Study shows global warming likely to alter bat echolocation abilities

December 11 2013, by Bob Yirka

(Phys.org) —A team of researchers from the Max Planck Institute in Germany has conducted sonic studies that suggest that the echolocation abilities of bats around the world are likely to be impacted by global warming. In their study published in *The Journal of the Royal Society Interface*, the group explains how they found that warming temperatures are likely to impact attenuation of bat chirps in various ways.

Bats, as most are aware, make their way through the air using echolocation—they emit sounds and listen as the sounds are bounced back to them after hitting something. This ability not only helps them avoid running into things in dark, but it's the means by which they identify and catch prey. In this new effort, the researchers found that changes in air temperature of just a few degrees could have a profound impact on the echolocation abilities of bats around the world.

Attenuation—the tendency of sound to lose volume and clarity as it moves through the air (or other materials) is impacted by a variety of factors, such as humidity, wind and of course heat—low frequency sounds are less impacted than are high frequency sounds. This means that bats that live in temperate climates such as North America or Europe (who use high frequency chirps) are likely to face more challenges than low frequency chirping bats living in the tropics, as global temperature rise.

Of course nothing in nature is as simple as that, other factors have an impact on survival of species as well, and global warming is almost certain to cause environmental impacts that no one foresaw. But, what is clear from this new study is that some bats are likely to be winners, and some losers, because of where they live. Those that live in temperate climates but who use low frequencies, for example, might find the hunting getting easier. Others who are slow to adapt, on the other hand, may find the added stress of having to chirp louder, lower or more often, too much to bare leaving them with too little energy to mate.

An associated finding with this study is that it highlights the fact that the more the impact of global warming is studied, the more we discover just how far and wide the impact will be felt, both on a global scale, and within simple communities, such as those occupied by bats.

More information: Global warming alters sound transmission: differential impact on the prey detection ability of echolocating bats, Published 11 December 2013 DOI: 10.1098/rsif.2013.0961

Abstract
Climate change impacts the biogeography and phenology of plants and animals, yet the underlying mechanisms are little known. Here, we present a functional link between rising temperature and the prey detection ability of echolocating bats. The maximum distance for echo-

based prey detection is physically determined by sound attenuation. Attenuation is more pronounced for high-frequency sound, such as echolocation, and is a nonlinear function of both call frequency and ambient temperature. Hence, the prey detection ability, and thus possibly the foraging efficiency, of echolocating bats and susceptible to rising temperatures through climate change. Using present-day climate data and projected temperature rises, we modelled this effect for the entire range of bat call frequencies and climate zones around the globe. We show that depending on call frequency, the prey detection volume of bats will either decrease or increase: species calling above a crossover frequency will lose and species emitting lower frequencies will gain prey detection volume, with crossover frequency and magnitude depending on the local climatic conditions. Within local species assemblages, this may cause a change in community composition. Global warming can thus directly affect the prey detection ability of individual bats and indirectly their interspecific interactions with competitors and prey.

Citation: Study shows global warming likely to alter bat echolocation abilities (2013, December 11) retrieved 19 September 2024 from https://phys.org/news/2013-12-global-echolocation-abilities.html