

Better food makes high-latitude animals bigger

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(PhysOrg.com) -- New research suggests that animals living at high latitudes grow better than their counterparts closer to the equator because higher-latitude vegetation is more nutritious. The study, published in the February issue of *The American Naturalist*, presents a novel explanation for Bergmann's Rule, the observation that animals tend to be bigger at higher latitudes.

Ever since Christian Bergmann made his observation about latitude and size in 1847, scientists have been trying to explain it. The traditional explanation is that body temperature is the driving force. Because larger animals have less surface area compared to overall [body mass](#), they don't lose heat as readily as smaller animals. That would give big animals an advantage at high latitudes where temperatures are generally colder.

But biologist Chuan-Kai Ho from Texas A&M University wondered if there might be another explanation. Might plants at higher latitudes be more nutritious, enabling the [animals](#) that eat those plants to grow bigger?

To answer that question, Ho along with colleagues Steven Pennings from the University of Houston and Thomas Carefoot from the University of British Columbia, devised a series of lab experiments. They raised several groups of juvenile planthoppers on a diet of cordgrass, which was collected from high to low latitudes. Ho and his team then measured the body sizes of the planthoppers when they reached maturity. They found that the planthoppers that fed the high-latitude grass grew larger than those fed low latitude grass.

The researchers performed similar experiments using two other plant-eating species—grasshoppers and sea snails. "All three species grew better when fed plants from high versus low latitudes," Ho said. "These results showed part of the explanation for Bergmann's rule could be that

plants from high latitudes are better food than plants from low latitudes." Although this explanation applies only to herbivores, Ho explained that predators might also grow larger as a consequence of eating larger herbivores.

"We don't think that this is the only explanation for Bergmann's rule," Ho added. "But we do think that studies of Bergmann's rule should consider ecological interactions in addition to mechanisms based on physiological responses to temperature."

It's not known why the higher-latitude plants might be more nutritious. But research in Pennings's lab at the University of Houston offers a clue. Pennings has shown that [plants](#) at low latitudes suffer more damage from herbivores than those at higher latitudes. Ho and Pennings suggest that perhaps lower nutrition and increased chemical defenses are a response to higher pressure from herbivores.

More information: Chuan-Kai Ho, Steven C. Pennings, and Thomas H. Carefoot, "Is Diet Quality an Overlooked Mechanism for Bergmann's Rule?" *The American Naturalist* 175:2 (Feb 2010).

Provided by University of Chicago

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