



Science Up Front: Jessica Blois on Small Mammal Diversity and Climate Change

Kara Rogers - June 3rd, 2010

Small mammals—gophers, mice, beavers, and their relatives—have long lurked and scurried in the wild shadows of large beasts. But recently, the world's little creatures pattered quietly into the biology limelight. They were coaxed out of hiding by Stanford University biologists Jessica Blois and Elizabeth Hadly and University of California, Berkeley biologist Jenny McGuire, who **related a new discovery** connecting the loss of small mammals to a past period of climatic warming in the May 23 online edition of *Nature*.



Excavation samples drying after being sieved for small mammal fossils. Photo by Xue Feng.

Given the current **global warming** trend, the new research likely prophecies the future of small mammals and that of all the creatures with which they coexist, including humans. The study definitively shows that drop-offs in species diversity among small mammals in North America coincided with the warming shift from the icy Last Glacial Maximum (LGM) some 21,500 years ago to the comparatively toasty interglacial period of the Holocene, about 11,700 years ago.

The work, led by Blois, focused on small mammal fossils excavated from the Samwell Cave Popcorn Dome in northern California. The cave lies at the eastern edge of the **Klamath Mountains**, the southern limit of the **Cascade Range**, and the northern limits of the **Sierra Nevada** and California's **Central Valley**. Because the boundaries of these areas merge within the Samwell region, the cave area has a high degree of species diversity and shares climatic features with each of the different surrounding ecosystems. Hence, as Blois

put it, “We figured that deposits in this region should be particularly good for recording climatic and faunal change through time.”

In comparing fossils from different sediment depths in the Samwell Cave area, the researchers found that populations of certain small-mammal species decreased, whereas others increased. Among the species that experienced declines were the Mazama pocket gopher (*Thomomys mazama*) and the **mountain beaver** (*Aplodontia rufa*), both of which migrated to cooler areas as soon as temperatures began heating up following the LGM. Populations of **ground squirrels** (*Spermophilus*), white-footed voles (*Arborimus albipes*), and various **chipmunks** (*Tamias*) also decreased. But while these species declined, generalists such as **deer mice** (*Peromyscus*), which are relatively nonspecific in their habitat requirements, expanded.



Jessica Blois and researcher Xue Feng carry excavation gear down to Samwell Cave, along the McCloud Arm of Lake Shasta. Photo by Ronny Hamed.

Minor shifts in populations of small mammals, such as the moving out of the Mazama gopher, can cause significant changes in ecosystems. “Small mammals are crucial members of local food webs, and they play many important roles within ecosystems,” Blois explained. “For example, they mix up the soil and recycle nutrients, disperse seeds, and disperse mycorrhizae that help many trees grow, and they are also an important food source for larger carnivores, like hawks, owls, foxes, and wolves.”

The team’s work now enables biologists to study questions about the response of small mammals to recent **climate change** in the context of past climate events. Since it is known that ecosystems can be destabilized following the loss of species, scientists already have some useful hypotheses to work with. “The small mammal community serves as a useful, measurable indicator—if these changes are happening in the small mammals, comparable changes are likely happening in many other communities as well,” Blois said. “Thus, the overall ecosystem may be less resilient to major climate changes now than in the past.”

Losses in small mammal diversity can also potentially impact the so-called ecosystem services, such as nutrient cycling and biomass production, that benefit human communities. According to Blois, however, researchers aren’t sure how many and which species need to be preserved to maintain the current distribution of ecosystem services. “Much of our society is built around the current distribution of life on Earth and the

particular arrangement of ecosystems that it creates, in terms of the natural areas we rely on for water resources, where our cities and agriculture are located," she explained.

In other words, regardless of the unknowns concerning the individual contributions of small mammals to ecosystem services, it is safe to conclude that altered species distribution and the ensuing shifts in ecological function could change how human societies interact with their local environments.

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1. [Hamilton](#) Says:

[June 3rd, 2010 at 4:20 am](#)

This is a great article and stresses a point which is often overlooked, in fact I don't think I have read anything else discussing the knock on impact of climate change affecting small land mammals, most discussion seems to focus on sea life.

The impact of mammals on their eco-systems is well documented, for example the regularly cited case of Sea Otters controlling Urchin populations, which in turn allows other species to thrive. The impact of multiple species shifting in terms of geographic location and population really is incalculable.

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