3Qs: New approach to understanding climate change

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Brian Helmuth, a professor of environmental science and public policy. Credit: Brooks Canaday/Northeastern University

Climate change continues to be a major topic of discussion—and often, fierce debate—on both the national and global stage. Brian Helmuth, a professor of environmental science and public policy at Northeastern's Marine Science Center, and a team of international researchers published a review in Climate Change Responses last month in which

they call for a new approach to understanding and predicting the impact of climate change.

Here, Helmuth, who holds joint appointments in the College of Science and the School of Public Policy and Urban Affairs, discusses why they wrote the review and the importance of looking at climate change in a different way.

What was the catalyst for this paper?

Last month the U.S. Senate passed an amendment to the Keystone XL bill acknowledging "climate change is real and not a hoax," but fell short of passing a subsequent amendment recognizing that humans largely cause today's climate change.

An appearance of a "debate" on human-caused climate change among non-scientists in Congress and in the general public stands in stark contrast to the scientific community, which has long recognized the overwhelming evidence of human-caused climate change.

It is also a sharp contrast to much of the rest of the world, which has accepted the reality of climate change and is actively preparing for its impacts. The authors of our paper—including scientists from the U.S., Australia, Canada, China, Hong Kong, Italy, Portugal and the U.K. —became increasingly frustrated that this perception of a "debate" in countries like the U.S. was beginning to affect scientific priorities.

Specifically, we argue that the question of whether climate is changing and is largely human-caused is now settled, and that the true challenge is to determine where, when, and with what magnitude these changes are occurring. Only by taking this approach can we can proactively prepare for impacts to humans and the ecosystems on which we depend.

What would you say is the most critical detail regarding biological responses to climate change that is overlooked due to research generalizations?

Generalizations such as increases in average surface temperature are useful for describing general trends. For example, a difference in global temperatures of 6 degrees Celsius (the same magnitude as what some models project for 2100) is the difference between today and the last ice age.

What these global trends tend to ignore is that there is extremely high variability in changes in temperature and precipitation over the globe. When we refer to "climate" we usually mean a 30-year trend in weather; "Global warming" means that on average, the vast majority of places around the world are getting warmer, but the degree to which this is happening varies because of the way heat is moved across the planet. It also means that in some places (like New England) we experience more intense rainfall and snowfall because of higher levels of moisture in the air, while other places experience extreme drought. Importantly, this does not mean that each successive year will be hotter than the previous year; it means that there is a highly significant trend showing that temperatures are on average much hotter today than they were even 30 years ago.

The idea here is that "climate trains the weather, and weather throws the punches." In other words, organisms (and humans) care about climate because it alters weather patterns, which are getting more and more unusual. Because of this, many people have started to call what we are experiencing "global weirding" instead of "global warming."

A great example of this occurred in the summer of 2012, when a record heat wave caused temperatures in the Gulf of Maine to be 3 degrees

Celsius higher than normal. This large increase affected the rate at which lobsters grew and molted, leading to unprecedented catches and a flooding of the market, but it likely had negative affects on other species living within the ecosystem. This temperature anomaly was the result of long-term changes in climate but it was the short-term weather that drove the observed responses.

Are there any specific organisms or ecosystems that you believe best support the need for more focused research? Why?

The arguments that we make apply to almost all ecosystems on Earth, but especially those whose conditions change the most rapidly and whose animals and plants are already living close to their limits. The Gulf of Maine is warming faster than 99 percent of any other large body of water on the planet, which puts us at ground zero. Anticipating the impacts these changes will have on fishery species and key "ecosystem engineers" such as marsh grasses and oyster beds in our region is going to be vital if we are to prepare for what lies ahead.

More information: "Beyond long-term averages: making biological sense of a rapidly changing world": www.climatechangeresponses.com … 40665-014-0006-0.pdf

Provided by Northeastern University

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