

the variance were granted, he says, including overactivating mangabeys' immune systems to see whether that causes AIDS.

When FWS invited public comment on Yerkes's request in May, opposition surfaced, including a letter from primatologist Jane Goodall and 18 other scientists. A key point of contention: The proposal noted that Yerkes funds a conservation effort for sooty mangabeys in Côte d'Ivoire. Goodall and her co-authors warned that "Approving Yerkes's application could open the floodgates to future permit applications premised on allowing entities to kill or otherwise harm endangered species in exchange for making contributions to conservation programs."

Jim Else, Yerkes associate director for research resources, challenges this idea of a

quid pro quo. "It wasn't 'Give us this, and then we'll do that,'" says Else, noting that FWS encourages permit applicants to explain how they are helping species in the wild. "We were already providing the support to conservation."

More important, Else says, FWS wrongly classifies sooty mangabeys as endangered because it relies on an old taxonomy that lumped species and subspecies together. "The taxonomy has changed beyond all recognition," says Else, a veterinarian.

Even some leading conservationists support this contention. The World Conservation Union, which publishes a "red list of threatened species," considers sooty mangabeys—*Cercocebus atys atys*—as "near threatened," two notches down from endangered. However, *Cercocebus atys lunulatus*, or white-

naped mangabeys, are at the top of the endangered list. FWS makes no such distinction, listing all mangabeys as yet another species, the red-capped *Cercocebus torquatus*. The sooty mangabey "is not as threatened as people think it is," concludes Anthony Rylands, deputy chair of the primate specialist group for the red list.

Michael Kreger, who works in the FWS branch that oversees foreign species on the endangered list, says the agency currently is reviewing the status of the sooty mangabey. In its 18 September letter, first reported by the Associated Press, Yerkes wrote FWS that it wanted to withdraw its variance request "in light of the possible reconsideration of the sooty mangabey classification status."

—JON COHEN

ECOLOGY

Global Loss of Biodiversity Harming Ocean Bounty

Environmental groups often argue that biodiversity offers tangible benefits to people. Now, a group of ecologists has put that argument to the test with the most comprehensive look yet at the human impact of declining marine biodiversity. On page 787, they report that the loss of ocean populations and species has been accompanied by plummeting catches of wild fish, declines in water quality, and other costly losses. They even project that all commercial fish and seafood species will collapse by 2048. "It's a gloomy picture," says lead author Boris Worm of Dalhousie University in Halifax, Canada. Yet the team provides a glimmer of hope, concluding that people still have time to recoup these ecosystem benefits if they restore biodiversity.

Although none of these points is new, some experts say the study strengthens the case for the practical value of biodiversity by marshaling multiple lines of evidence and taking a global look. "This is a landmark paper," says Jane Lubchenco of Oregon State University in Corvallis. Others aren't convinced yet. "It falls short of demonstrating that biodiversity losses are the primary drivers of why the services have declined," says Donald Boesch of the University of Maryland Center for Environmental Science in Cambridge.

Past studies of so-called ecosystem services have demonstrated, for example, that a rich array of pollinators creates greater yields for coffee farmers (*Science*, 20 August 2004, p. 1100). But proving that such benefits exist on a global scale has been difficult, particularly for the oceans, which remain poorly studied.



At your service. Highly diverse ecosystems, such as the Red Sea, provide many more ecological services than species-poor ecosystems.

To gauge whether the loss of marine biodiversity matters, Worm and his co-authors reviewed all the data they could find on the issue. They discovered a consistent pattern. In 32 small-scale experiments, higher diversity of either marine plants or herbivores led to benefits such as greater ecosystem stability and 80% more biomass. A review of 12 estuaries and other coastal ecosystems found the same trend. Those with more

species had lower rates of collapse of valuable fisheries than systems that were relatively species-poor to begin with. The team also argues that loss of filter feeders led to a decline in water quality, including depletion of oxygen, in regions such as the Chesapeake Bay.

Data for 64 large marine ecosystems showed that fisheries are collapsing at a higher rate in species-poor ecosystems than in species-rich ecosystems. "Within my lifetime, I might see global cessation of wild fisheries," Worm says. The good news is that closing fisheries and establishing protected areas boosted the number of species in these regions by 23% on average and increased catch-per-unit effort four-fold in nearby waters, although overall yield didn't increase much.

Still, Boesch and others note that it's difficult to prove that loss of diversity causes the decline in services. Boesch says that in the Chesapeake Bay, factors such as excessive fertilizer runoff probably are the real cause of the decline in water quality. Ray Hilborn, who studies fisheries at the University of Washington, Seattle, adds that fishing doesn't necessarily cause ecosystems to be less productive; the long-exploited Mediterranean, he points out, continues to be productive.

Worm and his colleagues call for the creation of new marine reserves, sustainable management of fishing, and tighter control of pollution. Those are well-worn recommendations, but Worm says the team's analysis of the consequences of not taking action, especially the loss of wild fisheries, gives them greater weight. "If you can see the bottom of the barrel, that changes things."

—ERIK STOKSTAD