Keystone Species: The Otter

Directions: Read the article and answer in **COMPLETE SENTENCES.**

Sea otters are known as a keystone species, filling such an important niche in ocean communities that without them, entire ecosystems can collapse. Scientists are finding, however, that sea otters can have even farther-reaching effects that extend to terrestrial *(land)* communities and alter *(change)* the behavior of another top predator: the bald eagle.

In nearshore marine communities, towering kelp can reach heights of 250 feet and function much like trees in a forest, providing food, homes and protection for fish and invertebrates. The most important enemies of these giant algae are tiny sea urchins, only inches in diameter, which live on the kelp's holdfasts and eat its tissue. When urchin populations become too large, they can defoliate *(remove leaves from)* entire kelp forests, leaving only barren remains.

Enter the sea otter. Otters can eat the spiky urchins whole, making them the major urchin predator. The otters' presence keeps urchin populations in check and maintains the balance of the ecosystem.

2) What important functions do otters provide to the ecosystem as a keystone species?

Scientists have known about these kelp forest community interactions since the 1970s. But in the October issue of the journal Ecology, Robert Anthony and colleagues report that the presence or absence of otters can also affect the diet of bald eagles, a neighboring terrestrial predator. Anthony is an ecologist with the Oregon Cooperative Fish & Wildlife Research Unit of the U.S. Geological Survey and Oregon State University.

Bald eagles live in high densities along the Aleutian archipelago (*group of islands)* off the coast of Alaska and place their nests on islets, coastal cliffs and shoreline sea stacks. Historically, more than 90 percent of the eagles' food comes from the ocean. Sea otters once also occupied a large range of coastal marine environments near these islands, but in recent years, otter populations have declined in response to their own main predator.

"All of the available data point to increased numbers of killer whales as the direct cause of the sea otter decline in southwest Alaska," says coauthor Jim Estes of the U.S.G.S. and the University of California at Santa Cruz. "The otter decline has caused a phase shift in the coastal ecosystem from a kelp dominated phase state to a deforested phase state."

3) What is causing the decline in sea otter populations?

This shift means many fewer kelp forest fish for the eagles to eat. In response, the eagles have adjusted their foraging tactics. Anthony and his colleagues surveyed remains of bald eagle prey in their nests during 1993 and 1994, when otters were abundant and the kelp forests were healthy, and in 2000, 2001 and 2002, when otters were scarce and the kelp forests had collapsed. They found that when otters were abundant, eagle prey consisted of predominantly kelp-forest fish and sea otter pups. When the otters were rare, however, the proportion of marine birds in the eagles' diet was much higher.

4) How does a decline in the otter population affect the bald eagles?

Notes on Grizzly bears:

Notes on Sharks:

Which keystone species do you think is the most important? Why?

**Directions:** Answer the following questions in **COMPLETE** sentences.

1) Which keystone species do you think is the most important? Why?

2) Do you think humans should focus more on protecting endangered keystones species than other endangered species? Why or why not?