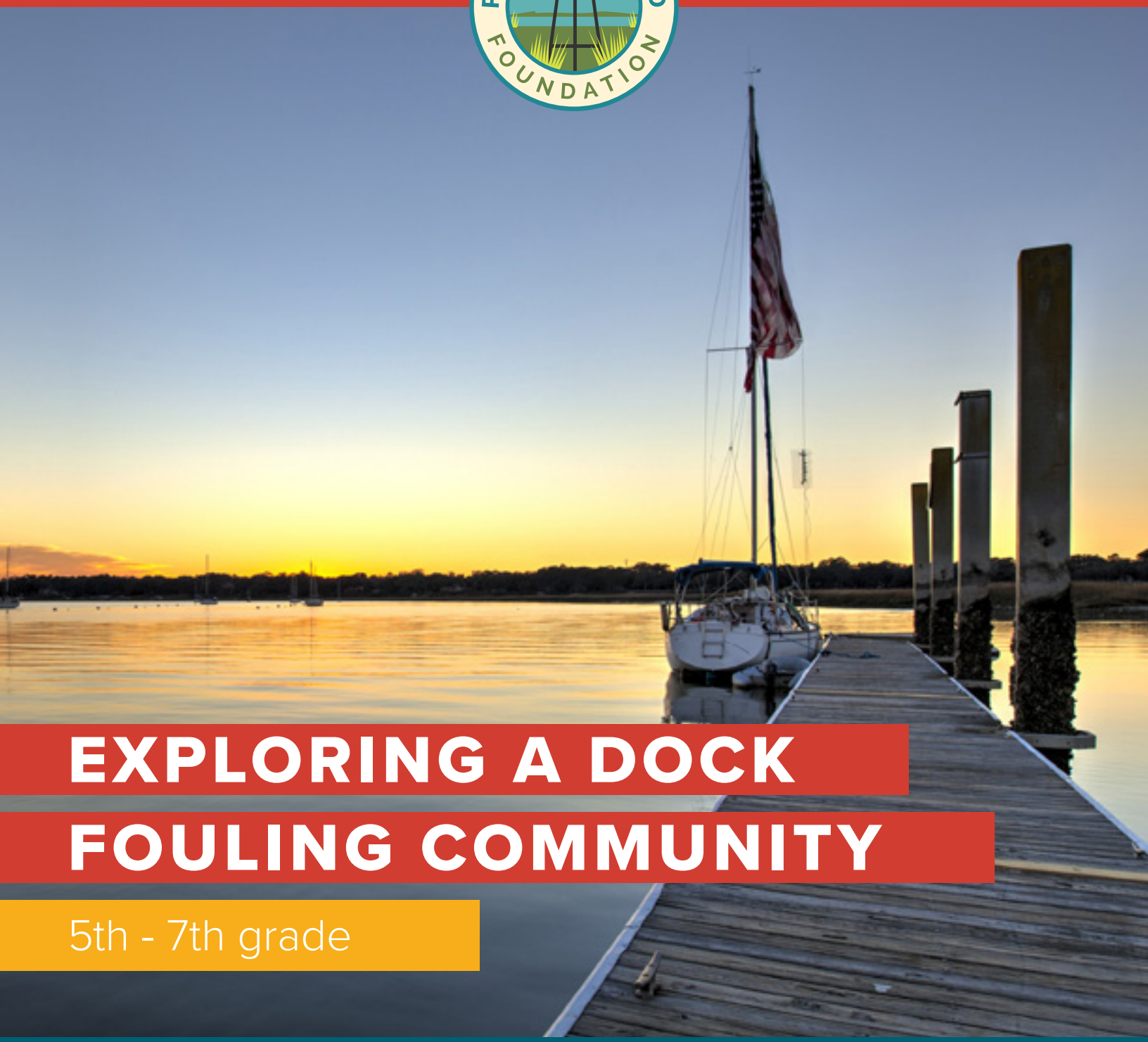

EXPLORING A DOCK FOULING COMMUNITY

5th - 7th grade

PORT ROYAL SOUND FOUNDATION
MICROSCOPE ACTIVITY

"IN EVERY WALK WITH NATURE, ONE RECEIVES FAR MORE THAN HE SEEKS."

