LESSON 3 – PLACING THE CLAMS

PLACING THE CLAMS (12 juvenile clams per experimental container)

- On the day after the clam packets and containers have been prepared, the trip to the intertidal flats will occur. The clam packets will need to be kept refrigerated until that field trip occurs. (If time and tide allow, the students and supervisors could travel to the field location for placement of clam containers on the same day.)
- The students will need permission slips that allow their participation, providing the who, what, when, where, why, and how to their parent(s)/guardian(s), and explaining that students will need to bring boots, outdoor play clothes, and a complete change of clothes.
- If time allows, students and supervisors will travel back to the Downeast Institute (DEI) to graph their clam container data into the student charts and the classroom chart. (This lesson may be kept for another day)

Title: Placing the Clams

Content Area Subjects:

Science, Math, English Language Arts

Grade level(s):

Grades 3 -12+ (can be adapted to any level)

Standard(s):

Maine Learning Results

- Career and Educational Development. Interpersonal Skills (A3.pre-k to diploma.a,c)
- ELA. Informational texts (A3.3.c); (A3.3.e); (A3.6.e); A3.9-diploma.b); Research (C1.3-5.a,c,d)(C1.6-8.g); (C1.9-diploma.a,c); Listening (E1.3-diploma.c); (E1. 9-diploma.a); Speaking (E2.3-8.d); (E2. 9-diploma.a)
- Health and Physical Education. Cooperative Skills (I1.pre-k to diploma.a-d); Responsible Behavior (I2.pre-k to diploma)
- Math. Data (B1.4-8.a,b); (B1.9-diploma); Measurement and Approximation (B1.4-diploma.a,b); (B1.9-diploma.a,b,c); (B2.3-6); (B2.7.1a, 1b); (B2.8-diploma.3)
- Science. Scientific Inquiry and Technological Design (B1.3-diploma.a); (B1.3-diploma.b); (B1.3-diploma.c); (B1.3-diploma.d); (C1.3-diploma.a)

- Social Studies. Taking Action Using Social Studies Knowledge and skills (A3.3-diploma)

Common Core:

- ELA. (V.3-12.6); (SL.3-12.1c); (SL.3-5.1); (L.3.5b);(L.3.5b)
- Science and Technology. (R.6-12.4); (R.7-12.4)

STEM Skills

Hypothesis/Brief Description:

How does the place where juvenile soft-shell clams, *Mya arenaria*, live on a flat (upper, mid, and lower tidal zone) affect how they grow and survive?

The field-based experiment will consist of four main parts: preparation of materials, planting/deploying the experiment, harvest/termination of field component, and analysis. Students will prepare and place the experimental units containing juvenile clams (ca. ½-inch in shell length) into the soft-bottom environment at high, middle, and low tidal zones. Several months later, the units will be excavated and their contents inspected for living and dead clam individuals. An accurate count of surviving clams and a measure of each shell (for growth rate) will be taken to collect data to answer the essential question/hypothesis.

Adaptations for different age levels:

All students K-12 were involved in this part of the project. Some students measured and cut the netting; others counted out juvenile clams for packets. We did discover during the placement, that many younger students, Grades K-4 find moving through the mud flat difficult, so it may be that the older students would be the ones selected to place the containers at mid tide and low tide locations. All students may complete the worksheets that accompany the lesson individually, in groups, or with a partner. For younger students, the instructor could lead a discussion using the worksheet as a guide and having the younger students moving through the concepts as a group.

Objectives/goals:

After completing the activities, the students will be able to:

Place the plastic containers at the upper, middle, and lower tidal zones, placing clams from one packet in each container and ensuring the clams are covered with sediment;

Make a grid of the location of each container (a field map); and

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Record where netted and un-netted containers are located within the grid.

Time needed:

1 day to travel to and from the tidal zone and place the clams.

Keywords and Phrases:

data, final length, growth rate, hypothesis, initial length, juvenile clam, *Mya arenaria*, hatchery mark, high tide, high water line/mark, low tide, low water line/mark, mortality rate, survival rate, tidal zones: upper intertidal zone, middle intertidal zone, lower intertidal zone, tidal height, tree line

Materials Needed:

- Packets of juvenile clams from the previous lesson that have been kept refrigerated;
- Insulated container to hold wax paper packets of clams (to keep cool between the school and the clam flats);
- Digital camera to take photos of activities (photos of students as they participate, the clam flat before and after; photos could be used later in a project presentation night or in the classroom to use an a basis for extension activities);
- The students will need permission slips that allow their participation, providing the who, what, when, where, why, and how to their parent(s)/guardian(s), and explaining that students will need to bring boots, outdoor play clothes, and a complete change of clothes;
- Boots and casual clothes;
- Aluminum trowels that will not bend;
- Transportation to the field study location (tidal flat);
- Paper towels, wet wipes, sanitary gel, etc. for use during the field experiment; and,
- Large plastic garbage bags – 1 for each child to sit on coming home (this is an attempt to keep the bus/vehicle clean).

