GUIDE TO MARINE INVERTEBRATES

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Math/Science Nucleus
Guide to Marine Invertebrates

Enclosed are written materials that will aid you in the use of your kit. This is an outline to help guide your use in the classroom. If you have any questions, please write to us. Please remember that the copyright allows you, as a teacher, to reproduce copies to use at your school or for your class. For more lessons please look at our I. Science Mate curriculum available at http://msnucleus.org

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Marine Invertebrates Kit
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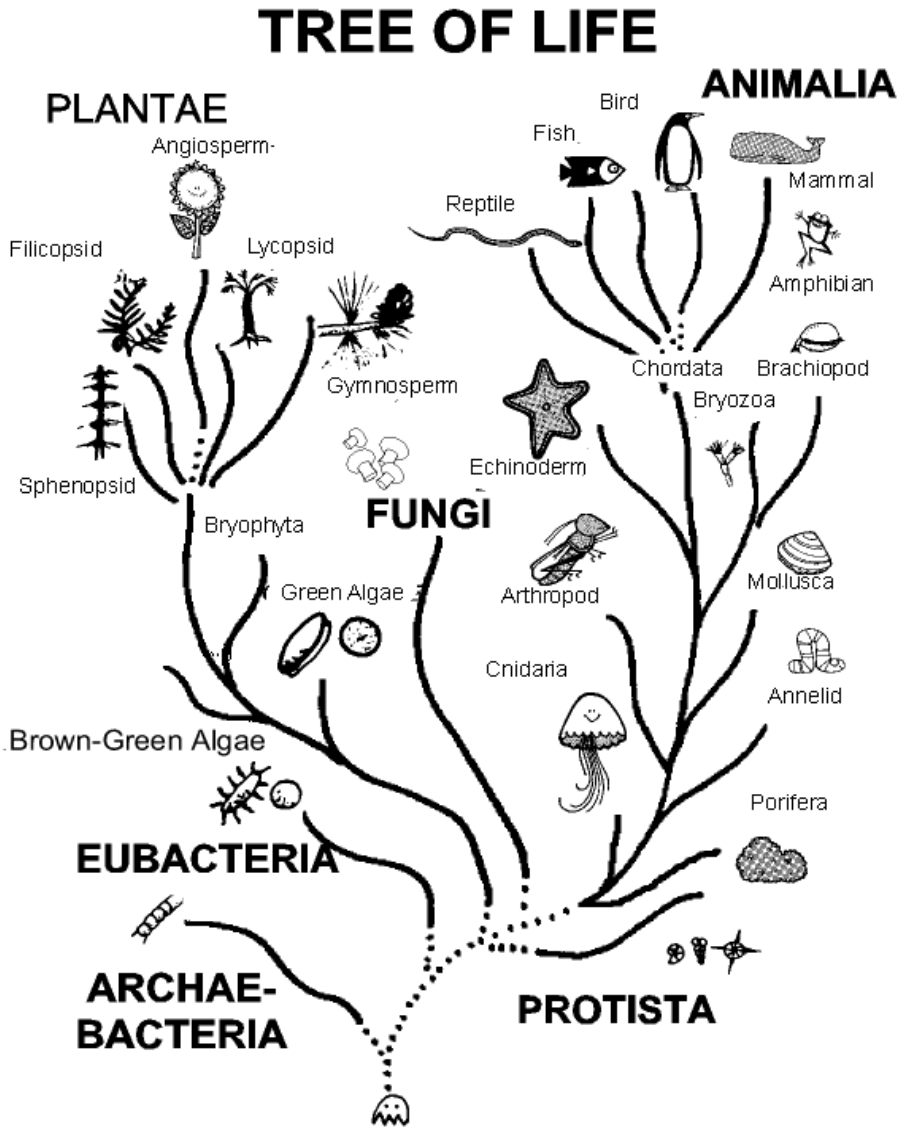
Using the Marine Invertebrate Kit

The organisms in your activity kit represent most of the major invertebrate phyla in the Kingdom Animalia, as illustrated in the Tree of Life. Many students may never have seen these organisms other than on television or in a museum. This kit allows you to have your students feel the organisms and for you to illustrate how these organisms are different from one another. The information provided in this booklet illustrates the different characteristics and incorporates activities on how you can compare and contrast organisms within a phyla and with organisms from other phyla. These organisms can be used at any grade, whether to introduce the organisms; to teach new spelling words; or to learn about the organism.

