LESSON 13 Key Questions

Section 1

- What are some common sights of the marine habitat?

It depends on the type of marine habitat, but one might see tide pools, salt water, wave and wind action, sand, mud, various seaweeds and shore grasses, crabs, periwinkles, starfish, mussels, gulls, ducks and other shore birds, bits of shells, various sizes of rocks,barnacles, garbage and other pollutants, And depending on whether it is high or low tide, one might see boats, clam/worm/seaweed harvesters, etc.

- What are some common sounds of the marine habitat?

Gulls, sounds of water as it moves in an out with the tide, sounds of water hitting rocks, wind whistling, boat engines, etc.

- Describe what can be touched/felt at a marine habitat.

The mud, salt spray, hot/cold sand, marine organisms (shells, slime, etc), water, etc.

- Describe what is smelled at a marine habitat.

Mud, salt water, decaying plant and animals at some locations, etc,

- Describe the marine habitat(s). Describe the marine habitat(s) that you visited.

If the students were able to go on a field trip to a particular marine habitat, have them describe what they saw. This could be done as a class activity during or after the field trip. Their descriptions could be written down or verbal. Use their descriptions as a basis for reviewing aspects of the habitat and trying to decide which type of habitat it was (physical or biogenic, etc)

The answer will depend on what habitat(s) the students visited it may be sandy, rocky shore, tidal flat, estuary, and water column (where there is always water)

Section II

- Where do clams live?

In the muddy or sandy substrate, except for when they are in their earlier life stages, during which they float in the water column before they attach to the substrate

- Where does the clam get food and water?

The soft-shell clam, *Mya arenaria,* is a filter feeder that takes in plankton through its incurrent siphon. As the tidal water rises, Mya extends its siphons into the water, and when it recedes, Mya retracts the siphons.

- Where does the clam get shelter?

Mya arenaria burrows down in the tidal substrate. It seldom leaves the area that it chose as a tiny juvenile clam, unless the conditions of the habitat change or a predator moves it without destroying it.

- How does the clam stay safe?

Mya arenaria can retract its siphons and clamp its shell fairly tightly.

- What are some other species that exist in this marine habitat?

Its predators - black ducks, moon snails, green crabs; shore birds, gulls, some raccoons and small wildlife may visit; seaweeds are along the shore and on rocks depending on the substrate

- Where do they get shelter, food and water?

Ducks and other shore birds may tuck their heads under a wing to rest or stay sheltered; they may hide their young near rocks and crevices; they find food in the seaweeds and on the sandy and muddy bottom. Moon snails can retract into their shells for shelter or safety; a slime coat helps them stay attached during wave action or tides; they drill holes in clams and other mollusks and eat them. Green crabs can burrow into the substrate or hide in seaweed or crevices in the rock; they eat small clams by crushing their shells. Raccoons and small wildlife have shelter in the land habitat often in small holes, dens, or burrows; they forage for food. Seaweeds do not seek shelter; they get nutrients from the waters surrounding them.

- How do they stay safe? See above

Section III

- What are physical habitats?* See below
- Explain the difference between rocky, sandy, muddy, and water column habitats? See below

Physical habitats are defined by their substrates (bottoms) and water depths, which influence what organisms can survive and grow in a particular area. The substrate can be a large rock outcrop, to sand, to mud, or a combination. Rocks provide places for plants and animals to attach and grow, whereas sand and mud do not. Sand and mud allow burrowing of organisms, whereas rocky substrate does not. The water depth affects the sunlight, which reaches the substrate or water column and influences the types of vegetation and the abundance of vegetation. The water depth of tidal ebb and flow affects the plants and animals; the pounding wave action affects the attachment and movement of species in the habitat. In Maine, our major marine habitats defined by physical characteristics are Rocky Habitats, Sandy Habitats, Muddy Habitats, and Water Column (no substrate).

Compared to the area covered by all marine habitats, the Rocky Shore is the smallest, yet it has the highest biodiversity for its small size, and should be protected. Its major threat is runoff of fresh water from the land, which can include nutrients, oils and other pollutants that are foreign to the rocky shore habitat or displacement of soil, sand, rocks, or sediment. (www.seafriends.org.nz/enviro/habiatat/intro)

The Water Column's physical characteristic is that it has no solid substrate. Within the water are places of different temperature, salinity, and density. The organisms may move up and down within the water

column to stay in favorable conditions. Vertical mixing of large masses of water with different temperatures and salinities (for example, cold, less saline waters of the Gulf of Maine meeting with the warmer, more saline Gulf Stream influences the types of animals and phytoplankton that live in the water column.

