Marine Biology

Worksheet IV

Selected Answers

(Oceanic Provinces, Ocean Resources, Marine Pollution)
1. Matching:

I___a. Black colored lichens  
III__b. California mussel  
II___c. Buckshot barnacle (*Chthalamus*)  
II___d. Goose barnacle  
IV___e. Sea palm  
II____f. Acorn barnacle (*Balanus*)  
I____g. Periwinkle snail  
IV___h. Octopus  
IV___I. Brown sea hare  
IV___j. Sea urchin  
IV___k. Sea star  
IV___l. Sea Anemone  
IV___m. Feather Boa Kelp

2. List 3 reasons that the rocky intertidal of the Pacific Coast of North America has such high species diversity.

• Temperatures in winter are mild and usually above freezing
• Summer heat is moderated by coastal fog
• Upwelling creates nutrient rich waters which supports a high density of phytoplankton
3. What is a *Keystone Species*? Why is the sea star considered a keystone species in intertidal regions in California?

- A keystone species is a species that other organisms in the environment depend on for their survival.
- Sea stars are predators of mussels. If sea stars are removed from an area, mussel move down onto the lower intertidal and displace the organisms that live there. Thus removal of sea stars decreases species diversity in the lower intertidal.

5. Using the diagram below, explain why there is a difference in the distribution of acorn and buckshot barnacles from the time of larval settlement to the time when the barnacles are adults. What factors that influence the zonation adult buckshot and acorn barnacles?

Buckshot barnacles grow slower and are smaller than acorn barnacles.

Buckshot barnacles can withstand higher temperatures and longer periods of exposure to air than acorn barnacles.

Acorn barnacles can out compete buckshot barnacles at lower elevations in the intertidal since they grow faster and as they grow they push buckshot barnacles off the rocks.

Thus physical factors (tolerance to heat and air) determine the upper limit for both buckshot and acorn barnacles. Competition for space determines the lower limit of buckshot barnacles. Acorn barnacles can out compete them in areas where acorn barnacles are not exposed for extreme periods. The lower limit of acorn barnacles is determined by predation and competition for space by mussels.
6. Examine the diagram below:

A. Structure A is: Siphon

B. What is meant by the term anoxic?

Without oxygen

C. How does structure A enable clams to live in anoxic muds?

Clams are filter feeders. They use their siphons to bring water into their body and filter feed using cilia on their gills.

7. Examine the diagrams below.

Diagram A

A. What is the common name of the worm in diagram A? How does it feed?

- The “Fat Innkeeper Worm”. It is called an innkeeper because it shares its “U” shaped burrow with a polychaete worm, a crab, and one or more fish.

- It is a filter feeder. It creates a mucus net and pumps water through this net using muscular contractions of its fat body.
B. What is the common name of the worm in diagram B? How does it feed?

• The Parchment Worm. It is a type of polychaete worm that live in burrows in mud flats.

• Like the fat innkeeper worm, it creates a mucus net to filter organisms from the water column. It uses enlarged parapodia, “fans”, to create a current that moves water through the mucus net.

C. If you wanted to collect specimens of these worms where would you go?

• An estuary at low tide so that the mudflats would be exposed

Fat Innkeeper Worm (*Urechis caupo*)
8. Identify the two organisms below. Where are these organisms found in the marine environment?

A. Name: Kinorynch  
B. Name: Tardigrade or water bear

Location: Meiofauna  
Location: Meiofauna

Meiofauna a microscopic organisms that are found between the grains of sediment.

9. The organisms in the diagram below are found on mud flats in estuaries. Identify the organisms A - D.

A. ________________
B. ________________
C. ________________
D. ________________

10. What is the feeding strategy of the organisms in the diagram?

A. Predator  
B. Deposit feeder  
C. Filter feeder  
D. Predator
11. Give two examples of each of the following:

A. Infauna: ____________________ ____________________
B. Epifauna: ____________________ ____________________
A. Meiofauna: ____________________ ____________________

12. How do sand crabs (mole crabs) feed?

They are filter feeders (suspension feeders). They grab particles from the water column as waves wash over the sand.

13. List 4 reasons why estuaries are important coastal ecosystems.

A. Resting and feeding areas for migratory birds
B. Provide homes and habitat for endangered species
C. Flood control. The energy from storm waves is reduced as they move through estuaries. Part of the reason hurricane Katrina was so devastating in New Orleans is that most of the wetlands between the coast and the city were destroyed.
D. Water filtration and purification. The bacteria in the muds detoxify lots of poisons and breakdown components of sewage.
E. Act as nurseries for juvenile fishes. It gives them places to hide from predators.

14. Identify regions A - E on the diagram below:

A. Open water
B. Muds flats
C. Chord grass grows at lowest elevation and is partially covered with sea water twice a day during high tides.
D. Pickleweed
E. Salt grass grows at the highest elevation

15. How do the plants found in salt marshes tolerate being covered with salty sea water? Chord grass and salt grass have salt glands that excrete salt. Pickleweed is a succulent that concentrates salt in its tips and then drops off its salty tips.
Chord Grass at the lowest elevation in the salt marsh

Estuary

- Mud flats
- Open water

Sea Felt

California Horn Snail

A Deposit Feeder
16. List two organisms in Phylum Chlorophyta that are found on the mud flats of estuaries.

