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A Chronicle of Coasts: Study charts historical changes in seas, estuaries

by Ben Harder
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Human exploitation of marine species and destruction of habitat have been spoiling coastal ecosystems since the birth of the Roman republic. By comparing historical changes in 12 bodies of water worldwide, a new study highlights the extent to which civilization's advance has led to ecological degradation.

"Estuaries, because of their proximity to human settlements, are sort of ground zero for human impacts," says marine ecologist Larry B. Crowder of Duke University. The bounties of coastal seas and estuaries began attracting people before the start of recorded history.

This makes it difficult for scientists to study the evolution of a coastal ecosystem from its unsullied state to its current condition, says fisheries and restoration ecologist Hunter S. Lenihan of the University of California, Santa Barbara. "For the most part, we've used reference points that are far down the time line of historical degradation," he says. A broader perspective might reveal potential interventions.

Lenihan and his colleagues reviewed hundreds of documents, including scientific studies, written historical accounts, and artwork, to identify past shifts in coastal species diversity, abundance, and size.

Their information included 8,000-year-old sediment data that predate civilization along the northern Adriatic and western Baltic seas. For various North American and Australian waters, the researchers assessed data including paleontological and archaeological remains and water-quality information. The researchers, led by Heike K. Lotze of Dalhousie University in Halifax, Nova Scotia, report their findings in the June 23 *Science*.

Most ecological damage in the New World occurred after European settlement, they find. But the breakdown began earlier around San Francisco Bay, where natives fished and hunted heavily during pre-colonial times.

"Degradation started sooner in some systems than others, but ... the sequence of degradation was similar," Lenihan says.

Colonialism brought to the New World large-scale deforestation and destruction of wetlands, and soil erosion dumped sediment and excess nutrients into the seas. But, says Lenihan, "it wasn't until [people] began to overharvest biofiltration organisms"—such as oysters—"that we saw massive changes in water quality." With neither these living water filters nor wetlands, "systems can no longer withstand the inputs of nutrients and sediment," he says.

Restoration of oyster habitat in North Carolina's Pamlico Sound, the most degraded New World site in the study, "would have a profound effect on biodiversity, the production of economically valuable species, and filtration," Lenihan says.

While fishing has played a primary role, the new study highlights that "declines are not due [exclusively] to any one human activity," Crowder says.

A few ecological "success stories" have occurred in waters where society has taken multiple steps to repair nature, Crowder says. "Where we've failed to do that, things continue to degrade."

References:

Lotze, H.K., H.S. Lenihan, *et al*. 2006. Depletion, degradation, and recovery potential of estuaries and coastal seas. *Science* 312(June 23):1806-1809. Abstract available at Related Web Site: http://www.sciencemag.org/cgi/content/abstract/312/5781/1806.

Sources:

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For further study:

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