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How Global Warming is Changing the Wild Kingdom

 By [Ker Than](#)

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The planet is warming, humans are mostly to blame and plants and animals are going to dramatic lengths to cope. That's the consensus of a number of recent studies that used wildlife to gauge the extent of global warming and its effects.

While the topic of climate change is [contentious](#) -- including whether the planet is actually heating up -- a growing number of documented shifts in traits and behaviors in the wild kingdom is leading many scientists to conclude the world is changing in unnatural ways.

Among the changes [\[see full list\]](#):

- Marmots end their hibernations about three weeks earlier now compared to 30 years ago.
- Polar bears today are thinner and less healthy than those of 20 years ago.
- Many fish species are moving northward in search of cooler waters.
- A fruitfly gene normally associated with hot, dry conditions has spread to populations living in traditionally cooler southern regions.

While we argue ...

Over the past century, Earth's average temperature has risen by about 1 degree Fahrenheit and many scientists believe greenhouse gases and carbon dioxide emissions from human activities are to blame. Left unattended, they [warn](#), temperatures may rise by an additional 2-10 degrees by the end of the century. In the leading computer models, it follows that polar ice will melt and seas would [rise drastically](#), threatening coastal communities around the globe.

A handful of scientists dispute the data. Others say humans aren't to blame.

Terry Root, an environmental science and policy professor at Stanford University, says that as humans argue about thermometer readings, animals are providing evidence that should be figured in to scientific and political decisions.

Animals are "just reacting to what's going on out there," Root says. "And if their behavior is very similar to what we expect with what's going on with global warming -- if they're shifting and they're moving, if they're changing their breeding time by 5 days in 10 years -- we can use that

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information to support what the thermometers are also showing."

Climate change can occur naturally, but what worries many scientists the most -- and the reason why they don't think this is part of a natural cycle -- is the rapid rate at which the current changes are happening -- changes that are being reflected in the responses of wildlife.

In a 2003 study published in the journal *Nature*, Root and her colleagues analyzed numerous studies involving wild plant and animals for changes due to global warming. Out of the nearly 1,500 species examined, the researchers found that about 1,200 exhibited temperature-related changes consistent with what scientists would expect if they were being affected by global warming.

The authors highlighted four possible ways that species might respond to rising temperatures, all of which have been documented by other studies and researchers.

Divide and destroy

The first is for species to migrate northward or move to higher elevations. The ubiquitous presence of humans, however, is making this option difficult for some species.

"The thing that is very, very different from prehistoric times is that there are now K-Mart parking lots these species have to cross as they try to move north to get away from the heat down south," Root told *LiveScience*.

As a result, species that can't adapt to urban or agricultural environments become isolated, their lines of retreat cut off.

In a study published last year in the journal *PLoS Biology*, Elizabeth Hadly, a biologist at Stanford University, examined fossil records from past warming periods and concluded that global warming can reduce genetic diversity by affecting the connections between species populations.

The best way to ensure species survival is to have large, interconnected populations that are genetically diverse, Hadly explained in an email interview.

This means that even if the genetic diversity of a species as a whole is high, if the individuals are scattered and prevented from interbreeding, they can become just as vulnerable to disease and external threats as a species with a *small* population and *low* genetic diversity. Like the military strategy of divide-and-conquer, a group that together might have had the resources to withstand an assault can be picked off one by one if split up.

Connections among individuals within a species aren't the only things that can be disrupted: global warming can also threaten the ties that bind members of *different* species to one another.

Many biologists, including Darwin, once believed that species responded to temperature changes as a group, thus preserving their relationships to one another. But scientists are finding that this is often not the case.

Instead, different species respond to environmental stressors in different ways, and this can lead to what Root calls the "tearing apart of communities."

Intricate connections

The second prediction was that the timing of natural events like flowering, migration, and egg-laying could shift. Ecosystems are intricately connected webs, and even if a species doesn't rely on



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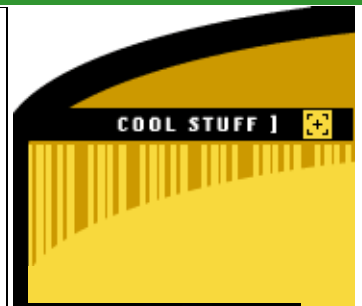


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temperature and daylight cues to trigger certain behaviors, it may interact with other species that do.