The less complex invertebrates (i.e. sponges) are discussed first. As you read the information note that the organisms become more complex, with respect to their development of tissues and organs. The specimens in your kit that correspond to the material are in italics. More lesson plans can be found on our website http://msnucleus.org In the Life Cycle section.



PORIFERA
sponge

There are many different types of sponges. Make sure your students realize that most of the sponges that they use at home or at school are synthetic, but at one time natural sponges were used for that purpose. All sponges are not made of the same material that the sample in your kit is make of (called spongin). Some sponges make a skeleton of silica (glass) or calcium carbonate (shell material). Many sponges are irregular in shape, massive, and encrusting. They can be as big as a bath tub or as small as a bean. Sponges are considered primitive invertebrates. They do not have organs, they are basically a conglomeration of cells. Notice the holes on your specimen. This is where water comes into the sponge and flagellated cells along the lining, filters debris that is later used for food. The water that has been filtered leaves the sponge by one of the holes. Other cells in the sponge prepare the food for use by the sponge.

KEY POINTS:

- < many cells
- < mainly marine
- < without organs (i.e. lungs, heart, etc)
- < body full of pores, canals and chambers
- < water flows through openings by action of numerous flagellated cells, that line the internal cavity
- < lives in medium to deep water

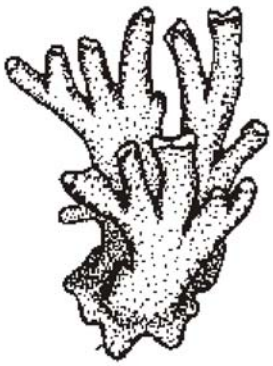
CNIDARIA

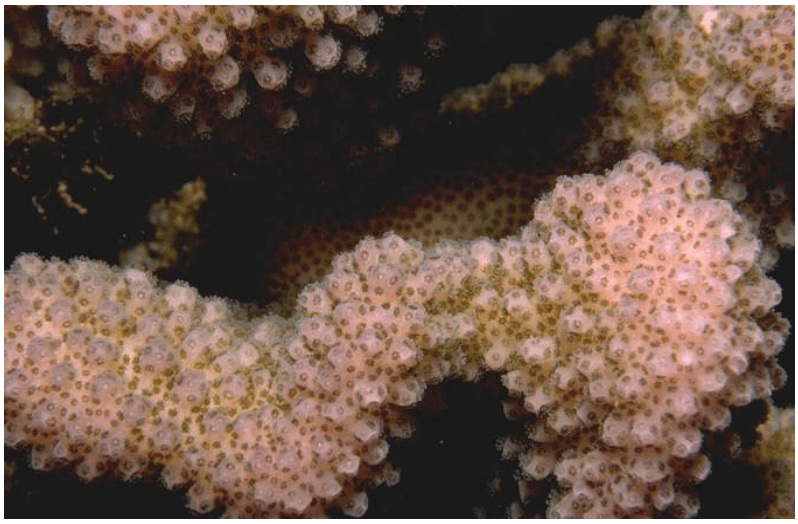
Coral(brush, flower, and mushroom)

The pieces in your kit represent only a small group that make up the Phylum Cnidaria. Corals are usually referred to when people talk about warm, clean areas like Florida, Hawaii or Australia. This is so, because coral are sensitive to changes in water conditions, without the right conditions the corals will not survive. The part that you have in your kit, is the skeleton that the animal makes. The animal itself has most of the characteristics listed above. Corals usually make good fossils because they leave behind their skeleton. The three types that you have represent two different types of living habits. The branching coral or stem coral is a colony. It is made up of many individuals that live together on a common skeleton. Each opening represents where each of the individuals lived. The mushroom and flower coral on the other hand is an individual. One animal made this skeleton. The many radiating walls (septa) helped support the animal when it was alive. Emphasize with your students the difference between colonies and individuals and to make sure they understand that the real animal looked like an upside down jellyfish, whose tentacles capture food.

