Calculations may have overestimated extinction rates

18 May 2011 by **Debora MacKenzie**
Magazine issue 2813. **Subscribe and save**
For similar stories, visit the **Endangered Species** Topic Guide

THE destruction of nature is driving species to extinction - but perhaps not as rapidly as has been thought. While the most widely publicised estimates predict the loss of natural habitat will condemn 18 to 35 per cent of all species to extinction by 2050, these figures could be about twice as high as the actual number - all because of a mathematical error that has gone unnoticed for decades.

It's all to do with habitat loss (Image: Christian Ziegler/Getty)

We still face an extinction crisis, warn Stephen Hubbell of the University of California, Los Angeles, and Fangliang He of Sun Yat-sen University in Guangzhou, China. But the pair's work will allow biologists to more precisely define how habitat destruction leads to extinction.

It is impossible to accurately measure extinction rates. Dozens of new species are identified each year, and counting those that disappear is hard because many are small and live in poorly studied, mainly tropical environments.

Instead, extinction rates are often predicted from a mathematical model based on habitat loss, which is more easily measured. The larger the area you survey, the more species you encounter. Ecologists calculate a curve called the species area relationship (SAR) for an ecosystem by measuring the area they must survey to encounter the first individual of each successive species. To establish the number of extinctions caused by habitat destruction, they run the SAR calculation in reverse.

"We had a feeling there were problems with this, but we could not say why mathematically," Hubbell says. So Hubbell and He checked the method using data from forest plots located all over the world. The pair could calculate the SAR for each plot, and also see what happened to species unique to these plots if they "destroyed" a certain area of each plot in their mathematical model. As the area of destruction widened, these species began to die out. But after each simulated loss of habitat, "more species always remained than were expected from the SAR", says Hubbell.

The pair's analysis explains why. Using the reverse SAR method, biologists have assumed that a species is lost with the destruction of an area of habitat equivalent to the area needed to first encounter it. But in reality, the species is lost only with destruction of the habitat area that includes every individual of the species, which is always larger. Consequently, the SAR method loses species too fast.

The duo developed a model relating extinction rate instead to the entire area occupied by a species. Using the forest data, and extensive data sets on birds, they found that the SAR gave extinction rates that were between 83 and 165 per cent higher than those their method produced (*Nature*, DOI: 10.1038/nature09985).

Similarly detailed information does not exist for most of the world's species, making it difficult to apply Hubbell and He's model more generally. "As a rule of thumb, we might correct traditional extinction rates by dividing them by factor of 2 to 2.5," says He.

Jean-Christophe Vié, deputy head of species survival at the International Union for the Conservation of Nature, agrees better baseline data on species is badly needed. He says IUCN doesn't use the SAR method. But, he points out, "a twofold miscalculation doesn't make much difference to an extinction rate now 100 to 1000 times the natural background".

Hubbell and He agree: "Mass extinction might already be upon us."

Conservation under scrutiny

Improvements to the science of extinction come at a good time: conservation scientists are about to come under the kind of scrutiny now experienced by climate scientists. In October, countries in the Convention on Biological Diversity plan to launch an Intergovernmental Platform on Biodiversity and Ecosystem Services, a scientific advisory panel similar to the Intergovernmental Panel on Climate Change.

There have been calls for this for a long time. Now the challenge will be to reach a consensus – a lack of which may have allowed some researchers to make inflated claims, says Carsten Rahbek of the University of Copenhagen, Denmark. "Scientists working for conservation organisations have used the SAR method (see main story) to get high estimates [of extinction rates]."

However, the increasing scarcity of funding to gather basic data on what species are where will make consensus-building difficult. At the same time, research will face greater scrutiny as countries work to meet biodiversity treaty obligations. For example, the European Union's biodiversity strategy, published this month, aims to use some of the EU's massive farm budget to fund ecosystem services, such as boosting bee populations.

Back to article

PRINT SEND SHARE