–John Muir

HYRDOIDS

are habitat forming inverts that also filter feed using their anenome like feeding appendages.

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DETAILS

Program Overview

Learning local flora can help identify where you are in the maritime forest. This program helps teach kids about plant growth, speciation, working in groups and how to problem solve using a dichotomous key.

Lesson Description

Using a dichotomous key students will identify local plants found in our maritime forest and salt marsh. The hour and half nature hike along our Mobley Tract Trail takes them through a maritime forest and a salt marsh and ends at an outdoor classroom where they will identify plant species they have collected along the way.

What to Wear and Bring

Closed toed shoes that can get muddy (bag to put muddy shoes in), extra shoes, a reusable water bottle, hat, sunglasses, sunscreen, bugspray, pencil or pen and lunch/snack.

Reservation and Program Information

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Maritime Center
(843) 645 - 7774 ext. 203

Differentiation of Instruction

Please inform us at the time of your reservation of any special needs, disabilities, allergies, or language barriers your students have so that we may better enhance your experience and make any changes necessary.

Location

The Port Royal Sound Foundation Maritime Center is located at 310 Okatie Hwy, Okatie, SC, 29909, underneath the Lemon Island bridge.

If you are coming from Bluffton please exit to the right of the Lemon Island bridge and drive under the bridge. DO NOT TURN LEFT and cross highway.

If you are coming from Beaufort you will exit to the right, and when departing will drive under the bridge and exit on the opposite side. DO NOT TURN LEFT and cross highway.

Facilities

Restrooms and water fountain are available at the Maritime Center. The maximum number of children per field trip is 60 kids. Per Beaufort County schoold district policy there will be a 10 to 1 chaperone ratio, chaperones and teachers are free of charge but we encourage as many adults as possible. We will provide a lunch space with trash and recycling cans but clean-up falls onto the school and schools will be charged if deemed necessary.

Expectations for Student Conduct on Site

“In every walk with nature, one receives far more than he seeks.” - John Muir

In order for students to gain the most knowledge from their experience here at the Maritime Center, please remind them of the expectations for the trip and for their behavior on site. We suggest the following T.R.I.P. guidelines:

T Together. Stay with the group and with the adult in charge.

R Respect. Be considerate of your surroundings and the people around you. Only touch what you have been told you may touch.

I Interest, Show your interest by paying attention to the guide and listen well. Ask thoughtful questions.

P Polite. Use your best manners and thank your guide.

SC STANDARDS & PERFORMANCE INDICATORS

Fifth Grade Standards and Performance Indicators for Science

Standards

5.L.4 The student will demonstrate an understanding of relationships among biotic and abiotic factors within terrestrial and aquatic ecosystems.

Conceptual Understandings

5.L.4A Ecosystems are complex, interactive systems that include both the living components (biotic factors) and physical components (abiotic factors) of the environment. Ecosystems can be classified as either terrestrial (such as forests, wetlands, and grasslands) or aquatic (such as oceans, estuaries, lakes, and ponds).

5.L.4B All organisms need energy to live and grow. Energy is obtained from food. The role an organism serves in an ecosystem can be described by the way in which it gets its energy. Energy is transferred within an ecosystem as organisms produce, consume, or decompose food. A healthy ecosystem is one in which a diversity of life forms are able to meet their needs in a relatively stable web of life.

Performance Indicators

5.L.4A.1 Analyze and interpret data to summarize the abiotic factors (including quantity of light and water, range of temperature, salinity, and soil composition) of different terrestrial ecosystems and aquatic ecosystems.

5.L.4A.2 Obtain and communicate information to describe and compare the biotic factors (including individual organisms, populations, and communities) of different terrestrial and aquatic ecosystems.