KEY POINTS:

- < includes hydroids, jellyfish, sea anemones, and corals
- < lives near shore to deep ocean depths
- < ranges in size from one millimeter to several meters
- < all have radial symmetry
- < sac-like body has central body cavity
- < body wall consists of 3 layers
- < single opening serves as both mouth and anus and is surrounded by food capturing tentacles
- < stinging cells (nematocysts)





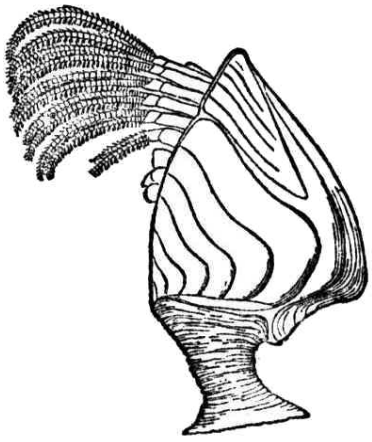
ARTHROPODS
barnacle

KEY POINTS:
- < has the largest number of species of any phylum
- < includes insects, crabs, lobsters, shrimps
- < segmented with appendages
- < has a skeleton on the outside of its body (exoskeleton), unlike many organisms that have an internal one (endoskeleton)

There are many arthropods in the world, but many do not have a hard part that can be preserved. Many of your students would be familiar with a crab. Have them compare a crab shell with that of the coral and make sure they notice the difference in hardness. The lack of very hard parts prevent many arthropods from becoming fossils.

Arthropods have a problem when they grow. Their shell does not grow with them. They must get rid of the old skeleton and replace it with a new one (called molting). Many times your students will see on the beach small "dead" crab shells, this is many successive molts of the crabs.

In this kit you have a barnacle which is related to shrimp. The part that is in this kit is the outside skeleton. The little shrimp-like creature lives on its back inside the skeleton. It has a little lid that covers the organisms when it is not submerged with water. When water covers the barnacles the lid opens and the barnacles' appendages come out and feed on any food that might pass by or settle down on its appendages.



MOLLUSCA

abalone, bivalves(ribbed, smooth, mussel, scallop), gastropods (low spiral, spiral)

The phylum Mollusca is a very diverse group that includes clams, snails, and octopus. The samples in your kit are from the groups generally called the bivalves (clams) and gastropods (snails). Gastropods are coiled while bivalves have two shells that are bilaterally symmetrical.

KEY POINTS:

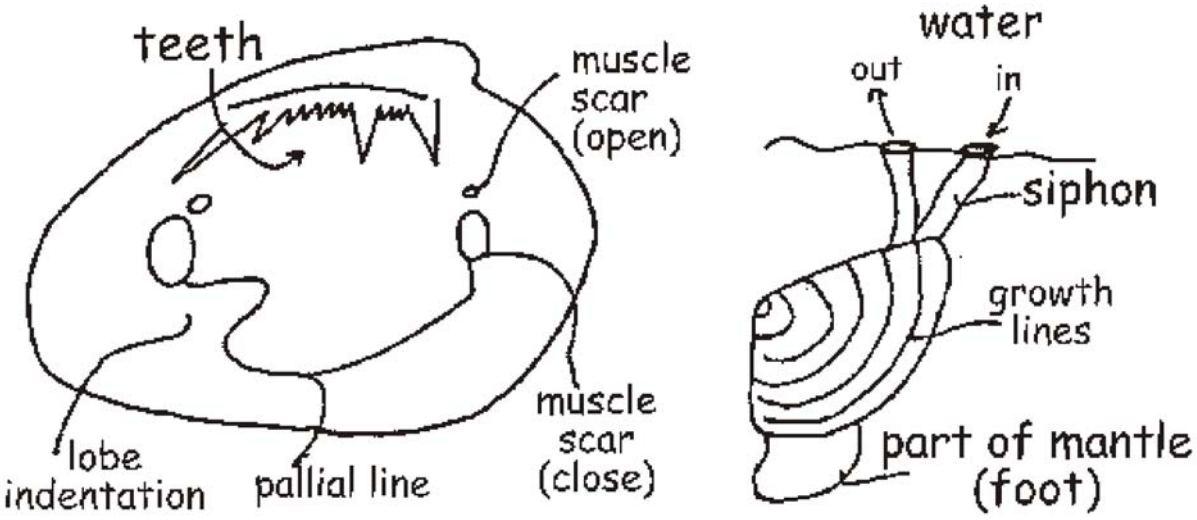
- soft bodied animals
- internal or external shell
- have a mantle, a fold in the body wall that lines the shell
- makes a shell of calcium carbonate
- lives in mud and sandy flats, as well as forests, soil, rivers, lakes and the deep sea

Bivalves have very interesting shells that can help illustrate to your students different living habitats. An important point to emphasize with students is that in shells the living organisms are gone, but on the shell many times information is imprinted. Not in words but in subtle clues that the organism leaves behind. Many of the features that will be described may not be on shells that you purchase from a "shell shop." This is because they polish many of the shells before they sell them, removing some of the "clues."

