

Climate change could increase levels of avian influenza in wild birds

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Rising sea levels, melting glaciers, more intense rainstorms and more frequent heat waves are among the planetary woes that may come to mind when climate change is mentioned. Now, two University of Michigan researchers say an increased risk of avian influenza transmission in wild birds can be added to the list.

Population ecologists Pejman Rohani and Victoria Brown used a mathematical model to explore the consequences of altered interactions between an important species of migratory shorebird and horseshoe crabs at Delaware Bay as a result of [climate change](#).

They found that climate change could upset the carefully choreographed interactions between ruddy turnstone shorebirds and the [horseshoe crabs](#) that provide the bulk of their food during the birds' annual stopover at Delaware Bay, a major estuary of the [Delaware River](#) bordered by New Jersey to the north and Delaware to the south.

Climate change-caused disruptions to the well-timed interplay between the birds and crabs could lead to an increase in the avian influenza infection rate among ruddy turnstones and resident ducks of Delaware Bay, the researchers found. Because Delaware Bay is a crossroads for many bird species traveling between continents, an increase in the avian infection rate there could conceivably help spread novel subtypes of the [influenza virus](#) among North American wild [bird populations](#), according to Rohani and Brown.

Their findings were published online Aug. 29 in the journal *Biology Letters*.

"We're not suggesting that our findings necessarily indicate an increased risk to human health," said Rohani, a professor of ecology and [evolutionary biology](#), a professor of complex systems and a professor of epidemiology at the School of Public Health.

"But every single [pandemic influenza](#) virus that has been studied has included [gene segments](#) from avian influenza viruses. So from that perspective, understanding avian influenza transmission in its natural reservoir is, in itself, very important."

Avian influenza refers to infection with bird flu Type A viruses. Those viruses occur naturally among wild aquatic birds worldwide and can infect domestic poultry and other bird and animal species.

Avian flu viruses do not normally infect humans. However, sporadic human infections with avian flu viruses have occurred. Since 2003, for example, more than 600 cases—including more than 300 deaths—of human infection with highly pathogenic avian influenza A H5N1 have been reported worldwide, according to the World Health Organization.

Delaware Bay, which hosts many resident bird species as well as the hundreds of thousands of migratory birds that gather to feed on horseshoe crab eggs, is known as a hot spot for [avian influenza](#) virus. Infection levels in ruddy turnstones, which stop at Delaware Bay each May during their northbound migration to breeding grounds in the Arctic after wintering in South America, have been found to be exceptionally high.

The birds time their arrival at Delaware Bay to coincide with the availability of the horseshoe crab eggs. Brown and Rohani wondered

what would happen to influenza levels in Delaware Bay birds if climate change altered the timing of the ruddy turnstone's migratory flight to Delaware Bay or affected the timing of horseshoe crab spawning.

Their mathematical model looked at virus infection rates in ruddy turnstones and two species of duck—mallards, which winter at the bay, and American black ducks, which live there year-round.

The researchers found that if ruddy turnstones reached Delaware Bay either several weeks earlier or later than their current May arrival date, influenza infection rates in the species increased significantly, driving up the infection rates—also called prevalence levels—in the resident ducks as well.

"If the ruddy turnstones arrive either earlier or later than they do now, then their arrival coincides with higher viral prevalence in the resident ducks," said Brown, a postdoctoral research fellow in the Department of Ecology and Evolutionary Biology and the Center for the Study of Complex Systems. "And because these birds are interacting with a greater number of infected resident ducks, prevalence levels in ruddy turnstones are boosted.

"There's a feedback mechanism at work as well. Higher prevalence levels in the ruddy turnstones may, in turn, impact the prevalence levels in the resident ducks, driving them even higher."

If the timing of the horseshoe crab spawning season at Delaware Bay changed significantly due to climate change, ruddy turnstone populations would drop significantly due to a loss of food, and the influenza infection rate would decrease sharply as well, the researchers found.

Delaware Bay was declared a site of hemispheric importance by the Western Hemisphere Shorebird Reserve Network in 1986. Sites of

hemispheric importance act as staging, nesting or breeding grounds for at least 500,000 shorebirds annually, or at least 30 percent of the biogeographic population of any species.

Provided by University of Michigan

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