5.L.4B.1 Analyze and interpret data to explain how organisms obtain their energy and classify organisms as producers, consumers (including herbivore, carnivore, and omnivore), or decomposers (such as fungi and bacteria).

5.L.4B.2 Develop and use models of food chains and food webs to describe the flow of energy in an ecosystem.

5.L.4B.3 Construct explanations for how organisms interact with each other in an ecosystem (including predators and prey, and parasites and hosts).

5.L.4B.4 Construct scientific arguments to explain how limiting factors (including food, water, space, and shelter) or a newly introduced organism can affect an ecosystem.

Science and Engineering Practices

5.S.1A.2 Develop, use, and refine models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others.

5.S.1A.4 Analyze and interpret data from informational texts, observations, measurements, or investigations using a range of methods (such as tabulation or graphing) to (1) reveal patterns and construct meaning or (2) support hypotheses, explanations, claims, or designs.

5.S.1A.6 Construct explanations of phenomena using (1) scientific evidence and models, (2) conclusions from scientific investigations, (3) predictions based on observations and measurements, or (4) data communicated in graphs, tables, or diagrams.

SC STANDARDS & PERFORMANCE INDICATORS

Sixth Grade Standards and Performance Indicators for Science

Standards

6.L.4 The student will demonstrate an understanding of how scientists classify organisms and how the structures, processes, behaviors, and adaptations of animals allow them to survive.

6.L.5 The student will demonstrate an understanding of the structures, processes, and responses that allow protists, fungi, and plants to survive and reproduce.

Conceptual Understandings

6.L.4A Life is the quality that differentiates living things (organisms) from nonliving objects or those that were once living. All organisms are made up of cells, need food and water, a way to dispose of waste, and an environment in which they can live. Because of the diversity of life on Earth, scientists have developed a way to organize groups of organisms according to their characteristic traits, making it easier to identify and study them.

6.L.4B The Animal Kingdom includes a diversity of organisms that have many characteristics in common. Classification of animals is based on structures that function in growth, reproduction, and survival. Animals have both structural and behavioral adaptations that increase the chances of reproduction and survival in changing environments.

6.L.5A The Protist Kingdom is one of the most diverse groups and includes organisms that have characteristics similar to but are not classified as plants, animals, or fungi. These microorganisms live in moist environments and vary in how they obtain energy and move.

The Fungi Kingdom consists of organisms that do not make their own food (heterotrophs) but obtain their nutrition through external absorption. Fungi can be grouped by their growth habit or fruiting structure and respond to changes in the environmental stimuli similar to plants.

6.L.5B The Plant Kingdom consists of organisms that primarily make their own food (autotrophs) and are commonly classified based on internal structures that function in the transport of food and water. Plants have structural and behavioral adaptations that increase the chances of reproduction and survival in changing environments.

Performance Indicators

6.L.5B.2 Analyze and interpret data to explain how the processes of photosynthesis, respiration, and transpiration work together to meet the needs of plants.

Performance Indicators continued

6.L.5B.3 Develop and use models to compare structural adaptations and processes that flowering plants use for defense, survival and reproduction.6.L.4A.1 Obtain and communicate information to support claims that living organisms (1) obtain and use resources for energy, (2) respond to stimuli, (3) reproduce, and (4) grow and develop.

6.L.4A.2 Develop and use models to classify organisms based on the current hierarchical taxonomic structure (including the kingdoms of protists, plants, fungi, and animals).

6.L.4B.1 Analyze and interpret data related to the diversity of animals to support claims that all animals (vertebrates and invertebrates) share common characteristics.

6.L.4B.2 Obtain and communicate information to explain how the structural adaptations and processes of animals allow for defense, movement, or resource obtainment.

6.L.4B.3 Construct explanations of how animal responses (including hibernation, migration, grouping, and courtship) to environmental stimuli allow them to survive and reproduce.

