High School Salt Marsh pre-field trip activities

1. Have each student complete the activity “Too Many Crabs”.
    a. Notes for the teacher:
        i. You may want to have the students start by just dropping the quadrat once and then using that number to extrapolate the total population of crabs. This provides an opportunity to discuss the importance of replication/repetition.
        ii. Hopefully one of your students will ask a question about whether or not to count a crab if only its claw is in the quadrat. If not, you should ask them what they think they should do if only part of a crab is in the quadrat. Scientists will count something as being “in” the quadrat if more than 50% of the organism is inside the quadrat. Students should do the same here.
        iii. The actual number of crabs in the “colony” is 179.
        iv. Discussion question: “How might tidal state affect the results of a fiddler crab survey?
        v. It should take students about 10 minutes to complete the activity independently—allow up to 20 minutes, if done as a class, to discuss the answers to questions posed in the activity and to potentially talk about the importance of replication and/or the discussion question above.

2. These are terms that are used during the virtual field trip. You may want students to look up the definitions (or review them after the virtual field trip):

    a. Intertidal zone

    b. Inundation (tidal)

    c. Hydrogen sulfide ($H_2S$)

    d. Microplastic

    e. Pneumatophores (of mangroves)

    f. Carbon dioxide ($CO_2$)

    g. Sill (in marsh restoration)

    h. Quadrat

    i. Detritus

    j. Bioturbation

    k. Dissolved oxygen

3. Below are 16 species that students will encounter in the virtual field trip. You may want to assign students to research particular species and share information with the rest of the class (e.g. the scientific name, common name, or an aspect of the species' biology or ecology).

    a. Yellow-crowned night heron

    b. Eastern oyster

    c. Raccoon

    d. Smooth cord grass

    e. Marsh elder

    f. *Lycium carolinianum*

    g. Sea purslane

    h. Southern glasswort

    i. Saltwort

    *j. Distichlis spicata*

    k. Salt marsh hay

    l. Black needlerush

    m. Black mangrove

    *n. Laguncularia racemosa*

    o. Salt marsh periwinkle snail

    p. Fiddler crab

**"TOO MANY CRABS"**

**A FIDDLER CRAB POPULATION EXERCISE FOR THE CLASSROOM**

**OBJECTIVE:** To develop skills in estimating population sizes

**MATERIALS:** Copy of "Too Many Crabs: A Fiddler Crab Colony"

Index card or cardstock paper

Scissors

Pencil or pen

Ruler

**BACKGROUND INFORMATION:**

Fiddler crabs are among the most abundant animals of the estuary. They live in burrows dug into the mud of the marsh and tidal flats. The fiddler crab got its name because the male has one claw that is much larger than the other. It waves the large claw back and forth, both in an attempt to attract a mate and in defense of its territory. They have eyes on stalks that extend out from their body to enable them to see in all directions. When a predator approaches, these tiny crabs scurry sideways and disappear into their burrows. The male, which is somewhat more colorful than the female, is the first to enter the burrow and the last to return to the marsh or tidal flat after the predator leaves.

The fiddler's burrow serves three purposes: protection from predators, protection from high tide, and as a place for mating. Using legs and claws, the fiddler digs his hole to a depth near ground water where the dirt is moist. They roll and push the excess dirt into a ball that is then carried away from the entrance. These are called "housekeeping balls." At low tide, the fiddler comes to the surface and feeds by scraping morsels of food from the grains of sand. He rolls the sand into very small balls (smaller than the housekeeping balls) after all of the food has been removed. When the tide comes in, the fiddler returns to his burrow, sealing the entrance with a thick plug of mud to prevent himself from drowning.

Scientists often need to count or take a census of the number of fiddler crabs in an area in order to determine the range, health and productivity of the population. Instead of counting every fiddler, scientists estimate the total number of a particular species by doing a quadrat study or random sampling. Scientists use a square frame of a known size (quadrat) which they either place randomly, or at pre-determined locations along a line (transect). They count the number of crabs within a set number of quadrats and calculate an average number of fiddlers per unit area. Next, they calculate the total area of that habitat, and extrapolate their sample number to the entire area. This gives an estimate of the total number of fiddler crabs in the entire area being sampled. It has been estimated that there are more than eight million fiddler crabs per acre of marsh on Sapelo Island, Georgia.

**PROCEDURE:**

*Assume that there is only one fiddler crab per burrow.*

*Do not count all the crabs on the page.*

1. Cut a one-inch square from an index card or some other stiff paper. This is your quadrat.

2. Lay your copy of the fiddler crab colony on a flat surface.
3. Hold the paper quadrat about one foot above the paper. Drop it onto the colony and trace around it. If the quadrat does not land within the colony, pick it up and drop it again.
4. Count the number of crabs in the square. Place this number in your data table.
5. Repeat steps three and four, nine more times. Add all 10 trials to get the total number of crabs. Divide your total by 10 for an average. Place this number in your data table as the average number of crabs per square inch.
6. Use your ruler to measure the length and width of the crab colony. Multiply the length and width to find the total area of the colony in square inches.
7. Next, multiply the total area from #6 by the average number of crabs in a square inch (#5). This will be your estimate of the number of crabs in the crab colony.
8. Finally, if possible, obtain each of your fellow students' estimates and find the class average (add all of the estimates and divide by the number of students in the class).

**OBSERVATIONS:**

**Data Table:**

| | # of crabs per square inch |
|---|---|
| Trial 1 | |
| Trial 2 | |
| Trial 3 | |
| Trial 4 | |
| Trial 5 | |
| Trial 6 | |
| Trial 7 | |
| Trial 8 | |
| Trial 9 | |
| Trial 10 | |
| Total | |
| Total area of colony | |
| Your estimate of the # of crabs | |
| Average of entire class estimates | |

Answer the following questions:

1. Why do you think different people got different averages?
2. How far from the class estimate of the number of crabs in the colony was your estimate?
3. Do you feel that the class estimate is a fairly accurate estimate of the number of fiddler crabs in the colony? Explain why or why not.
4. Why do you think that scientists use quadrat studies to measure populations of organisms?

Adapted from pages F-23 to F-25 in Sapelo Island, Georgia's Coastal Treasure by Margaret Olson. https://georgiawildlife.com/sites/default/files/crd/KTC/files/Sapelo_Island_Georgias_Coastal_Treasure_OPT.pdf

**TOO MANY CRABS: A FIDDLER CRAB COLONY**