- What are Biogenic habitats?*

Biogenic habitats occur when plants and animals grow in such a way that they provide a place for other plants and animals to survive and grow. Biogenic habitats may provide places where other plants and animals can attach, hide, find shelter, and find food. In Maine, these are the habitats known as salt marshes, sea grass beds, kelp beds, shellfish beds, and cold-water corals. Biogenic habitats are created within a range of other physical habitats and environmental conditions. For example, a salt marsh may be located primarily in a muddy intertidal area, but it could be found in a rocky or sandy intertidal area as well.

- Explain the difference between salt marshes, sea grass beds, kelp beds, shellfish beds, and cold-water corals. These habitats are created by plants and animals.

A Salt marsh is a grass-dominated habitat that extends from the low intertidal zone to the upper limits of the highest high tides. A Salt marsh is among the most biologically productive ecosystems in the world, supporting rich coastal and estuarine food webs. Geese, deer, voles, insects, snails, and crustaceans consume vegetation. Much of the plant matter enters the food web after it dies, it is broken down into smaller particles that are swept away by the tides to provide food for crabs, shellfish, and several species of fish that feed, breed, and hide in tidal channels or on the flooded marsh surface.

A Sea grass bed is a term for flowering plants that live in low intertidal and subtidal marine environments. They are a critical habitat in the Gulf of Maine. Roots anchor the seagrass to the sediment, and seagrass absorbs nutrients from the water along the entire length of its blades, which can grow up to ten feet long. Eelgrass is one of the dominant species of seagrass, which can tolerate a wide range in temperature and salinity, and can grow in sand or mud or on small patches of mud between cobbles or boulder. Eelgrass can live anywhere that the water is relatively clear as long as it has the right amount of light.

A Kelp bed forms a distinct type of underwater habitat. The large, flat structures create an under water canopy similar to forests on land. Kelps are found from the lower intertidal zone to about 40 meters in depth. The holdfast will attach to rocks and docks, as well as anything else that presents a hard substrate. The large structures provide protection from predators and harsh environmental conditions. Kelp holdfasts provide microhabitats for small invertebrates (snails and juvenile mussels). Kelp contributes to nutrients recycling by absorbing inorganic nutrients and then reentering the food web as dead tissue.

A Shellfish bed can be found in the intertidal and subtidal zone and from estuaries to far offshore. The 3 types of shellfish beds in the Gulf of Maine that have become biogenic habitats for other species are mussel beds, oyster beds, and scallop beds. Small animals can find refuge in the crevices among the shellfish, or they may attach themselves to the shells. The small fish can hide to ambush prey, avoid predators, or escape water currents.

There is very little data on Cold-water coral in the Gulf of Maine, but a reef was discovered close by, near Nova Scotia and Newfoundland. Fishermen in the Gulf of Maine have found large corals in their

nets, however. The corals can form a unique habitat that attracts a wide diversity of other species from suspension feeding invertebrates such as basket stars and anemones to fish, shrimp, crabs, sea stars, sea slugs, snails, and others.

(Except as cited within the notes, the information on habitats comes from Tyrrell, M.C. 2005. *Gulf of Maine Habitat Primer*. Gulf of Maine Council on the Marine Environment. www.gulfofmaine.org,vi+54pages)

- What habitats have been formed by human activity? Learn about Invasive Plant habitats and Fouling communities

There are some physical and biogenic habitats that have developed due to human activities. They may have formed on the surfaces of structures that are placed in the water such as docks or other structures and are called Fouling communities, or they may be an invasive species that has established itself due to shipping, aquaculture, the release of aquarium pets or some other human activity and are called Invasive-Plant habitats. Often, they upset the normal balance of the ecosystem and are not looked upon as habitats to preserve.

