CORAL REEF ECOLOGY

Concepts
Life cycle
True vs. false

HCPS III Benchmarks
SC.4.3.2

Duration
1.5 hours

Source Material
PRISM
MARE

Vocabulary
Asexual reproduction
Brooding
Budding
Fragmentation
Larvae
Planula
Sexual reproduction
Spawning
Zooplankton

Background and Dramas

Summary

Students will discuss and write what they know and want to know about coral. They will watch videos of reproducing corals and read background articles on the coral life cycle. Students will then work cooperatively to produce a drama that showcases the lifecycle of coral.

Objectives

- Student will make a statement and a ask a question about a coral's life cycle
- Students will differentiate coral life cycle facts from fictional statements
- Students will learn coral life cycle vocabulary
- Students will use drama to show the different types of sexual and asexual reproduction

Materials

KWL chart of Coral Life Cycle (1 per student)
Background article (1 per student)
Videos from PRISM website (other resources) demonstrating sexual reproduction in coral
Drama supplies (see dramas descriptions on pg. 3)

Making Connections

Up to this point, students have learned about coral structures and also that it is an animal. They will recall their knowledge of coral morphology to learn how corals reproduce.

Teacher Prep for Activity

Draw a KWL chart on chart paper for the class discussion. Photocopy one KWL chart and Background article for each student. Find videos of coral reproduction in your library or in the resources page on the PRISM website. Familiarize yourself with the coral dramas so you can be the lead polyp. Print coral dramas from pg. 3 and cut out.

Background

Corals either reproduce **sexually** or **asexually**. Sexual reproduction occurs when corals release their gametes (eggs and/or sperm) at the same time (synchronously) into the water column. These gametes meet with other gametes of the same species creating a zygote that forms into larvae called a **planula**. A planula can be thought of as a baby coral. This type of sexual reproduction is called **spawning**. Some corals produce both eggs and sperm during spawning. Other corals produce only eggs or only sperm.

The other type of sexual reproduction is **brooding**. In this form, the sperm from another coral enters a polyp and fertilizes an egg and in its place a planula exits from the coral.

Asexual reproduction can occur through budding, fragmentation or brooding. During **budding**, a new polyp forms from the base of the old polyp. Another common type of asexual reproduction in corals is by **fragmentation**. Broken pieces of corals that land on a suitable substrate may begin growing and produce a new colony. The last type of asexual reproduction is **brooding** where the parent polyp spits a planula **larvae** out of its mouth fertilized from its own eggs and sperm.

After a planula larvae is formed, either by sexual or asexual reproduction, it floats a few meters below the ocean surface and is called a **zooplankton**. Zooplankton is an animal larvae of any type that floats with the ocean's currents.

Many cues (such as light, surface structure and the presence of other organisms) can cause a planula larvae to "settle" onto the substrate and begin it's metamorphosis into a polyp. Once the polyp reaches a juvenile stage, it will lay down the foundations of its calcium-carbonate skeleton. Soon after, the juvenile polyp will bud off sister polyps creating a new colony. The age and size of when a coral colony reaches sexual maturity can vary between species but commonly it takes 3-5 years before corals reproduce for the first time.

Procedure

1. Begin a class discussion by asking students what they think the life cycle of a coral might be like. Next, ask students what how they think a coral's life begins and ends.
2. Chart answers under the "What I want to *know* (K)," using the KWL chart. Follow with what questions the class has about coral life cycle and chart under the "What I *want* to know (W)". Later on, students will come back to these charts and fill in what they learned about the coral lifecycle. *NOTE: class responses should be recorded on chart paper while students record their own answers on the KWL chart worksheet.*
3. Have students read the short background article on the life cycle of a coral. *NOTE: Depending on reading levels, this can be done individually or out loud as a class.*
4. Divide students into groups and assign each group one paragraph of the reading. Have the groups write down what they learned from the paragraph.
5. When each group has finished reviewing their paragraph, ask one member from each group to share what they learned.
6. Referring to the "W" section of the class KWL chart, ask the class if this article has answered any of their questions. Also, ask the class if they have any additional questions based on the reading.
7. Show videos of asexual or sexual coral reproduction found online on the PRISM website (http://www.uhh.hawaii.edu/affiliates/prism/) or other videos you have found.
8. Perform the dramas, as a class, of the different types of sexual and asexual reproduction of corals found below. Divide the students into 6 groups and assign each group one form of reproduction or stage of the life cycle to act out.

