



Frontiers in Ecology and Evolutionary Biology

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Size Matters: Why the
Earth's species are headed
for a mass
extinction and how
pleasant it will be to
prevent it.

Seminar

Holland Hall Room 102

11:30 – 12:30PM

Imagine waking up everyday surrounded by natural wonders, waking up in an environment so restorative that you feel like you are on vacation. We can have a magical future like that one, or else one of sterility and desolation. For today, the Earth's treasury of species, its biodiversity, faces an historic fork in the road. If we keep claiming that diversity will survive in the embattled reservations which we set aside for her, we shall soon see the extinction of almost all species on the planet. But if instead, we recognize that, in order to survive, nature must be allowed and assisted to recolonize our human landscapes, we can produce a rich, sustainable planet to hand on to our children's children. Our generation gets to choose life's direction for the next million years.

We can make confident forecasts of sustainable diversity because biodiversity is a branch of science. A small army of biogeographers, ecologists, paleobiologists, evolutionists and biomathematicians working steadily for the past two centuries has discovered the forecasting laws. They did it by looking for underlying patterns and then, as is the way in all robust sciences, they searched for the causes of those patterns in rules of gain and rules of loss. The number of species is but the bottom line that results from a host of related transactions that govern diversity.

We call the gains originations --- the foundation events that give the Earth its new species. The dominant type of origination, geographical speciation, starts when geological or climatological forces divide a species into two (or more) isolated populations. If the isolation lasts long enough, genetic forces do the rest and one species becomes two. The bigger the canvas on which geology works, the faster new species appear.

The losses are extinctions. The several causes of extinction include the total disappearance of habitat as well as the appearance of other species that bring new disease, or a new predator, or parasite, or competitor. Because new interactions tend to shrink the area in which a species is established, they increase its chance of extinction. So, as originations add to diversity, they also reduce the opportunity for new isolates and increase the the average risk of extinction. The rate of gains per species ebbs, while the rate of losses per species rises. Eventually the two rates balance and the result is the sustainable number of species.

Two major influences determine whether a region's sustainable diversity is relatively rich or poor: climate and the region's size.

We do not yet entirely understand how climate works --- it is even possible that global warming will have little effect on how many species we shall see in a million years. But at first, global warming will accelerate extinction rates a great deal by eliminating whole habitats, especially the cooler ones at the poles and in high mountains.

Meanwhile, the ultimate player is how much land nature has available. We already have taken away 40% to 95% (depending on who is counting) and that reduces sustainable diversity by about the same percentage. Even at only 40% loss, life faces a mass extinction almost as large as the one that exterminated all dinosaurs 65 million years ago. No species is safe.

But we can prevent this mass extinction and do it with great rewards to ourselves. First we change our attitude. Instead of walling off the world of nature behind the fences of nature reserves, we reestablish her presence in our landscapes. We cannot do this merely by greening our landscapes. We must learn how to re-engineer them so that they represent a wide variety of new habitats. Each habitat will allow a unique list of species to thrive. This is called reconciliation ecology. However some species will never be able to live with us and will always need the sanctuary of a reserve. So we coordinate what we are doing with what nature reserves can do. Together, reconciled landscapes and nature reserve will defend the largest possible array of native species.

Providing a new habitat is far from trivial if we want it to do its job of meeting the needs of a defined set of wild species. However it has been done in a number of cases all over the world already. Research was necessary in each case.

Once the research is done, reconciliation ecology is cheap or even adds to profits. People already pay for nature to surround them. Think of the time and money we already spend on gardens and landscapes. Now imagine that we restyle our efforts by taking account of wild species in our plans. Our military installations do this already. If the Department of Defense can make peace with the environment, so can we all.

And reconciliation ecology can be a force for environmental justice, too. Richer people buy nature for their homes. Reconciliation ecology permits everyday people to enjoy the same right. And the largest environmental program in Africa, "Working for Water," puts people to work saving South Africa's treasure of native heathland shrubs, which produces more water for the Capetown area. It also trains its workers for the more skilled jobs to be had after they finish their time in the program.

Diversity is a science, not just descriptions of the weird and the cute. If we choose to, we can take advantage of that to build a future we will all be proud and happy to pass along.

Chalk Talk

Holland Hall Room 124

2:00 – 5:00PM