Population Diversity Crowds the Ark

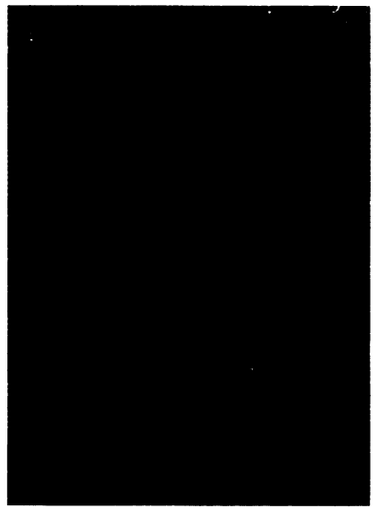
Next week, just before Halloween, scientists and policy makers are meeting at the National Academy of Sciences in Washington, D.C., to come to grips with a different sort of scare: the loss of global biodiversity.

At the time of the first landmark meeting on the subject more than a decade ago (SN: 9/27/86, p. 202), "biodiversity" was a fresh entry in the dictionary, and to many people it stood for endangered species. Two reports in the Oct. 24 SCIENCE illustrate how thinking about biodiversity has changed since then—and how complex the concept and conservation of biodiversity have become.

Any species, endangered or otherwise, is made up of genetically or geographically distinct populations. Many studies have focused on the importance of populations within a species—the Sumatran rhinoceros, for example—for ecological, economic, or aesthetic reasons (SN: 2/8/97, p. 92; 5/17/97, p. 303).

Three Stanford University ecologists have developed a new measure of biodiversity drawn from such population studies. Jennifer B. Hughes, Gretchen C. Daily, and Paul R. Ehrlich calculate that each species has, on average, 220 populations, totaling 1.1 billion to 6.6 billion populations globally.

They go on to estimate that in tropical forests, some of Earth's richest habitats, 1,800 populations are lost every hour—some 16 million annually. The ecologists will also present their analysis at the NAS meeting.



A new estimate puts the loss of populations from tropical forests, like this one in the Amazon, at 1,800 per hour.

"This is the first real attempt to document either the overall diversity of populations or the rate of loss, so it's a pretty significant paper," says ecologist Walter Reid of the World Resources Institute in Washington, D.C.

The numbers are "absolutely astronomical," says Stuart L. Pimm of the University of Tennessee in Knoxville.

By combing through recent studies on the genetic differences between populations, Hughes and her colleagues came up with a measure of populations per unit area for 82 species, mostly vertebrates and plants. They also estimated each species' range. Averaging these numbers, they applied standard estimates of the annual loss of tropical forest to gauge population losses.

Although crude, "the estimates of population extinction are far greater than [those of] species extinction," the common barometer of biodiversity loss, says Hughes.

"Species extinction has a huge ethical significance," says Reid, even though a species isn't providing much ecologically or economically by the time it's on the brink. "But losing populations gets to the economic importance." A case in point is the overfishing of local populations of fish, such as cod in the North Sea (SN: 2/22/97, p. 124).

On the tree of life, if the branches represent broad groups of organisms, the enormously diverse populations are the twigs—the source of "evolutionary innovation," says Pimm.

In the second report, Sean Nee and Robert M. May of the University of Oxford in England take a broad look at the effects of mass extinctions and calculate that even if 95 percent of species are lost, most of the major branches of the tree of life will persist.

Reviving biodiversity after such mass extinctions, however, depends on the evolutionary creativity of lots of locally adapted populations, says Pimm. "The future is in the terminal twigs, particularly the species that are branching rapidly, the most evolutionarily creative." —*C. Mlot*

High cholesterol may benefit elderly

Everyone's heard the litany: High concentrations of cholesterol in the blood raise a person's risk of dying from heart attacks and stroke. A new study suggests, however, that this assessment may need a qualification—notably, it may not apply to men and women who survive into their late eighties.

For them, a new rule seems to emerge: The higher an individual's cholesterol, the longer he or she will live. In the very senior citizens studied, the risk of dying during a 10-year study fell by 15 percent for each additional 39 milligrams of cholesterol in a deciliter (dl) of blood.

"This finding was a surprise," acknowledges study leader Annelies W.E. Weverling-Rijnsburger of Leiden University Medical Centre in the Netherlands.

As part of an ongoing study of Leiden elders, Weverling-Rijnsburger's team measured total cholesterol in 724 men and women, all of whom were 85 or older in 1986. Some 24 percent had less than 200 mg/dl, an amount usually considered healthy. Another 48 percent had moderately high concentrations (up to 250 mg/dl), and the rest were even higher.

By last year, 88 percent of the participants in the study had died. Contrary to standard wisdom, heart disease, the predominant killer, claimed roughly the same proportion of victims from each cholesterol group, the Dutch researchers report in the Oct. 18 LANCET. By way of explanation, Weverling-Rijnsburger speculates that persons especially susceptible to cholesterol's heart risks die at a younger age.

In some people, moreover, low cholesterol may be a result of chronic, life-threatening disease, says Daniel Levy, director of the long-running Framingham (Mass.) Heart Study. In the Framingham population, he says, such disease—especially unrecognized cancer—appears to explain why "above age 50, we find a very poor relationship between cholesterol levels and mortality."

Among the Leiden seniors, the low-cholesterol group experienced the highest rate of death from cancer and infections, while the high-cholesterol group suffered least from such problems—largely explaining that group's generally longer survival.

The infectious disease component of these findings appears to be consistent with data from studies of animals reported last year by Jos W.M. van der Meer and his colleagues at University Hospital in Nijmegen, the Netherlands. Normal mice died when injected with large quantities of pneumonia-causing bacteria. Animals with what would normally be considered highly elevated low-density lipoprotein (LDL) cholesterol—the so-called bad cholesterol—survived the same load of germs. One reason, van der Meer says, is that their LDLs bound the poison produced by the bacteria, facilitating its "detoxification." —*J. Raloff*