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# THE *Current*

May 25, 2006

Gail Gallessich

## **Overfishing Puts Southern California Kelp Forest Ecosystems at Risk, Report Scientists**

Overfishing presents a much greater risk to the kelp forest ecosystems that span the West Coast -- from Alaska to Mexico's Baja Peninsula -- than the effects of run-off from fertilizers or sewage from the shore, say scientists at the University of California, Santa Barbara. The findings have important implications for the design of California's Marine Protected Areas.

In an article published in the May 26 issue of *Science*, researchers describe the first study to compare the top-down versus bottom-up human influences on the food chain of the kelp forest ecosystems.

The study was conducted by scientists at UCSB's National Center for Ecological Analysis and Synthesis, known as NCEAS, which is funded by the National Science Foundation.

"This study shows that California is on the right track by limiting fishing in certain areas in an effort to comply with the Marine Life Protection Act," said first author Ben Halpern, project director at NCEAS.

Kelp are giant algae that reach up to 120 feet in height and support diverse ecosystems. They provide beautiful settings for scuba diving and are rich areas for

commercial and recreational fishing.

The research team took data from four years of marine life surveys by the National Park Service. The park service regularly checks 16 different kelp forest sites around the Channel Islands off the coast of Central California, an area about half the size of Rhode Island.

They maintain data on 46 different species.

Next, the scientists matched data from the park service with data provided by SeaWiFs, a satellite monitoring project that photographs and analyzes ocean color for information about ocean life. SeaWifs data can be used to estimate nutrient levels in the ocean.

Organic coastal run-off -- from fertilizers and sewage overflow -- increases the amount of organic material in the near-shore ocean. According to the study, differences in the amount of organic material do not have much effect on the delicate food chain of the kelp forest ecosystem, except at extreme levels. However, removal of the fish at the top of the food chain has a profound effect.

When the predator species, such as rockfish, at the top of the food chain are removed, the species that they normally eat, such as snails and barnacles, begin to increase in number. Many of these are herbivores that eat kelp. When their numbers increase, they decrease the amount of kelp, in turn changing both how kelp forests look and the type of species that are associated with the kelp forest.

"Kelp forests are so sensitive," said Halpern. "If you remove some of the predators, then you can have an effect on the entire kelp forest ecosystem."

He explained that until now studies of kelp forests looked at either overfishing or increased nutrients. This is the first study to put both variables together to see which is more important.

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