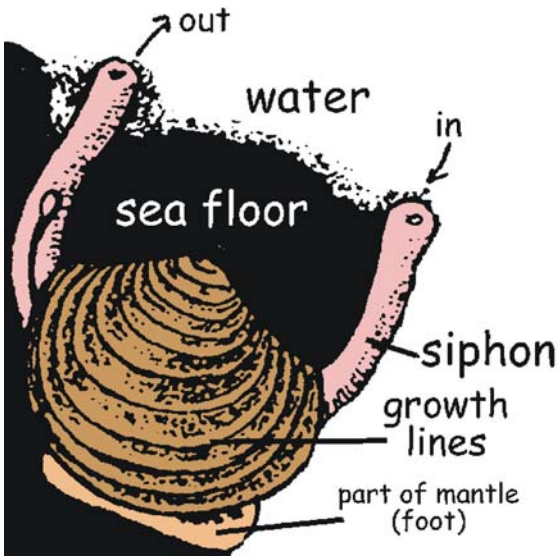
Let's try to see what key characteristics you can discover and compare on your shells. Have your students compare shell shape, shell weight, structure of the inside of the shell and coloration. Notice the many shapes that your Mollusca samples have in your kit. Most of these shapes are adapted to their living habitat and if you identify which structures give you clues, you can reconstruct where these animals live. The color of many of these organisms depend on how recently they died, for instance the sand dollars are a brilliant purple when alive, but become white after they die and bleached by the Sun or chemicals. The gastropods are colorful in life and maintain this color, but they in time would lose their color.

ABALONE - Only has one shell, the living mantle or fleshy material hugs on rocks. The organisms eats

bacteria or other food morsels that may be on the rocks



BIVALVES (ribbed) - The living organism had two mirror image shells. Along the hinge area (see diagram of ideal shell) the teeth that hold the shell together are not large. This gives a clue that the shell lived in the sand or mud of the Florida coast. If the teeth created a tighter hinge this would indicate that it lived on the surface of the sea bottom. If you look on the inside of the shell, you will notice the pallial line (see diagram) has a small lobe. This lobe indicates how large the siphon (brings water and food to mantle) was. The larger the lobe the larger the siphon, the deeper the bivalve dug into the bottom. In this shell, these clues tell us that this organism burrowed only a little.



BIVALVES (smooth) - This is a good shell to illustrate how you can find the age of a clam. Have your students notice the horizontal growth lines on the outside of the shell. This tells you that each growing season, the clam added a new layer. Please note, the word "clam" is just a generic name that can refer to several kinds of shells. Notice on the inside of this shell, the pallial line has a very large indentation. This bivalve was a deep burrower. Also notice the smaller smooth spots. These are where the muscles that controlled the shell's ability to open and close were located. The large ones are to keep the shell closed the smaller ones, just above the larger one, help keep the shell opened.

BIVALVES (mussel) - Mussels are also bivalves, but are unique in that they live on rocks or other hard surfaces. Many times you can see mussels exposed during low tide. Mussels can "sew" themselves to hard surfaces by using black threads that they make. The fibers are so strong that kings in early Europe used the threads to make their robes. The inside of the shell does not have a strong pallial line indentation because these are non-burrowers. Also the muscle scars (smooth surface areas) are missing because they rely on the threads for support. Also the hinge area has no teeth for the very same reason.

BIVALVES (scallop) - Scallops are also bivalves, except they have a reduced pallial indentation and reduced muscle scars. This is because it does not burrow and does not rely on its muscles to secure itself in case someone wants to eat it (like a sea star). It relies on its quickness. Scallops swim in the oceans and are capable of quick movement away from its predators (organisms that want to eat them).

GASTROPODS - (low spiral) - These snails are different from bivalves in that they grow in a spiral pattern and only have one shell. The organism lives throughout the entire shell. Many of the low spiral forms float throughout the water. A high spiral form would not be an ideal shape to float.

