

Information Sheet No. 15

Experiments for the Classroom

Here are some examples of conch experiments that can be conducted in your classroom. Many of these experiments can be combined. You will see results within a few weeks of running these experiments, although it would be ideal to run the experiments throughout the entire semester/year if possible.

1. Density. The aquarium is divided into separate parts or there are multiple aquariums for each density. The experiment should be run in triplicate for statistical purposes. The juvenile queen conch can be placed in varying densities and the students can observe their growth rate. Optimal densities to examine would be 75 conch/m² versus 150 conch/m², although you can choose a wider range as well. You will need to figure out the surface area of the bottom of your tank in m² to determine the number of conch needed. The juvenile queen conch may climb the sides of the aquarium, however, just use the bottom of the tank for the surface area, as you can assume all of the conch in each treatment will climb the sides. Have the students measure the length (mm) and weight (g) of the conch on a weekly or biweekly basis.

2. Substrate. Similar to the density experiment, the students can observe the effects of sand versus other substrates (pebbles, glass, plastic, coral rubble) on the shell growth of the juveniles. Have the students measure the length (mm) and weight (g) of the conch on a weekly or biweekly basis.

3. Food Types. The juvenile queen conch can be fed several different types of food. The animals can be weighed at the beginning and end of the experiment, and the amount of food fed to the animals should be weighed daily. This way the students can determine the Feed Conversion Ratio (FCR) for the different types of food. If the length of the animals is measured as well (on a weekly basis) the students can compare the growth rates with the different diets. Contact the CHN headquarters for information about purchasing conch food.

4. Water quality parameters. -- The students can adjust the temperature or salinity in their aquariums and compare growth rates to those in a well-conditioned tank. You will need at least two aquariums for this. Have the students measure the length (mm) and weight (g) of the conch on a weekly or biweekly basis. You will probably want to make sure each treatment is being fed the same amount of food, to remove food as a factor, therefore, have the students weigh out the amount of food fed each day.

5. Calcium. The students can examine the effect of calcium on the growth rate. You will need separate aquariums for this experiment as well as a calcium test kit. You can add a calcium supplement to the water to increase the amount of calcium in the water. Have the students measure the length (mm) and weight (g) of the conch on a weekly or biweekly basis, and also measure the amount of calcium in the water on a weekly basis.

Lesson 5.1

Aquariums in the Classroom

Grades: 9-12

Integrated Subjects: Science, Biology, Chemistry, Mathematics

Essential Skills: Research, Inferring, Writing, Scientific design

Sunshine State Standards: SC.H.1.4.1, SC.H.1.4.2, SC.H.1.4.3, SC.H.3.4.1

National Science Education Standards: Meets Content Standards: 1) Science as inquiry; 2) Life science; 3) Science and technology; and 4) History and nature of science

Duration: 1 class period or entire semester

Objectives:

Students will understand the scientific method by conducting experiments of their own to support or void their hypotheses. Students will learn:

- ✿ How to interpret data
- ✿ The importance of replication in an experiment
- ✿ How scientists design and implement research studies

Preparation:

Teacher Preparation:

- ✿ Duplicate appropriate materials

Support materials:

- ✿ Aquarium supplies (if applicable)

Information Sheets:

- ✿ No. 15 – Experiments for the Classroom
- ✿ No. 16 – Aquarium Supplies
- ✿ No. 17 – Aquarium Water Quality

Activity Sheets:

- ✿ No. 19 - Data Collection Worksheet

Lesson Plan

Activity 1. Introduction (20 minutes)

Discuss with the students that science is one way we seek principles of order in our world. Explain that science has two parts: the collection of objective evidence (data) and the structuring or interpretation of that evidence.

Explain to the students that scientists often generate a hypothesis, or a temporary working explanation based on accumulated facts that are tested or at least testable. A hypothesis is tested by running a series of experiments to prove or disprove the explanation. Once a hypothesis is tested, it either voids or supports the original explanation, although a hypothesis can never be proven with certainty.

Activity 2. Forming a Hypothesis (15 minutes)

Distribute Information Sheet No. 15 which gives examples of experiments that can be conducted in your classroom. Have the students come up with hypothesis and expected outcomes for each experiment. Discuss which experiment(s) you would like your students to conduct. What will be your controls? How many replicates will you need? How will you present the data?

Activity 3. Supply and Demand (10 – 30 minutes)

Now that you and your students have decided which experiment(s) to conduct in your classroom, have the students make a list of supplies. Information Sheet No. 16 will help establish your list. You may be able to collect many of the supplies at your school.

Activity 4. Aquarium Set-Up (45 minutes)

Once you have the appropriate supplies for your classroom, you will want to set up your aquarium at least several days prior to the start of your experiment. Distribute Information Sheet No. 17 so the students have an understanding of optimum water quality parameters, as well as daily/weekly maintenance procedures and troubleshooting.

Once the aquariums are stable, add your conch and begin your experiment. Use Activity Sheet No. 19 as a sample data sheet if necessary. Have the students collect as much data as possible, and produce graphs and tables of their findings. More advanced classes may also be able to write up a scientific paper complete with an abstract, introduction, methods, results, and discussion. The longer the experiment can last, the more definitive the results will be.