6.L.5A.1 Analyze and interpret data from observations to compare how the structures of protists (including euglena, paramecium, and amoeba) and fungi allow them to obtain energy and explore their environment.

6.L.5A.2 Analyze and interpret data to describe how fungi respond to external stimuli (including temperature, light, touch, water, and gravity).

6.L.4B.4 Obtain and communicate information to compare and classify innate and learned behaviors in animals.

6.L.4B.5 Analyze and interpret data to compare how endothermic and ectothermic animals respond to changes in environmental temperature.

6.L.5B.1 Construct explanations of how the internal structures of vascular and nonvascular plants transport food and water.

6.L.5B.2 Analyze and interpret data to explain how the processes of photosynthesis.

6.L.5B.4 Plan and conduct controlled scientific investigations to determine how changes in environmental factors (such as air, water, light, minerals, or space) affect the growth and development of a flowering plant.

6.L.5B.5 Analyze and interpret data to describe how plants respond to external stimuli (including temperature, light, touch, water, and gravity).

SKELETON SHRIMP

are common arthropods found on a dock fouling community, swaying back and forth feeding on plankton.

SC STANDARDS & PERFORMANCE INDICATORS

Seventh Grade Standards and Performance Indicators for Science

Standards

7.EC.5 The student will demonstrate an understanding of how organisms interact with and respond to the biotic and abiotic components of their environments.

Conceptual Understandings

7.EC.5A In all ecosystems, organisms and populations of organisms depend on their environmental interactions with other living things (biotic factors) and with physical (abiotic) factors (such as light, temperature, water, or soil quality). Disruptions to any component of an ecosystem can lead to shifts in its diversity and abundance of populations.

7.EC.5B Organisms in all ecosystems interact with and depend upon each other. Organisms with similar needs compete for limited resources. Food webs and energy pyramids are models that demonstrate how energy is transferred within an ecosystem.

Performance Indicators

7.EC.5A.1 Develop and use models to describe the characteristics of the levels of organization within ecosystems (including species, populations, communities, ecosystems, and biomes).

7.EC.5A.2 Construct explanations of how soil quality (including composition, texture, particle size, permeability, and pH) affects the characteristics of an ecosystem using evidence from soil profiles.

7.EC.5A.3 Analyze and interpret data to predict changes in the number of organisms within a population when certain changes occur to the physical environment (such as changes due to natural hazards or limiting factors).

7.EC.5B.1 Develop and use models to explain how organisms interact in a competitive or mutually beneficial relationship for food, shelter, or space (including competition, mutualism, commensalism, parasitism, and predator-prey relationships).

7.EC.5B.2 Develop and use models (food webs and energy pyramids) to exemplify how the transfer of energy in an ecosystem supports the concept that energy is conserved.

7.EC.5B.3 Analyze and interpret data to predict how changes in the number of organisms of one species affects the balance of an ecosystem.

7.EC.5B.4 Define problems caused by the introduction of a new species in an environment and design devices or solutions to minimize the impact(s) to the balance of an ecosystem.

The practices, as defined by the Next Generation of Science Standards, focus on eight key components:

- Asking questions
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

STUDENT & TEACHER RESOURCES

Reproducibles

Dock Fouling Community Classification Chart

The Living Dock, drawings & facts

Marine Ecosystem Energy Pyramid

Coastal Zone Food Web

Link to National Wildlife Federation (NWF) Lesson Plans & Ideas

Links in the Food Chain, K-4 NWF Lesson

The Low Country Institute Resources for Teachers

The Salt Marsh, Coastal Kingdom TV show

Hands-on Activities - Classification, Food Webs, Ecosystems & Biomes

An interactive to explore biomes, climate, biodiversity, and human impacts across the globe.

Learning Resource Tools & Activities from Arizona State University School of Life Sciences for students, teachers, parents, and life-long learners.

