

Darkness on the Water

DEVELOPMENT TAKES ITS TOLL ON ESTUARIES BY RODGER DOYLE

FURTHER READING

Depletion, Degradation, and Recovery Potential of Estuaries and Coastal Seas.

Heike K. Lotze, Hunter S. Lenihan, Bruce J. Bourque et al. in *Science*, Vol. 312, pages 1806–1809; June 23, 2006.

Impacts of Biodiversity Loss on Ocean Ecosystem Services.

Boris Worm, Edward B. Barbier, Nicola Beaumont et al. in *Science*, Vol. 314, pages 787–790; November 3, 2006.

Estuaries, where freshwater mixes with saltwater, are dynamic environments of great complexity and a critical habitat for economically important species. Together with coastal waters, which are affected by much the same environmental pressures, they have long suffered degradation. Indeed, last year the United Nations declared the estuaries of China’s two greatest rivers, the Yangtze and the Yellow, “dead zones.” The damage affects not only the immediate estuarine and coastal environment but also the oceans.

To assess the extent of the harm to estuaries and coastal seas and to reconstruct their ecological history, an international team headed by Heike K. Lotze of Dalhousie University in Halifax, Nova Scotia, has analyzed hundreds of documents. The group focused on 12 temperate-zone estuarine and coastal ecosystems that have been exposed

to intense human development for periods ranging from as little as 150 to as many as 2,500 years. They examined 30 to 80 species in each system plus seven water-quality parameters and data on species invasions.

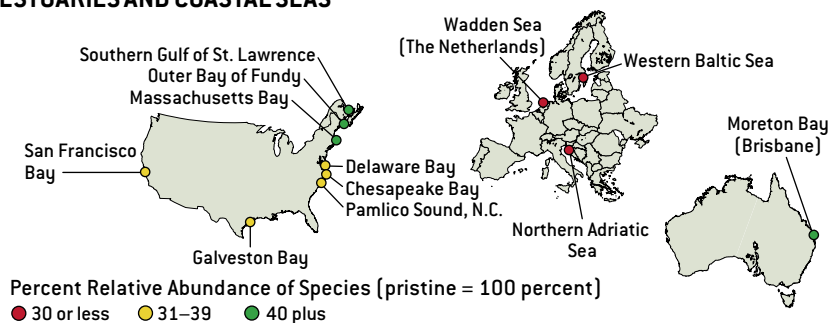
Generally, degradation was minor during the hunter-gatherer and agricultural eras. (Still, even prehistoric populations can do damage: in San Francisco Bay, early hunters depleted the sea otter, large geese, white sturgeon and native oyster populations.) Beginning with the intrusion of market economies about 300 years ago, the ecosystems experienced a rapid decline in species abundance. The past 50 years, however, have witnessed some improvement: populations of birds were up, and populations of reptiles, mammals and vegetation held more or less even. Only invertebrates and fish suffered sharp declines. The size of the ecosystems studied, their richness in terms of number of species, and the density of human population were not related to the degree of degradation. The most degraded systems were those subjected to intense commercial activity for the longest period—the Northern Adriatic, the Western Baltic and the Wadden seas.

By the late 20th century 91 percent of the species studied were depleted (loss of 50 percent of a species or more), 31 percent were rare (loss of 90 percent or more), and 7 percent were extinct. None of this loss could be attributed to invasive species, such as the soft-shelled clam, or to climate change.

During the past 100 years, several systems, including the Outer Bay of Fundy, the Southern Gulf of the St. Lawrence, and Massachusetts Bay, have made modest gains in species abundance, apparently thanks to conservation efforts, whereas in other areas species loss has slowed. These developments suggest to Lotze and his colleagues that degradation has passed a low point and that the systems are on the road to recovery, albeit slowly.

Rodger Doyle can be reached at rodgerpdoyle@verizon.net

ESTUARIES AND COASTAL SEAS



REGION	PERCENT OF SPECIES REMAINING	YEARS OF HUMAN IMPACT
Northern Adriatic Sea	25	2,500
Wadden Sea	28	1,000
Western Baltic Sea	30	1,000
Pamlico Sound, N.C.	31	300
Delaware Bay	32	240
Chesapeake Bay	35	240
San Francisco Bay	35	180
Galveston Bay	37	180
Moreton Bay	40	150
Massachusetts Bay	42	320
Southern Gulf of St. Lawrence	44	240
Outer Bay of Fundy	47	240