td></td>
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<tr>
<td>Reef Crest</td>
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<tr>
<td>Fore Reef</td>
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<tr>
<td>Back Reef</td>
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</tbody>
</table>

3. Why do scientists create GIS maps and how might they be used?