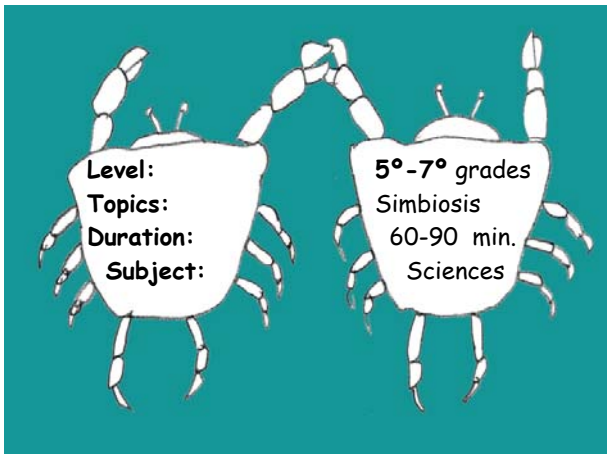
Working as a team



Objective:
Learn that the interactions between organisms
go beyond the predator/prey relationship.

Learning Skills: Interpretation of text, observation, and comparisons

Information Base:
The association between animals of different species has always been of interest to man. The most common is that of the predator/prey relationship. Yet there exists an intricate variety of relationships between organisms adapted to share their way of life. These include obligate association between organisms to temporary associations. These associations can be totally indifferent, may be harmful, or may benefit both organisms. **Symbiosis** is defined as a permanent relationship between two species where at least one organism benefits. On the other hand, a strict symbiotic relationship is defined as an obligate relationship of mutual benefit to both organisms (obligate commensalism). In order to understand and study these interrelationships, naturalists have classified them as:

1. **Mutualism** – like the name implies, the benefits are mutual (+ +). This relationship can be obligate or not.
2. **Commensalism** – there is no harm done to either organism. Usually one organism benefits from feeding off food, excretions or other discarded material (0 +).
3. **Epizoic** – An organism lives supported or attached to the exterior of another without causing any damage (0 +).
4. **Foresis** – One organism provides transportation for another (0 +).
5. **Parasitism** – One of the organisms benefits but harms the other (+ -).

Vocabulary: Symbiosis, interrelationships, commensalism, mutualism, and parasitism.

Materials: 11 cards with a picture or drawing of the following examples of symbiotic relationships:

1. Coral and Zooxanthellae (obligate mutualism).

2. *Agaricia* (lettuce) coral and the feather duster worm *Sabellastarte sp.* (Commensalism).
3. Trapezia crab and *Pocyllopora* coral (mutualism).
4. Anemone and clown fish (mutualism).
5. Stingray or shark and remora (commensalism).
6. Cleaning fish (Labridae) and grouper (mutualism).
7. Cleaning shrimp and fish (mutualism).
8. Barnacles and mollusk shells (epizoidism, mutualism, and foresis).
9. Anemone and hermit crab (mutualism and foresis).
10. *Alpheus* (red snapping) shrimp and anemone (mutualism).
11. Isopods and fish (parasitism).

22 cards with the names of each animal to pair with their proper "associate" (written in small print so they can find their relationships).
220 cards for the closing game with only the name of one animal (11 pairs/22 cards x 10 of each = 220 cards, approx. 5-7 cards per child).
If there are 11 pairs, we can work with 22 children. If we have more children we will need to use more cards as "examples". We need to repeat at least some of the large cards and their corresponding pictures (44 children max. with two pairs or partners).

Procedure:

1. Welcome and introduce the docents. Introduce the term "symbiosis" comparing it to their life. For example, they depend on their parents for food, clothing, shelter, education, etc.
2. Ask: "Where do your parents work?" Explain the dependant interrelationship that their mother/father has with their job. From the moment we get out of bed to the time we go to sleep we have relationships with other people. In many cases they help us and in others we help each other. In some cases only one person benefits or may even harm another. In nature we find the same relationships among many animals that depend on others for their survival.
3. Explain that today they will learn about these associations and will be able to observe them directly.
4. Make a circle on the floor at the aquariums. A coral reef is an example of a complex "city" at the bottom of the ocean where each inhabitant has a "job" to perform. Here we may find many associations and interrelationships between organisms.

5. Explain how they will play a game whereby they must find their "partner" or "associate". "How will you find your partner?" Pass out one card with the name of an animal to each student (these will tell them what they have to look for in the other animal). Give them a few minutes to read their cards, learn which each animal is and its partner. They should show their names to the rest of the class. On your signal they should scatter and look for their partner.
6. Once the pairs have been formed they must look on the table (or in the box) for the corresponding picture which represents their relationship.
7. Ask each pair of children (be sure to monitor the time during this portion) to tell the group who they are and how they are related by reading what is on their card and showing the picture to the group. It's important that they read about all of the different relationships in order to be prepared for the evaluation game).
8. Have them emphasize what type of relationship joins them. For example, if they both benefit or only one, if one harms the other, etc. For the older children, introduce the terms commensalism, mutualism, and parasitism and their significance.
9. Have them look for examples of these relationships in the aquariums and touch tanks.
10. In conclusion we will play a card game (the tables in the classroom are ideal for this activity). Each card must have the name of one animal. Deal out all of the cards. One child begins by flipping over their top card; continue around the table until you find a match with the associated partner. The two students with matching interrelationships must yell out "Symbiosis!" The one that yells second must take all the upturned cards. The one who loses all his/her cards first wins, the one with the most at the end of the game loses. If none of the children with a match yells, the cards are divided among the two that were unaware of their match.

Suggestions for the Docent:
5 minute video "The clown fish and the anemone" from the Oceans Alive series.
You can also play a memory game with the cards. The cards are placed in rows face down on the table. They must turn over pairs to find a match with the pace of the second hand of the clock. If they make a match they keep the cards if they don't they turn the cards back over. The child with the most matches at the end of the game wins.

Suggested Classroom Activities:
Children can investigate symbiosis in other environments.

References:
Audesirk, G. & Teresa Audesirk. Biology: Life on Earth. 1986, First Edition (976-978).
Coral crabs influence the feeding patterns of crown-of-thorns starfish. Corals Reefs (2000) 19:36

Coral I provide shelter inside my body for **Zooxanthellae**.	**Zooxanthellae** I help build the **corals** skeleton and often provide food which I produce myself.
Trapezia Crab I defend the **Pocyllopora coral** from its enemies like the crown-of-thorns sea star.	**Pocyllopora Coral** I provide shelter to the **Trapezia crab**
Cleaner Shrimp I feed on the parasites of many kinds of **fish**	**Fish** The **cleaner shrimp** helps me control parasites on my body

Anemone Traveling on the back of a **hermit crab** I can catch more food than if I were still	**Hermit Crab** I carry the **anemone** on my back for camouflage
Lettuce Coral I produce a substance that serves as food for the **feather duster** worm	**Feather Duster Worm** You frequently find me living among the **lettuce coral**
Giant Anemone My stinging tentacles serve as a refuge for the **clown fish**	**Clown Fish** I keep other fish away that may harm the **giant anemone**
Shark I frequently travel with a **remora** fish	**Remora** I take advantage of the scraps of food that fall out of the mouth of **sharks** during lunch
Cleaner Fish I feed on parasites that live in the **groupers** mouth	**Grouper** The **cleaner fish** keeps my mouth clean of parasites

Barnacle Stuck to its shell, I help the **snail** hide from his enemies	**Snail** **Barnacles** can attach themselves to my hard shell
Isopod I feed off **fish** by attaching myself to their gills or skin	**Fish** **Isopods** hurt me when they feed