Starfish Disease Impacts

Name:

Period:

SEA STAR$_a$
MUSSEL$_b$
JUVENILE MUSSEL$_{b^1}$
FEATHER-BOA KELP$_c$
SEA PALM$_d$
STALKED BARNACLE$_e$
GREEN SEA ANEMONE$_f$
LIMPET$_g$
CHITON$_h$
RED ALGA$_i$

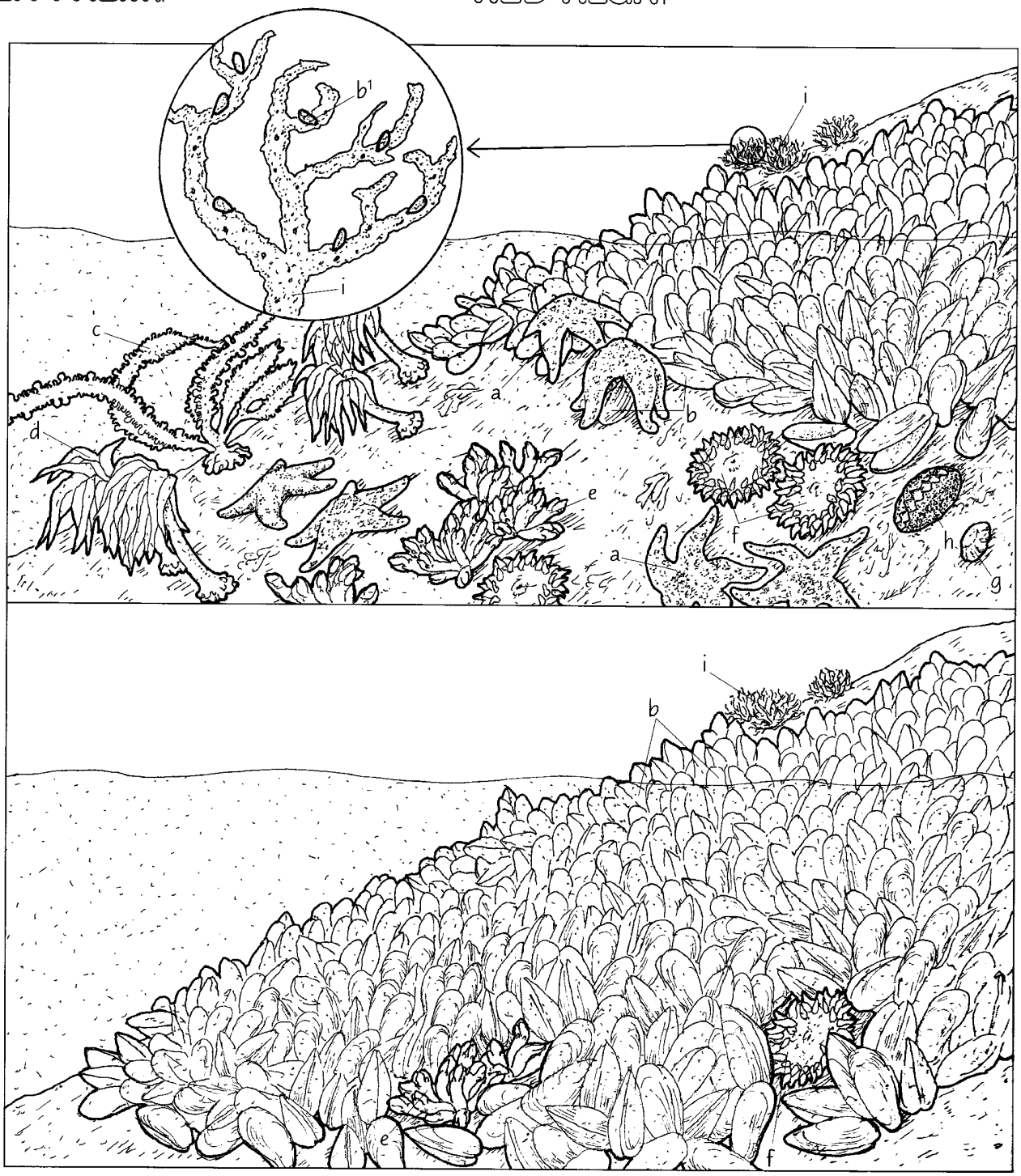

diagram from The Marine Biology Coloring Book (2000) by Thomas M. Niesen

Work: 14 points

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Read the news article below, then answer the questions that follow. Use complete sentences.

News article from November 4, 2013

http://www.ksbw.com/news/central-california/san-francisco-bay-area/widespread-starfish-deaths-reported-on-west-coast/-/5739064/22784236/-/slpkayz/-/index.html

SAN FRANCISCO —Marine scientists based in Santa Cruz are finding a large number of dead starfish along the West Coast stricken with a disease that causes the creatures to lose their arms and disintegrate.

