

Presence of humans, urban landscapes increase illness in songbirds

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Red and yellow male house finches eat at a bird feeder in an urban Phoenix backyard. The loss of natural habitat may be a driving force behind increases in avian parasite infections. Credit: Kevin McGraw

(Phys.org) —Humans living in densely populated urban areas have a profound impact not only on their physical environment, but also on the health and fitness of native wildlife. For the first time, scientists have found a direct link between the degree of urbanization and the prevalence and severity of two distinct parasites in wild house finches.

The findings are published in the Feb. 4 issue of the journal *PLOS ONE*.

A team of researchers from Arizona State University made the discovery while investigating [intestinal parasites](#) (*Isospora* sp.) and the canarypox virus (*Avipoxvirus*) found in house finches. The group also studied the effects of urbanization on the stress response system of the finches.

Specifically, the team studied male house finches found at seven sites throughout Maricopa County in central Arizona. Each site varied in the number of people living within one kilometer (about five-eighths of a mile) – from nearly a dozen to over 17 thousand.

Researchers also considered whether the soil in each location had been disturbed and the vegetation cultivated or left in a natural state. In all, they quantified 13 different urbanization factors. They also assessed the potential relationship between oxidative stress, the degree of urbanization and [parasitic infections](#) to see whether increased infections are associated with increased stress levels.

"Several studies have measured parasite infection in urban animals, but surprisingly we are the first to measure whether wild birds living in a city were more or less infected by a parasite and a pathogen, as well as how these infections are linked to their physiological stress," said Mathieu Giraudeau, a post-doctoral associate who previously worked with Kevin McGraw, ASU associate professor with the School of Life Sciences. Giraudeau now works with the University of Zurich in Switzerland.

"We also capitalized on data gathered by the Central Arizona Phoenix-Long Term Ecological Research program to accurately measure the degree to which the landscapes at each study site were natural or disturbed by humans," added Giraudeau.



A female house finch shows the early stages of a pox infection in her left eye.
Credit: Kevin McGraw

House finches (*Haemorhous mexicanus*) are native to the desert southwest in the U.S., but are now found abundantly throughout North America. Male finches are five to six inches long and have colorful red, orange or yellow crown, breast and rump feathers.

Emerging infectious diseases transmitted from animals to humans

According to the study, more than half of the world's population now lives in cities. Natural habitats and ecosystems have been dramatically altered from their original states, and there is rising concern about the

spread of diseases that can be passed from urban wildlife to humans. Research also shows as much as 75 percent of the world's emerging [infectious diseases](#) are zoonoses – those that can be transmitted from animals to humans.

"Much like the spread of human disease in populated areas, urban centers can foster increases in multiple disease types in wild animals," said McGraw, senior author of the study. "We are now investigating the mechanism underlying this observation – are urban animals immunocompromised and less able to fight off infections than rural ones? Or, do they acquire more disease because of increased contact with other, infected animals?"

Loss of natural habitats may drive avian parasite infections

The researchers found that the presence and seriousness of gastrointestinal parasitic infections were higher in more urbanized areas with land covered by compact soil and cultivated vegetation. Also, birds from sites with more cultivated vegetation were heavier – and significantly, heavier birds were more infected by the parasite. These internal parasites, called coccidians, live in a bird's gut and disrupt the animal's ability to get nutrients.



Scientists with ASU have found a direct link between the degree of urbanization and the prevalence and severity of two distinct parasites in wild house finches.
Credit: Eyal Shochat

They also found that the percentage of poxvirus infections was higher in more human-populated areas, but did not find a connection to [oxidative stress](#). The avian poxvirus, somewhat like the chicken pox virus in humans, causes lesions on the body – mostly on the feet, eyes, wings and ears, which in the late stages maybe become bloody and crusty, and lead to the loss of digits.

"Our careful analyses of land-use characteristics reveal that decreases in natural habitat may be a driving force behind increases in avian parasite infections. The same may be true in other animals. Because disease is so

critical to the survival of [wild animals](#), this is a real concern," added McGraw. "We need to improve our understanding of how specific anthropogenic disturbances in cities are affecting the evolution of parasites and their hosts."

The authors are continuing their study of urban impacts on finches – emphasizing the behavioral and immunological impacts of humans and urban parasites on the birds.

More information: Parasites in the City: Degree of Urbanization Predicts Poxvirus and Coccidian Infections in House Finches (*Haemorrhous mexicanus*)

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