Sea felt (*Enteromorpha*) and sea lettuce

17. Shorebirds are found at very high densities in estuaries. What are some physical features of shore birds that help prevent them from competing for the same food resources? Why are estuaries important habitats for shorebirds?

*Birds: Length of bill determines depth of penetration in the mud: Resource Partitioning*

Estuaries are resting and feeding areas for migratory birds
19. Matching:

I___a. Mud shrimps I. Animals that burrow
V___b. Birds II. Deposit Feeders
III__c. Black muds III. Hydrogen Sulfide
I____d. Clams IV. Meiofauna
IV___e. Tardigrades V. Predators
I____f. Sand Crabs VI. Primary Production
IV___g. Kinorynchs
I____h. Ghost Shrimps
V___i. Moon Snail
I____j. Sand Dollars
III__k. Rotten Egg Smell
VI___l. Benthic Diatoms
VI___m. Sea Lettuce
II____n. Sea Cucumber

20. The diagram on the right shows three types of coral reefs.

A. The top drawing is a ? Fringing reef
B. The middle drawing is a/an? Barrier reef
C. The bottom drawing is a/an? Atoll
21. List two toxic organisms that can be found on the reef flat.

   Cone snail and stone fish

22. What are three physical conditions required for the formation of coral reefs? Why are these conditions necessary for reef formation?

   Warm water, shallow water, and clear nutrient poor water

23. Corals belong to Phylum _______________, Class ________________. How does this class differ from other classes within the phylum?

24. What do corals feed on? Zooplankton - thus they are carnivores

25. Describe the relationship between corals and zooxanthellae. What is coral bleaching?

26. Matching

   II___a. Herbivorous Gardeners I. Anemone Fish
   V____b. Important to beach formation II. Damsel Fish
   V____c. Eat Zooxanthellae within coral III. Eel
   VI___d. Toxic ambush predator IV. Lion Fish
   VII___e. Water column stalker V. Parrot Fish
   III___f. Crevice feeder VI. Stone Fish
   I_____g. Mutualistic relationship with Cnidarian VII. Trumpet Fish
   VIII__h. Sets up cleaning stations VIII. Wrasse
27. What are 5 threats to coral reef ecosystems?

A. Over fishing: Removal of herbivorous fish results in algal bloom on the reef which kills the corals

B. Tourist and gift trade

C. Global warming - High water temperatures stress the corals and cause them to expel their zooxanthellae. This is called coral bleaching.

D. Pollution

E. The aquarium trade - cyanide, explosives

28. List 4 characteristics of the epipelagic zone.

Lit by sunlight, enough light for photosynthesis, lack of habitat diversity, and vast expanses of nutrient poor water

29. List three characteristics of the mesopelagic zone

The twilight zone (lit only by dim light), not enough light for photosynthesis, many animals in this zone are bioluminescent.

30. Why do a number of mesopelagic organisms migrate to the surface at night and then migrate down to deeper region during the day?

There is more food near the surface. There are also more predators near the surface. The animals migrate to the surface at night to feed and then move down to the mesopelagic zone at dawn to avoid predators.

31. Give two examples of phytoplankton, zooplankton, and nekton that are found in the epipelagic zone.

<table>
<thead>
<tr>
<th>Phytoplankton</th>
<th>Zooplankton</th>
<th>Nekton</th>
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See my online power point quiz for examples of epipelagic organisms.
33. Identify regions A - F on the diagram below:

A. Neritic Province
B. Oceanic Province
C. Pelagic Zone
D. Benthic Zone
E. Photic Zone
F. Aphotic Zone

42. List three structural or behavior features of anchovy, herring, and other clupeoid fish that explain why they account for such a large portion of the world fish catch.

• Clupeoid fishes are plankton feeding fishes such as anchovies and sardines. Since they are small, and feed at low trophic levels, they are abundant and account for the largest catches in the world.

• Most of these fish are not used directly for food but are concerted to fish meal and fish oil.

44. Why are oil spills so harmful to marine mammals and birds?

• Mammals and birds use fur and feathers for insulation. Fur/feathers traps air to increase the boundary layer around and animal and reduces heat loss. Oil destroys the ability of fur/feathers to trap air. Thus oiled birds and mammals suffer extreme drops in body temperature die of hypothermia.
Fishing down marine food webs means that fisheries (blue arrow), having first removed the larger fishes at the top of the food chain, must target fishes at lower and lower trophic levels. They ultimately end up targeting very small fishes and plankton, including jellyfish.
49. What are two consequences of fishing down the food web?

- Decreased species diversity and loss of stability
- The largest fishes are able to produce the greatest number of eggs. When the largest fishes are removed reproductive output declines

50. Most fish are at what trophic level?  Trophic levels 2 and 3