

Move over, polar bear

As icons for the victims of global warming, the most obvious species may not be the most deserving, says biologist **William Laurance**

I HAVE a problem with the polar bear – or at least with its status as an icon for the perils of global warming. Sure, this magnificent animal is being assailed by rising temperatures and vanishing habitat. But when it comes to convincing people of the need for action on climate change, the threat to the polar bear doesn't come close to representing the urgency of the situation.

A much greater danger is faced by the thousands of species – including many large, photogenic mammals – living in tropical rainforests. These lush forests are the world's most diverse ecosystems. With an area of 25 hectares – the size of 50 football fields – going up in smoke every minute, it's clear that wildlife there is massively at risk from habitat destruction. What may be less obvious is that species already adapted to sultry conditions are at dire risk from global warming.

Compared to those in cooler climates, tropical species can cope with only a narrow temperature range. Unlike their northern counterparts, they enjoy balmy weather all year, so have never adapted to freezing winters alternating with warm summers.

Because of this, most tropical species are also limited to particular elevations. Animals living in the lowlands rarely climb mountains because temperatures drop by about 1°C for every 100-metre increase in altitude. Even a 500-metre ridge can halt many lowland species in their tracks. Similarly, most mountain-dwelling species find the sweltering lowlands unbearable. Adapted for cool, cloudy conditions, their populations become isolated on particular peaks, which is why each mountain or chain of mountains tends to spawn scores of unique local species.

A clutch of recent papers have underlined the risks these species face from global warming. Animals endemic to mountains in the tropics may be among the most vulnerable. "As the world gets hotter, these creatures have nowhere to go," says Stephen Williams from James Cook University



in Queensland, Australia. "Their populations will wither and collapse until eventually they just disappear into heaven." Williams and his colleagues have modelled the responses to global warming of every endemic bird, mammal, frog and reptile species in the rainforests of north Queensland (*Proceedings of the Royal Society B*, vol 270, p 1887). Their conclusions are stark. If average temperatures rise by more than 2°C – which could easily happen this century – extinctions will spike dramatically.

The first species to go may be the white lemuroid possum (*Hemibelideus lemuroides*), a striking animal confined to a cool mountain top in north Queensland. It hasn't been seen by anyone in three years – and I spent a long night in 2008 searching for it myself. Williams reported last month that it may already be extinct. The last straw could have been a heatwave that hit the region in late 2005, when dead possums of several species were found along forest roads.

Species in the tropical lowlands are

vulnerable too. Biologist Raymond Huey at the University of Washington, Seattle, argues that many lowland species are living dangerously close to their thermal maximum. He points out that anolis lizards can die if heated to just a few degrees above their preferred foraging temperature. And during a recent summer heatwave, flying foxes in subtropical Australia died in droves (*Proceedings of the Royal Society B*, vol 275, p 419). At least 3500 of the giant bats succumbed to the heat in one day.

Such die-offs may prove irreversible, according to a study led by Robert Colwell at the University of Connecticut, Storrs, and published in October (*Science*, vol 322, p 258). As global temperatures rise, the authors conclude, species living near the foot of tropical mountains will migrate into the uplands, and mid-elevation species will move even higher. But lowland species with no mountains nearby, such as those in the vast Amazon and Congo basins, will have nowhere to go.

We seem to have reached the point at which global warming rivals habitat destruction as a threat to tropical biodiversity – or at least the two threats reinforce each other. Increasing habitat loss is likely to trap forest species, stopping them from seeking more favourable climates or elevations. The fragmented populations that remain will be battered by heatwaves, droughts, storms and other effects of global warming. Many will vanish forever.

It's an alarming scenario, and it has tropical biologists wondering which battle to fight first: habitat destruction or global warming. I believe that slowing habitat loss is the higher priority, in part because the rapid destruction of tropical forests produces about one-fifth of all greenhouse gas emissions today. Saving rainforests is one of the most effective ways to fight global warming, as well as helping to preserve some of the Earth's most imperilled species and ecosystems.

Perhaps we should also adopt the white lemuroid possum as an icon for the victims of global warming. Given that tropical species endangered by global warming probably outnumber their polar counterparts by 1000 to 1, it seems fitting. ●

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