

Increased destruction of bird populations are predicted with rise in global temperatures

August 5 2010

In 2003, a massive heat wave struck and killed some 30,000 people in Europe in an area where heat was not considered a major threat. Similar mass die-offs occur in wild birds and some mammals during heat waves, but unlike humans, birds may not be able to take shelter or find fresh water in order to survive devastating heat. What is the outlook for desert bird communities in light of expected global temperature increases on Earth?

Blair Wolf, an associate professor of biology at the University of New Mexico, and his collaborator Andrew McKechnie from the University of Pretoria, South Africa, have been studying how increasing [global temperatures](#) will impact desert [bird populations](#). They have found that during heat waves, increases in air temperatures of as little as two degrees Fahrenheit can double the rate of water loss in a small bird and importantly impact its survival time.

Wolf will discuss their findings at the Global Change and Global Science: Comparative Physiology in a Changing World conference from August 4-7, 2010 in Westminster, Colorado.

Predicting Who Will Be the Victims

The Intergovernmental Panel on Climate Change (IPCC) predicts that the average temperature of the planet will rise between 3.5 and 6.5 degrees Fahrenheit over the next hundred years. This may not seem like

much to the average person, but according to Wolf, these changes could be disastrous for [birds](#) and some mammals because of the increased intensity and frequency of heat waves that will result.

This is due, in part to the fact, that when environmental temperatures are above air temperature, birds and other animals have to get rid of body and environmental heat by evaporating water across the skin and by panting. Evaporative water loss increases rapidly with increasing temperature and excessive water loss reduces a birds' ability to stay cool. The resulting high [body temperatures](#) can produce heat stroke, which causes damage to body tissues, organ failure and blood clotting that quickly lead to death.

Wolf and McKechnie examined the effects of increased global temperatures and more intense heat waves on the water budgets of desert birds of differing sizes. They used a mathematical model to predict the future water costs for birds living during heat waves in the 2080s compared to the current costs for two hot desert regions, Yuma, Arizona USA and Birdsville, Australia. Their research shows that during heat waves in the 2080s, small birds will show greater increases in water loss rates than larger birds leading to greatly reduced survival times in small birds. For small birds, survival times may be reduced by as much as 30-40%. For all species of birds under 100 grams (the average American Robin weighs about 77 grams) the increase rate in water loss may decrease their survival time by 25%. These observed increases in water loss with more intense heat waves have another potential consequence, for many species, the heat may simply be overwhelming and they may not be able to keep their body temperature below lethal levels. "This is what appears to be happening almost routinely in Western Australia and India now" say's Wolf.

The key observations that drive these conclusions are that (1) water is very scarce in deserts; (2) birds that become inactive when it is very hot

(i.e., they find a shady place to sit and stay there); and (3) the heat waves cover large areas so the birds can't simply fly away. "Our models allow for making somewhat educated guesses at this point, but real data on bird tolerances to heat and water stress are lacking," says Wolf. The current models and data apply to birds in deserts or climates that are already hot and dry.

Monitoring the Massive Die-Offs

Incidents of large die-offs have occurred in Australia and India and were reported by the regional news media or by the locals. A similar phenomenon has also been noted with fruit bats dropping from the trees during [heat waves](#) in Eastern Australia.

"We don't have good research on these die-offs," says Wolf. "No researchers have actually been present during these incidents and no one has actually done the autopsies- so we don't even know the exact cause of death of these animals- whether it was dehydration or [heat-stroke](#)."

Local knowledge suggests that die-offs can result in the loss of some species from regions for decades and the long-term effects these die-offs have on other groups of plants and animals are as yet unknown.

So far, the die-off phenomenon has not been observed in North America. But Wolf predicts the first likely place it could occur in the U.S. would be in the American Southwest, a region filled with a large and diverse bird populations and heat.

"These incidents illustrate a need for more basic research on how animals function so that predictions can be made and measures can be taken to preserve our biodiversity," says Wolf.

Provided by American Physiological Society

Citation: Increased destruction of bird populations are predicted with rise in global temperatures (2010, August 5) retrieved 4 July 2024 from <https://phys.org/news/2010-08-destruction-bird-populations-global-temperatures.html>

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