Ecdysis in Arthropods

Lesson Focus: Molting/Ecdysis in Phylum Arthropoda

Learning objectives:

- Students will investigate how Arthropods grow
- Students will discuss why Arthropods shed their exoskeleton
- Students will explore how Arthropods replace their exoskeleton

Enduring Understandings for the lesson:

- Having an exoskeleton rather than an endoskeleton presents unique challenges to arthropods not faced by other animals.
- Ecdysis uses a process that makes arthropods very vulnerable in order to provide them with enhanced strength and survival abilities later.

Georgia Performance Standards Addressed:

SZ4 Students will assess how animals interact with their environment including key adaptations found within animal taxa.

a. Discuss morphological & physiological adaptations relative to ecological roles

b. Relate animal adaptations, including behaviors, to the ecological roles played by animals

c. Explain various life cycles found among animals (e.g., polyp and medusa in cnidarians; multiple hosts and stages in platyhelminthes life cycle; arthropod metamorphosis; egg, tadpole, adult stages in amphibian life history).

Grade level: Junior and Senior Zoology

Materials:

Specimens of various Arthropods
Video of the Blue Crab Molting
Crab exoskeletons

Time needed: Approximately 90 minutes

Background information: Arthropods are multicellular, eukaryotic, heterotrophic organisms thus classifying them as members of Kingdom Animalia. They are eucoelomate protostomes with well-developed organ systems, and cuticular exoskeletons containing chitin, which place them in the phylum Arthropoda. This phylum represents the largest group of living animals on Earth. It includes spiders, scorpions, ticks, mites, crustaceans, millipedes, centipedes, insects and several other

smaller groups. One of the most prominent characteristics of arthropods is the presence of a chitinous exoskeleton.

The exoskeleton is a hard, outer shell-like covering used for protection from predators and other dangers found in their environment. The presence of an exoskeleton has allowed arthropods to evolve to a point in which they now can be found in practically every environment on Earth. The exoskeleton presents unique opportunities and challenges for members of phylum arthropoda.

Learning Procedure: Prior to this exercise, students should have already been introduced to the process of ecdysis in arthropods, especially in subphylum crustecea.

1. Day of in the classroom, review the background information –
    a. Arthropod exoskeleton
    b. Exoskeleton composition
    c. Ecdysis
    d. The need for molting in arthropods
2. Within the lab setting:
    a) Assign students to one of fourteen lab stations that each have several various Arthropod specimens. (Both preserved and accessible for hands on manipulation)
    b) In their Lab Notebook, have students list characteristics of the specimens. (How they feel, look, smell, etc.)
    c) Have students compare and contrast different types of arthropods, as well as arthropods and other animals
    d) Have students brainstorm and discuss the pros and cons of having an exoskeleton within their lab group, then as a class. Ask students to hypothesize how an animal with an exoskeleton could achieve growth.
    e) Ask students to hypothesize how an animal with an exoskeleton could achieve growth.
    f) Introduce and view the Blue Crab Molt video
    g) Allow students to view the Blue Crab Molt video
    h) Discuss the video and any questions students may have.
        a. Why is there a need for the Blue Crab to molt?
        b. Why does the male Blue Crab wait until the female's final molt to reproduce?
        c. What are some of the pros and cons of having an exoskeleton that must be renewed through molting?
        d. What is the significance of the male Blue Crab selecting a mate before she has finished molting?
    i) Discuss with students the vulnerability of the Blue Crab just after the molt.
    j) Have students compare/contrast in an essay the growth of animals that have an exoskeleton and ones that have an endoskeleton

Evaluation:

- Have students compare/contrast in an essay the growth of animals that have an exoskeleton and ones that have an endoskeleton
- Evaluate the student's pre and post lab ideas regarding the production and maintenance of an arthropod's exoskeleton.
- Ask students to explain in essay format on the chapter test: the process used by a decapod to not only shed an exoskeleton, but also how to reform a new one and the steps taken for protection during the process.

Extensions:

- Have students compare the pros and cons of having an exoskeleton.
- Have students compare the anatomy of an arthropod with other invertebrates and vertebrates.
- Have students identify and classify various Arthropods as well as compare and contrast each Arthropod subphylum.

Resources:

- Animal Diversity, Hickman and Roberts, 1995
- Blue crab facts from South Carolina DNR http://www.dnr.sc.gov/marine/pub/seascience/bluecrab.html
- Blue crab facts and pictures from Blue crab Info: http://www.bluecrab.info/
- Altamaha River Keeper for the Blue Crab molt video

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This activity is a product of the Rivers to Reef Teacher Workshop sponsored by the Georgia Aquarium and Gray's Reef National Marine Sanctuary that the author participated in. For more information about this workshop, Georgia Aquarium, or NOAA Gray's Reef National Marine Sanctuary, please visit our websites at www.georgiaaquarium.org or http://graysreef.noaa.gov/

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