DEI keeps a chart of each field experiment it is involved in which will show the location of the experimental containers, but if the Instructor wishes to involve the older students in recording the tidal location, the following could be used (see worksheet section of teacher materials):

- **Student field chart (made on heavy cardstock or index card);**
- **Student chart - to document placement of individual experimental containers, and all other student containers as well; and,**

- **Classroom map/chart - to document placement of all containers (could be color coded for high, mid, and low tidal zones); netted and un-netted using round stickers of some sort on a piece of oilcloth-map to be rolled up and kept for use in subsequent lessons.**

- For follow-up activities back at school, the following items will be required:
  - Writing journals or notebooks
  - Partially completed KWHL (Know/Want to know/How/Learn) sheets for each student
  - "Response to Hypothesis" worksheet to be returned to DEI
  - Chart paper, markers, pencils, scissors, and pens

The Procedure:

Introduction

The Instructor will begin the lesson by reviewing the brief summary of the industry and its importance to our community by asking the students questions about what was said in the last lesson. This review could be on the bus or just before leaving or after the group reaches the flat:

- Why is the clamming important to us? (The harvesting and consumption of soft shell clams, *Mya arenaria*, has been important to our area since Native Americans lived here in the summers many years ago. Over the years, we realized that selling clams could provide financial resources for our area, and we expanded the industry).
- How can the DEI Clam project help this industry? (Over the years, harvesting and selling clams has provided a lucrative income for many local people and we have the chance to help the industry grow and thrive through the DEI Clam project.)
- Today we are ready to begin one of the most important parts of our scientific research. We need to have a way to find out how to help clams grow and survive in our area.
- We have prepared our clam containers and clam packets for placing into the wild environment. We will review some key words and phrases that are important to our project: juvenile clam, *Mya arenaria*, upper tidal zone, middle tidal zone, lower tidal zone, high tide, high water line/mark, low tide, low water line/mark, and tree line by locating them in the tidal area when we do the first phase of our field-based experiment.

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- After we have established all the containers and clams at the field location, we will carefully record the position of the containers at each tidal height and whether containers were completely covered with netting (to deter predators) or whether containers were open to allow predators access to the clams inside the container. (As mentioned earlier, the Instructor could develop a way to chart the placement of the experimental containers and further the students involvement in keeping track of the project-an example of a chart is provided)
- Remember, we will use netting as a full protective cover on half the containers and on the other half, we have wrapped a mesh fence around each container, but we will not cover the top of the container at all.

Key Questions

- Why will we put clam containers at upper, middle, and low tidal zones?
- What we will use on the clam containers to protect them?
- Why will we leave some containers unprotected?
- Why do we need to keep track of where we put each clam container?
- Why will we use plastic containers instead of the type we could make out of newspaper?
- What do you think will happen to the clam containers? Why?
- What do you predict will happen to the clams that are placed in protected and unprotected plastic containers at the upper, middle, and lower intertidal?
- What discoveries, if any, did we make at the upper, middle, and lower tidal zones?

Main Activity

- The student (team) will dig holes in the mudflat and place their plastic containers in the holes. Then, clams from a packet will be spread on the surface of each container in the area selected by the DEI instructor. Individual clams will be pushed gently into the sediment within each container to completely cover them. One-third of the containers will be placed in the upper tidal zone, one-third at the middle tidal zone, and the remaining one-third at the lower tidal zone. As prepared the day before, one-half of the containers will be surrounded by a protective strip of netting that will be held on with an elastic band. This strip will be affixed to the upper (open) portion of the container and will stick up out of the sediments of the clam flat approximately 1-inch. The reason for the strip of netting around the perimeter of the container is to keep the clams corralled within the container (clams can move laterally along the mudflat surface, and could crawl out of the six-inch diameter area of each container). The strip of netting

ensures that clams remain in the area of the container. If some are missing at the end of the experiment, they will have been removed by some other means, maybe a predator. Half of the containers will be completely covered with protective netting. The group will make a chart of the location of the containers and take photos if possible.

If the Instructor wants the students to do individual charting of clam containers:

Once the group has returned to school, a map of the clam containers could be developed to show the location of each container, whether it had a protective net at placement, and the name of the student(team) who placed the clam container. (The containers may have already been marked by permanent marker individually by the student(team) to identify it as well – CAUTION that this mark may disappear over the 4-month period)

Conclusion

The following concluding questions could be used to conduct a small group or full group discussion, centering on information relating to the hypothesis:

- What do you think will happen when the tide comes up?
- What do you think will happen to the clams within the netted containers?
- What do you think will happen to the clams in containers without nets?
- What do you think will happen to the clams during the time we leave them until we return to retrieve them? Why have you come to these conclusions?

Students will respond to the questions in small groups where their responses can be coded on chart paper and shared with the group.

All chart paper responses should be dated and kept for use and reference in later lessons after the harvesting of containers

Assessment/Extension Activities/Closure/Follow up:

1. Have students start a journal of their work in this project.

2. Have them record briefly what they saw, smelled, heard, tasted, and touched while on the tidal flats using a “Powers of Observation Worksheet”. (Their brief comments could be used later in the construction of a narrative story recounting their day.) They could do this as a group/small group or individually.

3. Have them add to their KWHL worksheet by adding to the “How I’ll Learn It” section.

4. Have them write individual responses to the Hypothesis worksheet question and return their responses to DEI.