



**LETTERS**

Sled dogs at work in Greenland.

Edited by **Jennifer Sills**

## Greenland sled dogs at risk of extinction

Dog (*Canis familiaris*) and sled remains found together suggest that the first sled dogs arose approximately 10,000 years ago (1). The ancestors to current sled dog breeds were essential to the Inuit's conquest of the Arctic. Sled dogs provided the main transport and hunting platform (2) for various Inuit groups, including the Old Bering Sea culture and Penuk (3), dating back at least 2000 years (4). The endemic Greenland sled dog breed lives with local communities north of the Arctic Circle on both the west and east coasts of Greenland. Greenland sled dog numbers have declined substantially, from more than 25,000 in 2002 (5) to fewer than 15,000 in 2016 [p. 15 in (6)].

There are multiple reasons for this decline. First, because of climate change, sea-ice is retreating, which hampers traditional hunting and hinders the provision of basic food for humans and dogs alike (7). Second, a large number of dogs and entire subpopulations are being wiped out by epidemics of canine distemper and parvovirus (8). Third, a change in culture has led people to replace the sledge with the snowmobile [p. 23 in (6)]. Unlike most other endangered species, sled dogs are domestic animals that can potentially be bred if there are incentives to do so. However, these changes in the cultural legacy and the reduced need for the dogs to pull sledges have led to correspondingly reduced motivation to breed enough dogs to maintain population numbers.

This drastic population decline could lead to the extinction of this unique breed, which would substantially affect how the Greenland Inuit use their environment, and

in turn could affect health and well-being. Furthermore, because Greenland sled dogs are widely distributed and are vulnerable to the same health risks as humans (such as zoonosis, environmental chemical contaminants, and climate change), the species is being used to monitor One Health—an initiative streamlining the health of humans, animals, and the environment—in the Arctic (9). To mitigate disease outbreaks and to halt population decline, we urgently need more research focused on these culturally and ecologically important Greenland sled dogs.

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## The misunderstood sixth mass extinction

Scientific misunderstanding about the nature and consequences of the sixth mass extinction has led to confusion among policy-makers and the public. Scientists

agree that there have been five mass extinctions in the past 600 million years (1). Although scientists also agree that Earth is now suffering the sixth mass extinction, they disagree about its consequences. Mass extinctions are defined as the loss of the majority of species in a relatively short geological time, caused by a catastrophic natural event (2). Some scientists argue that there is no reason for concern about the sixth mass extinction because extinction is normal, simply an inevitable consequence of the process of evolution (3, 4). This misunderstanding ignores some critical issues. First, the rate of species extinction is now as much as 100 times that of the “normal rate” throughout geological time (5, 6). Second, like the past mass extinctions, the current episode is not an inevitable consequence of the process of evolution. Rather, it is the result of a rare event changing the environment so quickly that many organisms cannot evolve in response to it.

In theory, evolution on Earth could proceed as long as conditions permitted with no mass extinction events. That has been the case for vast stretches of geological time between occasional encounters with unusual environmental circumstances. Extinctions did occur, but not suddenly and nearly universally, as is happening now (7, 8). The rate and extent of current extinctions is similar to those of past mass extinctions, not the intervals between them (9, 10). If past mass extinctions are any guide to the rate at which usual evolutionary diversification processes could restore a reasonable level of biodiversity and ecosystem services, the wait is likely to be millions, or even tens of millions of years (8, 9).

At the time of the past mass extinctions, there was no industrialized human population of almost 8 billion people utterly dependent on the ecosystem services

biodiversity helps provide, such as pollination, pest control, and climate amelioration (7, 8, 11). Scientists who deny that the current mass extinction has dire consequences, and policy-makers who listen to them, fail to appreciate the penalties human civilization will suffer for continuing on society's business-as-usual course (2–5). Moreover, beyond the consequences to humans, exterminating most of the only known living things with which we share the universe is clearly wrong (5–8, 12). The future of life on Earth, and human well-being, depends on the actions that we take to reduce the extinction of populations and species in the next two decades (8). It is irresponsible and unethical not to act despite the overwhelming scientific evidence indicating the severity of the current mass extinction event.

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## Injustices of foreign investment in coal

After remaining flat from 2014 to 2016, global greenhouse gas emissions in 2017 increased to a record high (1). One contributing factor is foreign investments in coal. Many countries are working to reduce their carbon footprints within their borders, but adding to emissions by investing in coal-based power projects elsewhere in the world. According to the Natural Resources Defense Council (NRDC), between 2007 and 2015, G20 countries financed US\$76 billion worth of overseas coal projects (2). China, Japan, Germany, and South Korea were responsible for US\$62 billion of the total (2).

After the 2015 UN Climate Change Conference (COP21), China, along with other nations, committed to cut greenhouse gas emissions. As promised, China has taken steps to substantially reduce coal use over

the past few years (3). However, China's government has continued to finance coal-based power projects beyond its borders, especially in countries where environmental regulations and laws are weak. In 2016 alone, China financed coal projects worth US\$6.3 billion in Egypt, Bangladesh, Pakistan, and Indonesia (4). In Pakistan, China plans to install coal-based power plants with a capacity of at least 7800 MW as part of the China-Pakistan Economic Corridor (CPEC) project (5). This investment includes excavation of coal-lignite from the Thar Desert of Pakistan (6). Coal-lignite emits about 1100 grams CO<sub>2</sub> per kilowatt-hour, compared with natural gas, which emits 150 to 430 grams per kilowatt-hour (7).

Between 1994 and 2012, Pakistan's greenhouse gas emissions increased at an annual rate of 4.1% (8), and the lignite-based power plants will likely increase the rate further. China's investments in coal-based energy plants, in the guise of producing energy, could have serious impacts on air and water quality and consequently serious repercussions to adjacent ecosystems, as well as to human health. The costs and consequences of such coal-based projects can stretch over decades, and they can trap developing nations in a system of carbon-intensive energy use. Pakistan, a country rated seventh most vulnerable to the impacts of climate change (9), must rethink its future in the energy sector.

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# Science

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