GASTROPODS - (high spiral) - This snail shape is more adapted toward living on the bottom of the ocean or along rocks, where they can move around. Some snails tend to be very ornamented while others are smooth. Snails also seem to live anywhere from deserts, to deep oceans, to mudflats, to trees, to even your front yard!

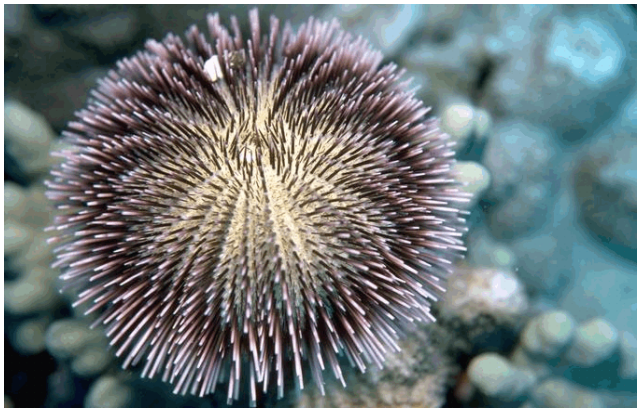
ECHINODERMS

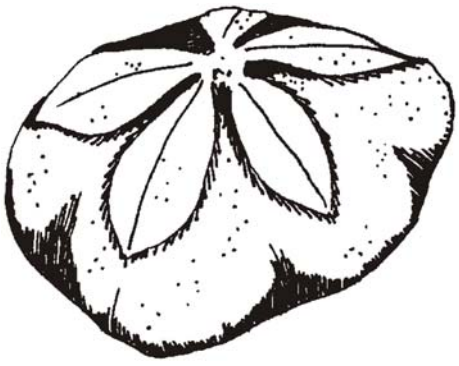
sand dollar, sea cookie, sea star, and sea urchin

In your kit you have several specimens that illustrate the 5 part symmetry. Have your students compare the top side of each of the echinoderms. The sea star and sea cookie have the star on their top; the sea urchin has 5 rays along the side; and the sea star has 5 arms. Also have them look for the tiny holes in each of the specimens, these are where the tube feet come out. There is also a big hole on the top of each of these specimens, this is where water enters the organisms. On the bottom you should be able to find 2 holes on the sand dollar and the sea cookie. The middle one is where the mouth of the organism is, and the little one is its anus. Echinoderms are more specialized than the other specimens in your kit. They have specialized organs that perform the different tasks for living. The sea urchin in your kit is without spines. The specimen you have would have thin black spines, but they fall off when the organism dies. The sea urchin spine in your kit comes from a different type of sea urchin, different sea urchin species make different types of spines.

KEY POINTS:

- live in seawater, mainly bottom dwellers
- have five part symmetry
- all have internal skeleton
- unique water pumping system that produces the water pressure which allows for the movement of tube feet (if you put on your forearm you can feel the tub feet moving the hairs on your skin as it moves across); they are used for locomotion, food catching and reproduction.