- *Codium fragile* (a green algae), and *Phragmites* (a tall reed that grows in fresh and brackish water) are two invasive plants that dominate the areas where they have taken over, and create new types of habitat (that are less hospitable to native species than the species they compete with). *Codium* takes over in areas where kelp and other native algae were decimated by urchins when the urchin population was very high (Larry Harris, UNH, personal communication), and *Phragmites* grows in very tall, dense stands along the edge of salt marshes, and in some areas where cattails once grew.
- Colonial tunicates (*Didemnum vexillum*, *Botryllus schlosseri*, and *Botrylloides violaceus*) are three colonial tunicate species that grow in abundance in fouling communities in Maine. *Didemnum* is a particularly big problem, covering entire docks and piers (such as the one in Eastport), and coating miles and miles of bottom on Georges Bank (Beth Bisson, UM Sea Grant, personal communication). There are also some non-native and invasive solitary tunicates that can dominate fouling communities and cause problems for aquaculturists, boat owners, and municipalities and individuals trying to maintain docks and piers. These include: *Styela clave* (club tunicate), *Ciona intestinalis* and others.

- How have the plants and animals adapted to living where they live?

Plants and animals have adapted in many ways. Some have shells that protect them (crabs, clams, mussels, periwinkles, snails, etc). Some have slime coats that prevent drying out(seaweeds). Some attach to rocks to keep from being moved during heavy winds and wave action and to stay anchored near the water column to preserve moisture during low tide. Some organisms move in and out with the tide, while some go into tidal pools or seaweeds; or burrow into the sand or crevices in rocks during the low tides.

- How do clams and some of the other species found in this habitat get shelter, food and water?

Some of this information may be repeating information in Section I. Clams use their siphons to draw water rich in plankton inside their shells. They get shelter by burrowing into the substrate of sand or mud. Clams are a source of food for crabs, moon snails, and black ducks. Their bodies are able to

regulate salts so they can use salt water where humans need fresh. Seaweeds take in nutrients from the water.

- What would humans need to do in order to survive here?

Humans cannot survive in this habitat. They would need food, water, and oxygen, shelter from the high winds, wave action and current, temperature changes, seasonal changes, sunlight, salt water and rainfall, and protection from predators. They would have to develop adaptations to all of these environmental stressors.

- What does it mean to participate in "sampling" of a marine habitat? How can this information be used?

Sampling can be done by laying down quadrats in low, middle, and high tide areas. Quadrats can be tossed down, and students can record what is found in the quadrat. Students can be taught how to determine the age of the seaweed, *Ascophyllum nodusum,* by counting the bladders found on a main stalk of the plant. One can also press coffee cans into the mud or sand to take core samples of soil. The soil can be sieved by dumping it into a simple unit similar to the ones used in the clam project (4 wooden sides, screen bottom, and open top and washing it in the salt water to let the dirt/sand rinse out. Students can then count plants or animals that are found. Sampling is important for scientists to find out what is surviving in a particular area. The data can be saved and sampling can be done at other time intervals.

- How will the plants and animals be affected by the change of seasons in this habitat?

The plants and animals will adapt to the changing conditions of the their habitat in various ways. Some birds will migrate; others will stay. Some animals will burrow deeper; the temperature changes of the water will not affect the cold-blooded animals as much.

- What happens to the sea water level over a period of time?

On a geologic time scale, the sea level rises and falls due to the melting and refreezing of massive glaciers, which advance or recede as ice ages come and go. The land level rises and falls as well. (See extension activity at end of this lesson and in Lesson 22) As glaciers form on the land, they press down on the land, as glaciers melt, the land "bounces back," very slowly, over millennia. (www.bigelow.org/generalzonation/photo2)

- How are changing sea water levels recorded?

Maps have been made to record the depths and features of the coastal areas

- How does the water level affect the plants and animals that live here?

As the tides rise and fall each day, the animals have had to adapt to living in the air for several hours. If the water level was a permanent change, animals would probably move to a dry area, plants would die out or adapt, the habitat would gradually change.

- How do temperature, salinity, wave action, wind, sun/light, and substrate affect the organisms that live in the marine habitat?

This answer is provided on the Sea Vs. Land worksheet located with the worksheets for Lesson 13

- How do the plants and animals interact in the same habitat?

See the Biotic Factors that affect a habitat developed for Lessons 13-16. Briefly, animals and plants interact in several ways: being first in a habitat, competition for food and space, co-operating, altering the environment, being a predator or grazer, being a producer, being affected by disease, or being disrupted by disease.

- How can we help to protect the plants and animals in this habitat? Why should we want the plants and animals to survive?

We can protect plants and animals by respecting their habitats and being good stewards of the environment. We should want plants and animals to survive to help the environment stay in balance.