BOOKS & ARTS

A sixth mass extinction?

Past species losses have much to teach us about current and future declines due to human activity.

Terra: Our 100-Million-Year-Old Ecosystem — and the Threats that Now Put it at Risk
by Michael Novacek
Farrar, Straus and Giroux: 2007. 480 pp. $27

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This year the baiji river dolphin (*Lipotes vexillifer*), a victim of the pollution and boat traffic of China's Yangtze river, was added to the list of creatures on the verge of extinction. Is this part of the sixth mass extinction in 450 million years, or does the recent spate of losses caused by humans represent a blip in the history of life on Earth? Michael Novacek's *Terra* takes stock of the situation and provides an opportunity to learn from the past.

Novacek ambitiously amalgamates the comings and goings of species over the past 400 million years to set the stage for his description of recent human-induced extinctions and an examination of today's threats to species. I would have preferred a single, persuasive synthesis rather than a hotchpotch of stories relating to the past, present and possible future, but the author covers his material engagingly, interspersing it with personal anecdotes.

I do not buy the thesis that the proliferation of flowering plants and associated insects about 100 million years ago was more important in determining today's life and ecosystems than were other events in the geological past. After all, land covers only 29% of Earth and flowering plants are not the only terrestrial life forms. If their evolution is so important, are flowering plants more or less sensitive to human onslaught than other components of global ecosystems, and how is their geological history relevant to the answer?

It would have been useful to include critical comparisons of past, recent and future extinction rates. How do the numbers stack up? Three of the recognized 'big five' mass-extinction events occurred in the past 300 million years, each accounted for the extinction of some 30% or more of marine genera. If 30–50% of present-day species are on their way to extinction, to use the numbers that Novacek quotes, then roughly 15–25% of genera might be lost — still short of the big-five estimate.

There are many difficulties in making comparisons between geological data and future projections, the assumptions and uncertainties involved merit a serious discussion missing here. Projected extinctions are, on the face of it, already within the range of the largest extinction events of the past 300 million years, each of which has heralded the arrival of a major new geological period or epoch. The human-dominated 'anthropocene period' seems to be unfolding.

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The baiji river dolphin, *Lipotes vexillifer*, of China's Yangtze river may soon disappear.

Limiting the rate of extinction will be extremely difficult because space and resources are finite. Take the demand for food and bioenergy production: about a quarter of maize (corn) production in the United States for 2007 is designated for biofuel. To fulfil the new US 2017 target for biofuels from this inefficient source would require about 0.5% of Earth's land surface, and a considerably greater percentage of its potential farmland. If the same area of uncultivated land is taken into cultivation elsewhere to replace lost food production, this will drive about twice as many species to extinction — through extra habitat loss — as would be reprieved by mitigating climate change. It has been shown that if just 6% of the land currently used for maize-ethanol production for biofuels were to be displaced into further tropical deforestation — releasing the carbon held in those forests — no climate-change benefits from carbon mitigation would accrue at all.

Win–win solutions are sometimes possible, for example, by saving carbon in intact forests that protect biodiversity. But we cannot increase the world population by 50%, and increase the food resources available to every citizen, and grow our energy, pharmaceuticals, plastic and other products, and still maintain existing ecosystem services and all extant species. Of course, we shall solve some of these issues with technological fixes. Yet if we maintain 9 billion avaricious people on Earth for the next millennium, a sixth extinction event seems inevitable.

The geological perspective of *Terra* is bizarrely reassuring. Humans will presumably be gone within a few million years, perhaps sooner. If the past that Novacek describes is a guide to the future, global ecosystem processes will be restored some tens of thousands to a million years after our demise, and new forms of life over the ensuing millions of years will exploit the denuded planet we leave behind. Thirty million years on, things will be back to normal, albeit a very different 'normal' from before. It is good to be optimistic. The problem is living here in the meantime. ■

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