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"Thousands of years of co-evolution could easily be disrupted," Root says.

Third, the body size and behaviors of species may change in response to rising temperatures. For example, scientists believe that as a general rule, bodies become smaller in response to general warming and larger with cooling.

A 2003 study led by Philip Gingerich, a geological sciences professor at the University of Michigan, looked at horse fossils from a warming period that occurred 55 million years ago. They found that as temperatures rose, the fossils shrank, from the size of a small dog to a house cat. The researchers believed the dwarfing might have resulted from the horses eating plants whose tissues were low in protein but high in toxic compounds -- plants that flourished in the carbon dioxide-rich environment of the time.

Finally, species can undergo genetic changes. This last prediction has been documented in at least two species, the red squirrel and the fruitfly *Drosophila*.

Business as usual?

Not all scientists are convinced humans have anything to do with climate change or the shifts seen in the animal world.

Michael Patrick, an environmental science professor at the University of Virginia, believes the current warming is part of a natural cycle.

"It's what you'd expect," Patrick told *LiveScience*. "It's not all a result of human induced climate change. Half of it is at best, probably less than half."

Even if humans are causing global warming, Patrick said, there is little we can do to change it. "If it is an issue, it is one that we will have to adapt to."

Patrick believes the wildlife changes are likewise natural.

"With all due respect, you would expect to see some slight changes in the distribution of plants and animals as the planet warms -- or as the planet cools for that matter," Patrick said. "It's hardly newsworthy."

If anything, most species would benefit from an earlier spring, and focusing on global warming is a harmful distraction from more serious problems afflicting wildlife, Patrick says. "If you asked me which one we should worry about more -- changes in climate or human-caused changes in habitat -- I would say that the latter is much more important."

"Overall climate will change quite a bit," Patrick said. "However, if you change characteristics of the surface -- if you turn forest into farmland -- that will have more severe effects on wildlife than merely changing the temperature a degree or two."

Stressful future

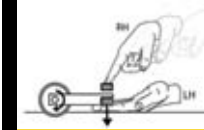
Ecosystems and wildlife aren't the only things that increasing temperatures will affect.

"Global warming is going to be a big stress to all animals, including *Homo sapiens*," said Root.

A recent report issued by the Pew Center for Global Climate Change, a Virginia-based nonprofit organization, warned that rising temperatures could exacerbate health risks such as asthma for the elderly, the infirm and the poor, and especially for those in poor countries.



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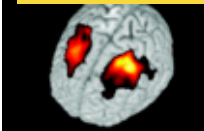
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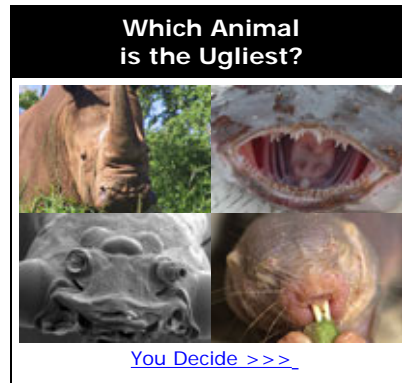
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Even if all pollution were stopped today, the climate will warm at least another degree by the year 2100 and seas will rise 4 inches (11 centimeters), according to one [recent study](#). Another report says warming is unstoppable through the year 2400. Despite the dire warnings, many scientists believe it may not be too late to reverse the trend.

The Pew report suggests creating transitional habitats that link natural areas as a way to help migrating species. Also, alleviating other environmental stressors like habitat destruction could help reduce their combined effects with global warming.

Root is encouraged by the fact that many cities are following higher environmental standards, even if state and national governments are dragging their feet.

In the end, she believes, it will be the relatively small things that people do that will have the biggest impact: "Hummer sales, thank heaven, are dropping since gas prices have gone up, and hybrid [car] sales have gone up. It's that type of stuff."

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The red fox is spreading northward in response to a warmer climate, scientists say.

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