Changing climates, mixing genes: Global warming may cause an increase in animal hybrids

As our climate shifts, so do the ranges of plants of animals.

Warming climates, for example, have pushed montane fir forests of Vermont higher and higher up the green mountains. This has in turn pushed the already threatened Bicknell's thrush in Vermont, which depends on these habitats, higher and higher and into smaller and smaller ranges. Now conservationists are worried there will soon be nowhere left for the species.

The same shrinking habitat affects the polar bear — surely you've seen an image of a polar bear floating, hapless, on the last shred of pack ice in the arctic? The bears depend on the pack ice to hunt, and without it they will need to dramatically alter their behavior or starve.

But these animals are not losing habitat to a lifeless void. Bicknell's thrushes have to contend with other closely related thrush species that are able to range farther up mountainsides as temperatures rise and forest composition changes; Polar bears encounter grizzlies as the great white bears range further abroad in search of food.

And where enough closely related animals mix, you get hybrids.

A captivating piece by Tim McDonnel in Nautilus uses the Arctic – by far the most dramatic location for observing climate change — as the setting to explore the coming "hybrid boom".

> In the last 40 years, the Arctic has warmed by about 3.5 degrees Fahrenheit, more than twice the overall global rise in that same period. Already grizzly bears are tromping into polar bear territory while fish like cod and salmon are leaving their historic haunts to follow warming waters north. One tangible result of the migration, scientists report, is that animals will learn to live with new neighbors. But polar biologists worry that animals could get a little *too* friendly with each other. With less ice clogging Arctic seas, whales are ranging farther; meanwhile, animals like seals that breed on the ice have fewer places to go. In both cases, the chances of encountering a different species jump. "All of a sudden, hybridization will skyrocket," says Brendan Kelly, a polar ecologist at the National Science Foundation.

The first confirmed cross between a polar bear and a grizzly bear—a white bear with brown patches—was documented in 2006; genetic analysis of a second, found in 2010, revealed that its mother was also a hybrid, suggesting that more instances are happening under scientists' radar. In 2009, a biologist at the National Marine Mammal Laboratory photographed a probable bowhead/right whale hybrid in the Bering Sea. More hybrids are possible. Kelly and his coauthors have counted 34 opportunities for hybridization across 22 Arctic or near-Arctic species, based on the animals' genetic compatibility and geographic range. The list includes potential hybrids of ringed and ribbon seals, Atlantic walrus and Pacific walrus, and beluga whales and narwhals.

A polar bear/brown bear hybrid at a museum in England. CREDIT: Messybeast, Wikimedia Commons.

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Hybridization as a result of dramatic changes in animals ranges/habitats is not unprecedented. There is a compelling argument to be made that the coyote, which was a native of the arid Southwest until the near-extermination of the wolf at the turn of the 20th century, interbred extensively with its larger cousin as the wolves were wiped out and the coyote expanded its range to take their place. Now the much larger, more wolf-like coyotes of the American Northeast, including my home of New England, maybe more accurately called "coywolves".

The loss of our wolves and their semi-replacement by a new hybrid species has not been perfect, however. Eastern coyotes do go after larger prey like white-tailed deer more often than their southeastern

kin, but they can't fully fill the ecological vacuum left by the loss of an apex predator.

McDonnel cautions against getting too excited about a future of "grolar bears" and "narlugas".

> While it's tempting to imagine a strange new Arctic teeming with "grolar bears" and "narlugas," hybridization comes at a cost. Arctic biodiversity will be reduced through gradual consolidation, taking with it a blend of genes that have evolved by natural selection over millennia. "There's going to be a whole bunch of organisms containing genes that we're going to lose," Kelly says. Which genes, exactly, is unclear. A hybrid's success, like any organism's, hinges on its fitness to its environment. Because the Arctic is changing rapidly, it's hard to predict which traits will be most important for, say, a population of grolar bears. Merging features of two well-adapted parent species might help hybrids cope with shifting conditions. But more often than not, Kelly thinks, genetic incompatibilities in hybrids will erase traits crucial to the long-term survival of both parent species. If that happens, he says, "then we can expect a great reduction in those populations, and possibly extinctions."

Hybrids are undoubtedly fascinating. They break the "rules" we were taught about species boundaries, they are anomalies and sometimes they're even giants. (I'm thinking of the liger, which is the captive-born offspring of lion father and tiger mother that, due to a quirk of its genetics, grows far larger than either parent.)

Ligers are popular attractions at circuses and renaissance faires (CREDIT: Zoe French/Flickr).

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Ligers are popular attractions at circuses and renaissance faires (CREDIT: Zoe French/Flickr).

This natural alchemy comes at a cost. Removing the physical barriers between species lets them mingle their genes, and it might create viable hybrids. But the first principle of alchemy is equivalent exchange; "To obtain, something of equal value must be lost".

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Additional Resources:

- "Genetic analysis shows that the Yeti was actually a polar bear hybrid," George Dvorsky | io9
- "DNA Turning Human Story Into a Tell-All," Alanna Mitchell | New York Times
- "Hybrid Populations," Macroevolution.net