Skeleton Shrimp

Skeleton Shrimp 2

Taxonomic identification

VOCABULARY

The following academic vocabulary is associated with the pre-visit, on-site, and post-visit activities in "Exploring a Dock Fouling Community." According to the South Carolina Academic Standards and Performance Indicators for Science, students should be familiar with most of these terms by the end of seventh grade. Terms that are explicitly mentioned in the either the sixth or seventh grade standards and support documents are marked with an asterisk.

Carrying Handle: used to transport the microscope from one location to another

Coarse Focusing Knob: first knob to use when bringing the specimen on the slide to focus and used to move the stage

Cord Hanger: stores the power cord

Disc Diaphragm: rotating disc that adjusts the amount of light from the illuminator that is projected through the slide

Eyepeice: the part of the microscope you look through

Fine Focusing Knob: second knob to use when bringing the specimen on the slide to focus

Illuminator Housing: houses the light to view the slides

Light Adjustment Dial: increases and reduces the brightness of the illuminator or light

Monocular Head: attachment that rotates the eyepiece

Nosepiece: rotates to bring different objectives into view and change the magnification

Objective: rotating magnifying lenses

Stage: where the slide is placed

Stage Clip: the clips hold the slide in place

PRE-VISIT EXPERIENCE

Introduction to Microscopes - Teacher-Led Experience to be completed BEFORE Field Experience at PRSF

This teacher-led experience should be completed BEFORE the students attend the on-site experience at the Maritime Center and will greatly enhance the learning students accomplish on-site.

Time to Complete: 30 minutes

Lesson Description

Students will use the microscope worksheet to identify parts on a microscope to better understand the functionality and uses of a microscope.

Materials and Resources

Microscope Worksheet
Understanding Microscopes

Teacher Preparation

Review Microscope Worksheet and Understanding Microscopes.

Procedures

Allow students or teacher to read “Understanding Microscopes” followed by studying and reading vocabulary list found in “Microscope Worksheet”.

ONSITE EXPERIENCE

Exploring a Dock Fouling Community - Naturalist-Led Field Experience to be completed ON SITE at PRSF

Time to Complete: 45 minutes

Lesson Description

Students will identify and study a dock fouling community using microscopes. This is a review of invertebrates and ecosystems.

Focus Questions

Why are ecosystems so complex?
What is an Invertebrate?
What is a Dock Fouling community?
What is the significance of a Microecosystem?

Materials and Resources

Place 15 microscopes out on tables connected to powerstrips (all are found inside microscope cabinet)

Place “Seashore animals of the Southeast” in between microscopes along with identification quick guide

Make available buckets of dock fouling community, rags, and petri dishes for sample making.

Teacher Preparation

Please review pre-activities on how to use a microscope.

Procedures

Begin with a 15 – 20 minute intro and instructions using lecture notes, culminating assessment and microscope instructions (I always state if you give me 20 minutes of your attention I will let you do the activity freely

Lecture Notes:

2 things to be discussed – Ecosystems and Invertebrates

Ecosystems – are where animals, plants, biotic and abiotic factors coexist and interact

- Extremely complex if not impossible to define a single ecosystem

Invertebrates – animals without a backbone and make up 98% of all living organisms

- Inverts have around 3+ million known species with an estimated 27+ million unknown (300,000+ species of beetles, more than vertebrates)
- Vertebrates have around 57000 known species

Microscopes – instructions:

The three things they **SHOULD NOT DO!**

DO NOT hang on the eye piece if they are too small to see then they need to stand up!

DO NOT change the magnification! It is on the 10x zoom, RED lens, if it goes to the yellow or blue lens they will either break the slide or the lens.

DO NOT move microscopes. The scope's eye piece can swivel. There is no need to move around the microscope

What they can touch on the microscope

Large black knobs located on both sides of scope – adjust the stage and focus'

Smaller black knob located below - fine focus

Small wheel located on the bottom left side – adjust light intensity

They can swivel eye piece, again **DO NOT** hang on it.