Conclusion

Discuss how scientists make new discoveries by conducting research to help support or disprove their hypotheses.

Bibliography

Davis, M. & A.L. Shawl. In press (a). A guide for culturing queen conch, Strombus gigas. Manual of Fish Culture, American Fisheries Society, Vol. 3.

Information Sheet No. 16

Aquarium Supplies

- ✿ Aquarium (depending on your experiment, a 10 gallon aquarium (which can hold up to 10 conch) can be used for one replicate or divided in half or thirds if the space is limited).
- ✿ Under-gravel filter system with sand (1-3 mm diameter) or side-hanging charcoal cartridge filter
- ✿ Air pump, air stone(s), and airline tubing
- ✿ Water quality kit (temperature, salinity, pH, ammonia, and dissolved oxygen if available)
- ✿ Calipers
- ✿ Scale (if weighing the animals or food)
- ✿ Calculator
- ✿ Food (algae tablets from a pet store, or juvenile conch food from Harbor Branch – see below)
- ✿ Conch (see below)
- ✿ Salt water (Instant Ocean will work)
- ✿ Calcium additive (available as “Reef Calcium” at Aquatic Ecosystems – www.aquaticeco.com, or possibly at your local pet store.
- ✿ Window screen (fiberglass NOT aluminum) or light diffuser sheets to make barriers if dividing your aquarium into sections

Purchasing Conch and Conch Food

You will need to determine the stocking density in the system: Other than the density experiment, we recommend a stocking density of 75 conch per sq. meter (8 conch per square foot). For one ten gallon aquarium (20" x 10.5" x 12") you would need 10 conch. The current price for conch and food is as follows:

CONCH- Varies, but will be around \$1.50 per conch (as purchased from Oceans, Reefs and Aquariums) - please contact Amber Shawl for exact pricing.

FOOD -1 lb juvenile food = \$5.00 (tax exempt for schools). *This food can be kept in a freezer and one bag (3-4 pounds) will easily last an entire semester.*

Please contact Amber Shawl for initial purchasing requests:

Harbor Branch Oceanographic Institution
5600 US 1 North Ft. Pierce, FL 34946

P: (772) 465.2400 (x578) • F: (772) 466.6590 • ashawl@hboi.edu

Activity Sheet No. 19**Conch Measurement Data Sheet**

Name: _____

Tank/Sample No: _____

Today's Date: _____

Sample Number	Length (mm)	Weight (g)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
Average		

Feed conversion ratio (FCR) is a measure of the kilograms (or pounds) of feed that are required to produce a kilogram (or pound) of weight. It tells you how efficiently the animal is using the feed. To find the FCR, you will need to know stocking weight, harvest weight, and the amount of food fed from the time of stocking harvest. (1 kilogram - 1000 grams)

Weight at Stocking : _____ grams

Weight at Harvest : _____ grams

Total amount of feed: _____ grams

Total No. of conch at Stocking: _____

Total No. of conch at Harvest: _____

$$\text{FCR} = \frac{\text{Total grams of food}}{(\text{Avg. Weight at Harvest} * \text{No. of conch}) - (\text{Avg. Weight at Stocking} * \text{No. of conch})}$$

Information Sheet No. 17

Aquarium Water Quality

The following is a guideline for your aquarium:

- 🔥 **Temperature:** 68 - 93° F (20-33 °C), *Optimal:* 27 - 29 °C
- 🔥 **Salinity:** 30 - 37 ppt, *Optimal:* 32 - 36ppt
- 🔥 **pH:** 8.0 - 8.8, *Optimal:* 8.0 - 8.4
- 🔥 **Ammonia:** 0.1 - 0.5 ppm
- 🔥 **Dissolved Oxygen:** 5.0 - 8.0 ppm
- 🔥 **Calcium:** 352 – 506 mg Ca/L (when using a sand substrate)
- 🔥 **Alkalinity:** around 120 mg/L as CaCO₃ for salt water

Aquarium Maintenance

- 🔥 Siphon the old food out of the tank as often as needed, otherwise the ammonia levels may be too high.
- 🔥 Keep an eye on the ammonia (nitrate, nitrite) levels in the tanks the first week after adding the conch to the tank. You may see a spike in the ammonia levels, at which time you should do a 100% water change on the tank.
- 🔥 Make sure the filter stays clean and is free of debris or old food.
- 🔥 Be sure that the air/water flow is reaching all areas or sections of the tank
- 🔥 Complete partial or full water changes as needed, but it is suggested that you maintain a regular schedule.
- 🔥 Check salinity on a regular basis, as you may need to add some fresh water if there is a lot of evaporation.

Trouble Shooting

- 🔥 **My conch aren't eating.** They may be stressed out. Check the ammonia, temperature, or salinity of your tank and complete a water change if necessary. Always siphon out old food. Reduce the amount of food or feed every other day.
- 🔥 **My water is cloudy.** Check to make sure the air and water flow are present throughout the entire tank. Adjust accordingly. Complete a water change.
- 🔥 **My conch died.** Unfortunately, sometimes this happens. I would recommend purchasing a few extras so you can replace them, if you have an extra aquarium to hold them in.