Sexual reproduction

1. Brooding

Boys throw small white paper balls ("pphift"-sound effect) from cupped fists carefully into hands of girls fists catching it to simulate female polyp fertilizing eggs within.

2. Spawning

Boys (white paper balls) and girls (colored balls) throw paper balls simultaneously into the air simulating release of egg and sperm into the water column.

Asexual reproduction

3. Budding

Polyp elbows split apart from wrist towards elbow ("pushing" sound effect)

4. Fragmentation

Have students huddle together as branches of a colony with two hands together towards the center raised; connected at wrist and elbow; wriggling fingers. Another student will act as a wave (making a wave motion with their arms and body (whoosh- sound effect)). The wave will pass by the colony and each student acting as a branch will separate (crack, crack- sound effect).

Life cycle

5. Planula
    a. free floating zooplankton larva swirling and twirling looking around ("humming happily" sound effect)
    b. The coral planula then begins to look for a place to settle but needs to find the perfect spot where the light and other cues to settle are good. If the planula:
        i. finds an uncomfortable substrate— settle on gluteus maximus but then quickly move again (back to step b)
        ii. find comfortable substrate- settle on gluteus maximus crunch up like a ball (move to step c).
    c. Slowly raise arms over head with elbows touching, fingers closed and slowly beginning to separate and wiggle and grow into a polyp.
    d. Extend above head represents maturing polyp as it [eats plankton] and [uses the sun's energy].
    e. Polyps begins to bud with elbows separating ("grunting" sound effect)

6. Growing reef

Open fist and slowly close it; clump together with others budding atop each. ("Tick tock"- sound effect displays time passing).

Assessments

Completed KWL Chart
Completed drama actions

Resources

www.bgundersea.com

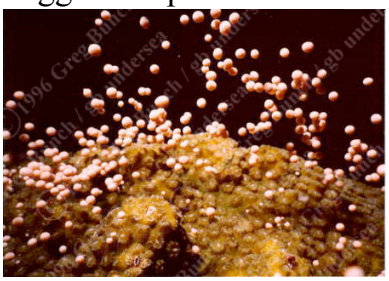
Extension Activities

1. Have students write a story about the life cycle of a coral polyp. Give the option to use either sexual or asexual reproductive techniques.
2. Have the students act out the dramas in front of other students in the school and teach others about what they have learned and how make their body into a coral polyp.

Student Background

It's a late spring night and the moon is full. This is the time of the year when corals start to reproduce so they can form more coral colonies. Corals can either reproduce **sexually** or **asexually**. This can happen because some corals are male, some are female and some corals are hermaphrodites meaning they are both female and male! If a coral is female it will only produce eggs, if it is male it will only produce sperm and if a coral is a hermaphrodite the coral polyp will produce both eggs and sperm.

During sexual reproduction corals release all of their eggs and sperm into the water column at the same time. This is called **spawning**. Eggs and sperm from the same species will find each other in the sea of pink eggs and form a zygote. A zygote forms into a larvae called a **planula**.



Spawning coral. www.gbundersea.com

You can think of a planula as a baby coral. Once the planula is formed, it floats a few feet below the ocean surface and is called a **zooplankton**. Zooplankton is animal larvae of any type that floats with ocean currents.

The baby coral will search for the perfect place to settle and make its home depending on the light conditions, surface structure and if other organisms are present. Once the baby coral finds the perfect home it will settle down and begin to change into a beautiful polyp. When the polyp enters its juvenile stage, it will begin to form a hard structure around it called a **skeletal calyx**. The skeletal calyx is like a human skeleton and protects the coral. Soon after, the juvenile polyp will use asexual reproduction to bud off

a new polyp. The polyps will keep budding until a coral **colony** is formed. After 3-5 years the coral will start to reproduce too!

KWL CHART

What you know about a coral's life cycle	What you want to know about a coral's life cycle	What you learned about a coral's life cycle