Scientists seek new emphases in Arctic climate change research

posted on: september 10, 2009 - 9:10pm

FAIRBANKS, Alaska— Much of circumpolar Arctic research focuses on the physical, direct changes resulting from climate warming such as sea ice retreat and temperature increases. "What's understudied is the living component of the Arctic and that includes humans," said Syndonia "Donie" Bret-Harte, associate professor of biology at the University of Alaska Fairbanks and co-author of a paper to be published September 11, 2009 in the journal *Science*.

The paper reviews current knowledge on the ecological consequences of climate change on the circumpolar Arctic and issues a call for action in several areas of global climate change research.

"Humans live in the Arctic with plants and animals and we care about the ecosystem services such as filtering water, fiber and food production and cultural values that the Arctic provides" said Bret-Harte, who specializes in Arctic plant ecology in Alaska.

The global average surface temperature has increased by 0.72 F (0.4 C) over the past 150 years and the average Arctic temperature is expected to increase by 6 C. "That's a mind bogglingly large change to contemplate and keep in mind that no one lives at the average temperature," Bret-Harte said.

The international team of scientists who collaborated on this paper reviewed dozens of research documents on the effects of circumpolar Arctic warming. They note that numerous direct effects including lengthening of growing season following a rapid spring melt, earlier plant flowering and appearance of insects following a warmer spring, deaths of newborn seal pups following melting of their under-snow birthing chambers have other, often more subtle, indirect effects on plants, animals and humans that warrants increased attention.

Understanding how changes in plant and animal populations affect each other and how they affect the physical or nonliving components of the Arctic is critical to understanding how climate warming will change the Arctic.

One effect studied intensively at the UAF Institute of Arctic Biology Toolik Field Station on Alaska's North Slope is shrub expansion on the tundra.

"Shrubs are increasing on the tundra as the climate warms and more shrubs will lead to more warming in the spring," said Bret-Harte. Snow reflects most incoming radiation, which is simply light that can transfer heat. Shrubs that stick out of the snow in spring absorb radiation and give off heat. In this positive feedback cycle, the heating of the air immediately above the snow warms the snow, causing it to melt sooner. Warmer soils lead to increased nutrient availability, which contributes to greater shrub growth, which then contributes to still more warming.

Another effect studied intensively in Alaska occurs under the snow.

"We need to better understand how winter comes and goes and how that drives shifts in plant-animal interactions," said Jeff Welker, professor of biology at the University of Alaska Anchorage. When it didn't snow at Toolik Field Station until Thanksgiving a few years ago the soil got cold and stayed cold. So cold that microbes in the soil were barely active. The spring green-up was slow in coming and likely affected caribou forage, says Welker.

In 2008, the snow started falling in September and never quit. The warmer winter soils with their active microbes were insulated from the cold and were able to provide nutrients to plants that stimulated growth.

The authors call for immediate attention to the conservation of Arctic ecosystems; understanding the ecology of Arctic winters; understanding extreme events such as wildfires and extended droughts; and the need for more baseline studies to improve predictions.

"This paper identifies gaps in our knowledge, what we need to be doing and where the public needs to spend its money," said Welker.

Source: **University of Alaska Fairbanks**

Similar Articles On This Topic:

- Dramatic biological responses to global warming in the Arctic
- IPY follow-up requires year-round research on Arctic and global warming
- Study: Young Arctic muskoxen better at keeping warm than scientists thought
- The change in Arctic nature foreshadows the global environment of the future
- Thanks for preventing the next Ice Age: Recent Arctic warming reverses millennia-long cooling trend

Popular Today:

- Archaeology meets mythology in Mycenean Pylos
- Jets on Saturn's moon Enceladus not geysers from underground ocean, says study
- 'Liposuction leftovers' easily converted to IPS cells, Stanford study shows
- Electrical circuits run entirely from tree power
- First results from major European patient survey show devastating impact of living with breakthrough cancer pain

Scientific Blogging:

- Are the new Hubble Images Better ?
- King Nestor - Argonaut And Trojan War Hero's Palace Discovered In Greece
- Vegetable Oils For Biofuels
- Biscuits More Dangerous than Things You Actually Worry About
- The Resurrection Of Metaphysics?

more