The starfish are dying from "sea star wasting disease," an affliction that causes white lesions to develop, which can spread and turn the animals into "goo." The disease has killed up to 95 percent of a particular species of sea star in some tide pool populations.

"They essentially melt in front of you," said Pete Raimondi, chairman of the Department of Ecology and Evolutionary Biology at University of California, Santa Cruz's Long Marine Lab.

Even starfish in an aquarium at the Gulf of the Farallones National Marine Sanctuary visitor center in San Francisco died from wasting disease after water was pumped in from the ocean in September.

Sampling has found the disease in starfish from Alaska to Southern California, according to a map on the marine lab's website.

Raimondi says wasting disease has never been as widespread as researchers are finding now.

In 1983-84, wasting disease hit Southern California but remained localized.

The disease usually affects one species, *Pisaster ochraceus*, an orange and purple starfish that grows up to 20 inches wide and is a staple of West Coast tide pools.

The starfish dine on mussels, so scientists worry that a collapse in the *Pisaster* population will allow mussels to multiply unchecked, crowding out other species.

What animals are being infected by this strange disease?

What symptoms would you expect to see on animals that are infected?

If this disease is only in oceans, how did it get into aquariums?

How is the mussel population predicted to be impacted by this disease?

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Follow the directions below to color-code the diagram and to answer the questions. You can use p.312 of your textbook to help you. Use colored pencils, and check off each box ☑ as you finish that part of the instructions.

For this exercise, you will be analyzing what happens when a large part of a population of sea stars is suddenly wiped out by disease.

Take a look at the diagram. It shows an intertidal zone along the central coast of California. This is a spot that gets waves crashing into it as the tide goes in and out. Mussels are animals with two shells like a clam. They attach themselves to rocks with strong threads they grow from their body, and eat by sucking water into their shells and straining out little bits of food. They are a favorite food of sea stars, which use their strong arms to pry open the shells. They then *shove their stomach inside the shell* to digest the mussel. Imagine if you ate that way!

[thanks for delivering the pizza ... I'll just open the box a little bit and ... BLAAAAARGHHHH ... mmmm ... good!]

Because mussels are trying to survive and not get eaten, they are usually found in locations where they are exposed to the air part of the time; the predatory sea stars prefer to stay underwater.

1. Let's start by looking at an area that has a healthy, balanced ecosystem. This is what you should see in the top diagram. Color all of the sea stars (*a*) orange □ and their label orange □ . In the center of the diagram, you should see a couple of happy sea stars eating.

How does a sea star eat?

2. In the top picture, you should also see a bed of mussels (*b*). Color the mussels □ and their labels □ dark blue. You can also color the juvenile mussels (*b1*) in the close-up circle dark blue □ , as well as their label □ .

Why don't the mussels live any deeper in the water?

3. Now look for the things that are not animals in the top picture. The feather-boa kelp (*c*), and sea palm (*d*) are both kinds of algae (yup—algae can be bigger than you) that grip onto rocks to keep from being washed away by strong waves. Color both these types of algae brown □ . Color their labels the same way □ .

How does the kelp and sea palm survive in one spot if there are waves?

4. To finish our healthy ecosystem, color the remaining animals in the top picture. The stalked barnacle (*e*) □ and its label □ should be grey. Any green sea anemone (*f*) should be green [duh!] □, along with its label □. Next, the limpet (*g*) in the lower right gets colored light brown □ , along with its label □ . Finally, both the chiton (*h*) and its food the red alga (*i*) get colored red □ , along with their labels.

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5. Now, imagine that this part of the coast is affected by the sea star wasting disease, and all of the sea stars get wiped out. This means that they were not able to resist the disease. This could be considered a result of something called a low genetic variation in the sea star population. If the sea stars had genes that were more diverse (different) it would be possible that some of them would have genes that would allow them to resist the disease and survive. So, to increase the chances of a population of organisms surviving a disease, new predator, change in environment, etc., you would need to have a high genetic variation. Breeding programs for rare animals and plants run into this problem all of the time—if there are only a few hundred of the animals left, you have a very small group of genes to breed them with.

Is it better for a population to have a high genetic variation or a low genetic variation? Explain your answer.

6. So, let's see what happened to the coast where all of the sea stars were turned into goo. Look at the bottom diagram. Use the color key you already filled out, and color the organisms in the bottom diagram using the same colors you used in the top diagram □ .

List the organisms that had an increase in population:

List the organisms that had a decrease in population:

List the organisms (besides the starfish) that disappeared:

How did low genetic variation in the starfish population affect the mussel population?

How did the change in mussel population affect the other populations of organisms in this area?

Work: 14 points