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Can "Assisted Migration" Save Species from Global Warming?

As the world warms up, some species cannot move to cooler climes in time to survive. Camille Parmesan thinks humans should help even if it means creating invasive species

Feb 16, 2009 | By [David Appell](#) |

Camille Parmesan didn't mind having her early work denigrated by Rush Limbaugh during his on-air program. "Actually, I was quite pleased with that," she says of the radio show host, who derided her studies on the geographic shifts of a butterfly species because of climate change. "I thought if I got his goat that heavily, then I must be making an impact."

That was in 1996, and since then she has become one of the leading conservation biologists monitoring what rapid climate change is doing to the world's plants and animals. Like many of her colleagues, she warns anyone who will listen of the ecological dangers. But unlike her colleagues, she is lately suggesting a way of saving threatened species that is still unthinkable to many biologists: assisting their migration and colonization.

The controversial approach, she argues, may be the only way to save imperiled species that cannot adapt to the unnatural rate of today's changes or escape to appropriate climes. Transplantation should be done, she says, even if it risks engendering new diseases and pests or other unintended consequences. Some scientists have begun to take her seriously, meeting to discuss the issue and building models that go beyond simple climate projections.

Parmesan did not hold such a view when she published her now famous 1996 study on the plight of Edith's checkerspot butterfly a delicate creature colored with brown, orange and white spots, sometimes no more than a centimeter across. She had spent almost five years trekking into the backcountry along the Pacific coast, from Mexico to Canada, crawling under the insect's plant, a type of snapdragon. Only once did she get chased off the land, in Baja California by someone who acted like "a typical drug lord," she recalls.

The checkerspot is very sensitive to temperature because its host plant dries out in warm temperatures, eliminating the insect's food source while in its caterpillar stage. Scientists already knew that human development and climate were driving down its populations, but Parmesan's systematic science startled everyone: three fourths of the populations at



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the lowest latitudes had become extinct, whereas only 20 percent of those in Canada had disappeared. Populations at higher altitudes were only one third as likely to go extinct as those at lower, warmer heights.

Soon Parmesan, now at the University of Texas at Austin, noticed similar trends among butterflies in Europe, where records of their domains go back much further. Subsequent analyses conducted with colleagues such as David Easterling of the National Climatic Data Center in Asheville, N.C., and Gary Yohe of Wesleyan University uncovered evidence of climate change nearly everywhere they looked. For instance, plants and animals have shifted their ranges by about six kilometers per decade toward the poles during the past quarter of a century. Spring events, such as blooming, frog breeding and migrant bird arrivals, have advanced 2.3 days per decade. Tropical pathogens are moving up in latitude and striking species not adapted to deal with them. About two thirds of the 110 known harlequin frog species in Costa Rica are believed to be extinct, their temperature-weakened immune systems devastated by a lethal fungus itself taking advantage of warmer temperatures.

Last December scientists announced the probable extinction of the first mammal because of climate change: the white lemuroid possum, now gone from Queensland, Australia. The possum, which lived only above 1,000 meters in altitude, could be killed by as little as five hours in temperatures greater than 30 degrees Celsius (86 degrees Fahrenheit). Although precise predictions are not yet possible, Chris D. Thomas of the University of Leeds in England and his colleagues have found that even under midrange global-warming scenarios, 15 to 37 percent of terrestrial species will be "committed to extinction" by 2050. Add that to existing threats from habitat destruction and migration barriers from towns and highways, and the future of the world's biodiversity looks increasingly thin and vanilla.

"As soon as I started to see what an impact climate change was having on wild species and documenting wild species going extinct," Parmesan says, she began to think about how the species might be saved. Short of the world's governments paying heed and cutting greenhouse gas emissions sharply to enable Earth to cool down, she and a few others began pondering alternative actions in particular, human assistance. She sees assisted migration, as the concept has come to be called, as the only hope to save at least some species though certainly only a small minority of those in peril. Jessica J. Hellmann, a conservation biologist at the University of Notre Dame, believes that most assisted migrations will require an advocate who favors a particular species for sentimental or, especially, economic reasons. (Parmesan understandably has several western butterfly species in mind.) Timber companies are already taking climate change into account when planting new trees to be harvested decades hence.

One amateur group, the Torreya Guardians, are attempting to "rewild" the endangered Florida torrey, a conifer tree. Native only to a 65-kilometer length of the Apalachicola River, it began to decline in the 1950s, probably because of fungal pathogens, and is thought to be "left behind" in a habitat hole that has prevented its migration northward. A few dozen seedlings were planted on private land near Waynesville, N.C., last July, with more expected.

Such assisted migration, Parmesan acknowledges, horrifies some conservation biologists: "They spend a good bit of time working against invasive species, and one big cause of species being endangered is being outcompeted by invasive species." In the particular case of the Torreya Guardians, "many biologists are queasy about it because they feel they didn't do the groundwork to see how it would impact the [new] community," she says. So she advocates systematic studies of threatened species' habitats where they thrive and why and what might threaten them.

Better theoretical tools will certainly help. Today's efforts, called climate envelope models, simply consider the temperature, precipitation levels and soil types that a species prefers, then feed that into a standard climate model to predict where a species might naturally migrate, sans human obstacles and assistance. Hellmann is working on a model that incorporates biological elements, such as genetics and competition among species what other species might be attracted or at risk, evolutionary responses, and so on because populations often vary genetically across a species' range. With such data, Hellmann remarks, "we can perhaps get rules of thumb that can help set population priorities."

Assisted migration is a more active idea in academia than among traditional conservation organizations. For example, the Nature Conservancy is studying the idea. "Assisted migration is a relatively drastic option," says Patrick Gonzalez, a climate change expert at the organization, "but might come about if all of our other options fail and a species is in danger of extinction. But it entails a lot of risks."

Such caution frustrates Parmesan, who was a co-author on a 2008 paper in Science proposing a "decision framework" for assessing the possible relocation of endangered species. "If we do nothing, we're also risking biodiversity. Conservation managers have the attitude

that doing nothing is good, and my approach is that doing nothing is bad," she explains.

But she is more dismayed by policy makers. In its last months in office, the Bush administration altered the Endangered Species Act to explicitly exclude climate change from factors that would necessitate independent, multiagency studies of species proposed to be protected. Parmesan's reaction was, she says, "mostly unprintable. It's in defiance of what every conservation organization is moving toward." John Kostyak of the National Wildlife Federation says that "chances are very good" for the Obama administration to reverse the regulation, although it could take as long as a year.

No matter what the White House does to tackle climate change, the world's ecosystems are in for more of a shock. Parmesan's call will surely only grow louder.

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