

## Climate Files

### Heading home?

British researchers have discovered that a species of microscopic plankton is migrating back to the North Atlantic, more than 800,000 years after its extinction in the region. The shift is likely due to warming ocean temperatures and melting polar ice. And though the plankton is a food species, its return is not being welcomed, as it signals changes at the base of the marine food chain that could have harmful consequences for other species.

### Bold step

This past July, Quebec introduced an ambitious cap-and-trade program to reduce carbon emissions. Targeting major industrial polluters, it has been cheered by environmental groups. But critics argue it could lead to speculation in carbon markets, driving up the price of carbon credits, and that it fails to address other major carbon-emission sources, such as automobile use.

write climate researcher Will Steffen and others in a recent issue of the journal *Philosophical Transactions of the Royal Society* devoted to the Anthropocene.

Biology has often been controversial. I think of Darwin, hunkered down at his estate in Kent 150 years ago, as he published his theories of natural selection and evolution. They were counter-cultural because they described a world humans had stumbled into rather than one made by God all at one time for the benefit of man, unchanging.

The controversy today over our effect on planetary systems is strangely linked to that. Today the struggle is also for the public to accept that things change. But this time it's not about a different distant past, it's about a potentially catastrophically different near future, wrought at our hand, unless we back away from the high-carbon world we have made.

To me, it says that the scientists piecing all this together are not just pioneers — they are also our best hope for survival. 🌍

# This Is a Wake-Up Call

If you haven't already heard of chronic wasting disease in deer and elk, it's time you did

By Jay Ingram Photos by Mark Raycroft



## EARLY WARNING

*CWD was first noticed among mule deer (above) at a Colorado research facility in 1967. It is now a threat to wild populations of deer, elk and moose in several U.S. states and two Canadian provinces.*

The image of dead cows engulfed in giant sacrificial bonfires depicted the disaster of Britain's 1980s mad cow disease outbreak better than any statistics. The epidemic did spread like wildfire, and slaughtering cattle was a desperate attempt to stop it. There is a similar disease in wildlife in North America, but because it is merely smouldering, it hasn't captured the public attention. But it should.

Mad cow was caused by bizarre infectious agents called "prions," misfolded protein molecules that spread to the brain of an infected animal, reproduce there and eventually kill the host. Its counterpart here and now is chronic wasting disease (CWD), also a prion infection that is established in both captive and wild populations of animals. It is unclear how it spreads and uncertain how far it will spread. One thing is sure though: prion scientists are very worried about it.

CWD was first noticed in 1967 at a mule deer research facility near Fort Collins, Co. The deer were losing weight, behaving oddly and eventually wasting away or dying suddenly after being handled. This previously unrecognized disease then began to spread, first to other captive animals, then in the 1980s to wild elk and deer, although it was probably around in these wild populations, unnoticed, at least 20 years before that.

Today, chronic wasting disease has spread to 18 states and two Canadian provinces, but there still isn't much known about it.



#### CARIBOU AT RISK?

*As CWD spreads it is moving northward, where it may intersect with caribou migration routes. Preliminary experiments suggest caribou are not easy to infect, but research so far has not been comprehensive.*

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#### New funding for prion research

Almost \$3 million in new funding was made available in mid-July to researchers studying prion diseases in humans and wildlife species. Included in the funding is support for scientists at Saskatoon's Vaccine and Infectious Disease Organization who are investigating developing a vaccine to fight CWD in wild elk and deer that would be delivered via food packets. Similar tactics are used to control rabies among foxes and raccoons in Eastern Canada.

Meanwhile, researchers at the University of Alberta are receiving support to identify risk factors for CWD in the wild, including potential threats to people and domestic animals, and to develop policy measures to reduce those risks. The funding for these and other projects comes from PrioNet Canada, a national research network..

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Estimates of the number of animals infected are tricky because we likely never see most of them—they die out of our sight, killed by predators, then scavenged.

How is it spreading? It could happen when an infected animal nuzzles others. There are plenty of prions in the saliva, and these can be passed by animals not yet exhibiting any symptoms of the disease. But it's also probable that urine, feces and placentas of infected animals are contaminating the landscape. And that could be a huge problem. These prions apparently remain infective for incredibly long periods of time, likely many years, in the wild.

Even with this apparent potential for spread, it might be tempting to dismiss the threat of CWD: yes, many animals are infected, but they are spread over vast areas of North America. But a study of the mule deer population in the Table Mesa area southwest of Boulder, Co., showed how dramatic the effects of CWD can be: the disease has been there since 1985, and the mule deer population is now about half the size it was. The life expectancy of infected deer was reduced from more than five years to less than two, and predation by mountain lions on those deer increased fourfold.

But it's not simply that CWD is a threat to deer, elk and even moose (although that should be enough). There are other significant worries. One of them is: are we susceptible? Thousands of people eat venison and elk in the United States and Canada. Eating cows with BSE has proven fatal for humans. And unlike BSE, and more unsettling, the CWD prions have been found in the muscle tissue—the meat—of mule deer. To date, there is no evidence that anyone has come down with a prion disease after eating meat from an animal with CWD, but neither has that possibility been eliminated.

Another ominous, but at the same time extremely uncertain risk, to another species altogether: caribou. CWD is now well established in Saskatchewan and Alberta, and is gradually working its way north. (And don't forget, surveillance of living deer gives us at best a sketchy picture of how far the disease has spread: many that are incubating the disease have escaped our notice.) The northern part of Saskatchewan is home, at least part-time, to herds of both woodland and barren ground caribou, tens or even hundreds of thousands of animals. Many aboriginal people depend on the annual arrival of the herds. In meat value alone, the northern caribou herds are worth an estimated \$100 million, but their cultural value to the people who have lived with them for centuries is beyond any dollar value.

So the shadow of a threat looms: if infected deer bring CWD far enough north to intersect with the caribou migration routes, and if caribou are susceptible to CWD, then we have the makings of a disaster. Part one is already underway. But are caribou susceptible? Preliminary experiments suggest that caribou are not easy to infect, but these experiments did not exploit the full range of different CWD prions, so little solace can be taken from that.

Besides attempts to get a handle on the spread of CWD, scientists at the University of Saskatchewan in Saskatoon are beginning to develop a vaccine, but control of the disease is, unfortunately, a long way off. What can be said is that prion scientists are definitely worried about its potential impact—some even thinking that the disease could ultimately threaten all North American populations of the so-called cervids: deer, elk, moose and caribou. It seems like a remote possibility, but then, so did BSE. 🌀