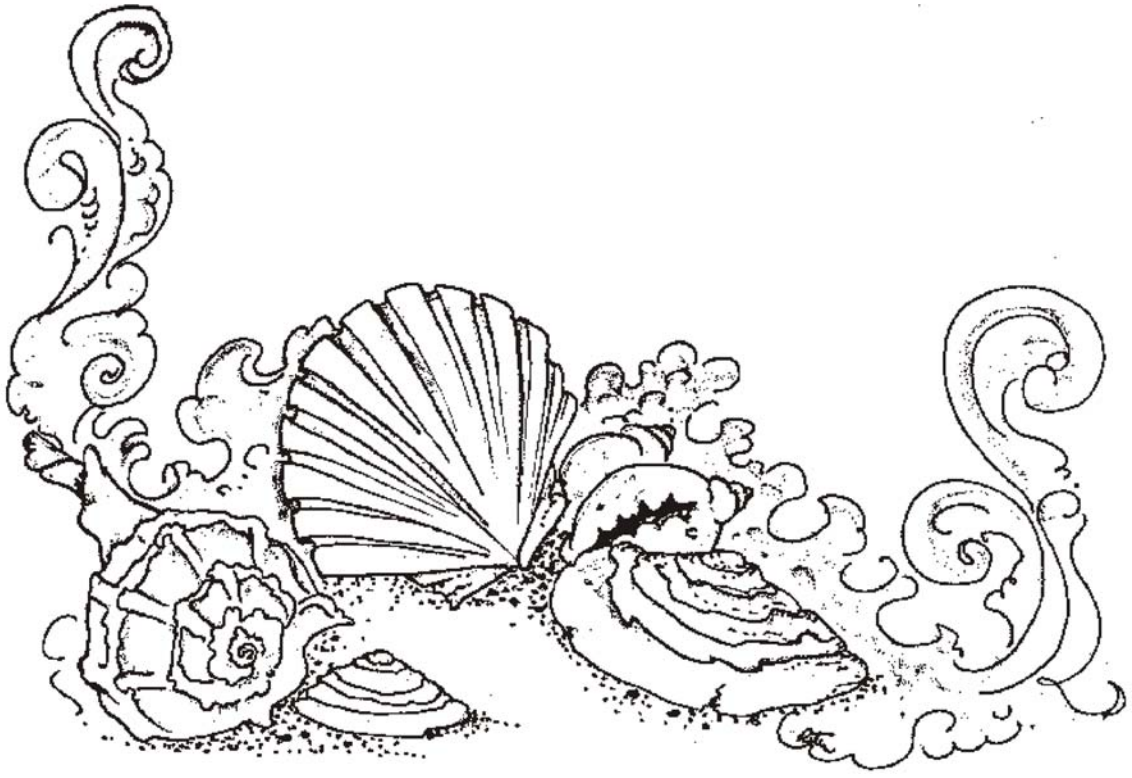
LABORATORY EXERCISES

The following are student sheets that can help explain the concepts that we have discussed in this packet. Answers are not given, because in most cases, the answers depend on what samples you use.

CLASSIFICATION - This includes 2 activities on sorting of different groups. Please remember classification is artificial, so this is a perfect exercise for students to be creative.

CHARACTERISTICS - This exercise uses the students observation skills, by using specimens students describe what they have. The questions below the drawing is just to help guide the students observational skills. Measuring and looking at detail is very important.

ECOLOGY - Once you have talked about the specimens in the kit, it may be helpful for the students to put the organisms where they live in the ocean. Sponge and scallops live in deeper water, near the old coral reef. Sea Urchin, Snails, Coral, and Abalone live between the rock and the old coral reef. The bivalve, mussel, and barnacle, live between the rock and the beach.



CLASSIFICATION

What are the six Kingdoms?

What does species mean?

Materials: mixed shells
See if you can match your specimens with the "Shell Identification Chart." Classify them by using the identification sheet provided and your own observations. If you find one not on the sheet draw and describe it.

Name	Key Characteristics	Drawing

SHELL IDENTIFICATION CHART

Neritina sp.
Common Merite

Nassarius sp

Tellins sp
White Tellina

Pyrene zp
Dotted Dove

Cerithium sp.
Common Cerith

Cypraea sp.
Gold ringer cowrie

Columbella sp.
Black Dove

Terebra sp.
Black Terebra

Torina sp.
Variegated Sundial

CLASSIFICATION

How do we group organisms?

What is a Phylum?

Materials: marine invertebrate kit

Procedure: You have different organisms in your packet. Classify the organisms into large groups (Phylum) using characteristics that might link the individuals. Draw the specimens and label the characteristics they have in common. (Hint: there are 5 major groups)

PHYLUM	CHARACTERISTICS	DRAWING

CHARACTERISTICS

THESE ORGANISMS LIVE IN THE OCEANS. LET'S TRY TO FIGURE OUT WHAT THEIR KEY CHARACTERISTICS ARE BY DESCRIBING THEM.

SAMPLE 1.
draw a picture

How large is this organism?_____
Is this organism a plant or an animal?
Have you ever seen this animal before? If so, where?

What can we call this organism?

SAMPLE 2.
draw a picture

How large is this organism?_____
Is this organism a plant or an animal?
Have you ever seen this animal before? If so, where?

What can we call this organism?

ECOLOGY

PLOTTING SEALIFE

Exercise I.
Let's review some of the organisms we studied last week. Make notes on each organism as you are given information. This information will help you plot where these organisms live on the map provided.

LIST ORGANISMS	NOTES