Geographic complexity explains patterns of spread of white-nose syndrome in bats, study finds

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(Phys.org)—The spread of white-nose syndrome, an emerging fungal disease in bats, may be determined by habitat and climate, scientists at the University of Georgia have found.

Using data about the spread of white-nose syndrome to date, postdoctoral researcher Sean P. Maher and colleagues at the Odum School of Ecology made a computer model showing that cave-hibernating species of bats in areas with cold winters are most vulnerable to the disease. Their study in *Nature Communications* finds simulations suggest that white-nose syndrome is likely to spread rapidly among vulnerable populations, reaching a peak in 2015-2016.

Bats are ecologically and economically important animals. They fly at night, consuming insects by the ton. For instance, a single individual of one of the vulnerable populations, the little brown bat, can eat over 1,000 mosquitoes in an hour. According to an estimate released by the U.S. Geological Survey, bats can save farmers up to $50 billion a year in crop damage caused by insects.

White-nose syndrome is a fungal disease of bats first identified in 2006. Since then, it has spread westward from the northeastern U.S., decreasing some bat populations by 80 percent, the U.S. Geological Survey estimates.

Very little is known about white-nose syndrome, so combating the disease will require gaining an understanding of how it spreads, Maher said.

He and his colleagues started by comparing disease dispersal models. Once they found the model that best fit with the existing data about the spread of white-nose syndrome, they began adding more variables relating specifically to geography and habitat. They found that a disease dispersal model that includes variables for habitat (caves) and climate (specifically, the length of winter) best fit the data. From there, they could simulate the future spread of the disease.

As well as new infections peaking in 2015-2016, their simulations suggest that most areas of the U.S. with caves may be infected within the next 100 years.

According to Maher, one of the most significant findings here is a new view of how a disease can spread. The authors moved from a broad view of the data to an understanding of some of the geographic features that can influence how the disease proliferates.

"Most disease models are made after the fact, whereas here the authors were able to model disease dispersal "as it's happening," said study coauthor Andrew M. Kramer, who also is a postdoctoral researcher in the Odum School.

The model is only part of the story, however. The authors were not able to include data from Canadian bats in their model, which could affect the results. Also, the model does not completely explain the mechanism of dispersal. For instance, "although the model is consistent with the data, it cannot tell us whether closing caves, as some have advocated, will check the spread of white-nose syndrome," Maher said.

Still, according to Kramer, the authors hope that their paper can guide further research into this potentially devastating disease in bats.

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