Dock Fouling Activity:

Bins with dock fouling community will be prepared (3-4 bins)

Petri dishes will be accessible and to the side of the buckets

Students will view before touching seeing if they can see any movement or any macro animals (worms, crabs, etc)

Students will then pick apart a small piece of soft coral / sponge, place in petri dish. Examine dish to see if you see any life to specifically look at, and place under microscope

Students will then attempt to identify as well as draw and describe each organism

Each group will list new species on board as a competition.

Culminating Assessment

Why do scientists have an estimated unknown for invertebrate species?

Only 5% of the ocean has been extensively explored

There are depths in the ocean that are deeper than 2 MT. Everest

The average depth of our oceans are 1 mile

We find new species almost on a daily basis

Insects have a huge genetic diversity leading to higher chances of cross-breeding leading to new species

Why are dock fouling communities so susceptible to change?

Why do the number of invertebrate species far outway the number of vertebrate?

POST-VISIT LESSON: DOCK FOULING COMMUNITY

SC Standards and Performance Indicators listed above for grades 5 - 7.

Time to Complete: 1 - 4 Lessons, 40 - 50 minutes each

Lesson Description

Students will discuss, classify and analyze the observations they made during their visit to the Maritime Center.

They will create graphic organizers to illustrate the relationships within the dock fouling community such as classification chart, food web, energy pyramid, life cycles and anatomy.

Students will evaluate the special ecosystems of Port Royal Sound in light of what they have learned, including how humans affect them and why they are important to us.

Focus Questions

What are the unique abiotic factors which limit the populations that live in and around the Dock Fouling Community and Port Royal Sound? How do these factors change and affect living things here?

How do organisms in the Dock Fouling Community interact and depend on each other to survive?

How does energy flow through the Dock Fouling Community, the salt marshes and all of Port Royal Sound?

What are the special adaptations, processes, structures, and responses that allow organisms of all types to flourish here? How are these organisms similar and different?

Assessment / Products

Using the data sheets started during the on-site microscope activity, students label and embellish their diagrams.

They use field guides and identification sheets (suggestions below) to augment their drawings and add details.

Students create their own charts and diagrams.

Students can be directed to focus on classifying the organisms, identifying characteristics they do and do not share.

Students can also concentrate on how food energy moves through the dock fouling community by designing food webs and energy pyramids.

Other areas of study include an organism's anatomy, unique adaptations, or life cycle.

Materials and Resources

Student's Own Data Sheets with Drawings from Dock Fouling Activity at PRSF

Field Guides to Saltwater Invertebrates & Micro-organisms such as these from South Carolina Dept. of Natural Resources:

- South Carolina Beachcomber's Guide, 2010
- Guide to the Salt Marshes and Tidal Creeks of the Southeastern US, 2016

Poster Board, Markers, Computer Devices & Software to create presentations or pamphlets & posters, depending on the desired outcomes

Culminating Assessment Questions

Explain how the Dock Fouling Community interacts with nearby salt marsh ecosystems and the larger Port Royal Sound. Tell how each system depends on the others. Include your own observations and research to support your claims.

Choose an animal that interests you from your visit to the Maritime Center. Evaluate the threats to its future survival. Predict what might happen to the ecosystem if this animal species became extinct. Suggest ways humans can encourage its survival. Defend your arguments with evidence you recorded during and after your visit.

Focus on the filter-feeders you learned about during and after your visit to the Maritime Center, i.e. sea squirts, sponges, coral, bryozoans etc. Explain how these animals obtain food and how their activities affect the surrounding waters, which in turn, affect people who live nearby. Evaluate the importance of their roles in the ecosystem. Include a labeled diagram of a filter feeder that illustrates and supports your explanation.

Imagine an oil tanker sinks off our coastline and a large oil spill sweeps into Port Royal Sound, inundating the whole tidal area. Describe the imminent dangers and major disruptions to local food webs, energy flow and interactions between biotic and abiotic factors. Use graphic models to illustrate and support your predictions.

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