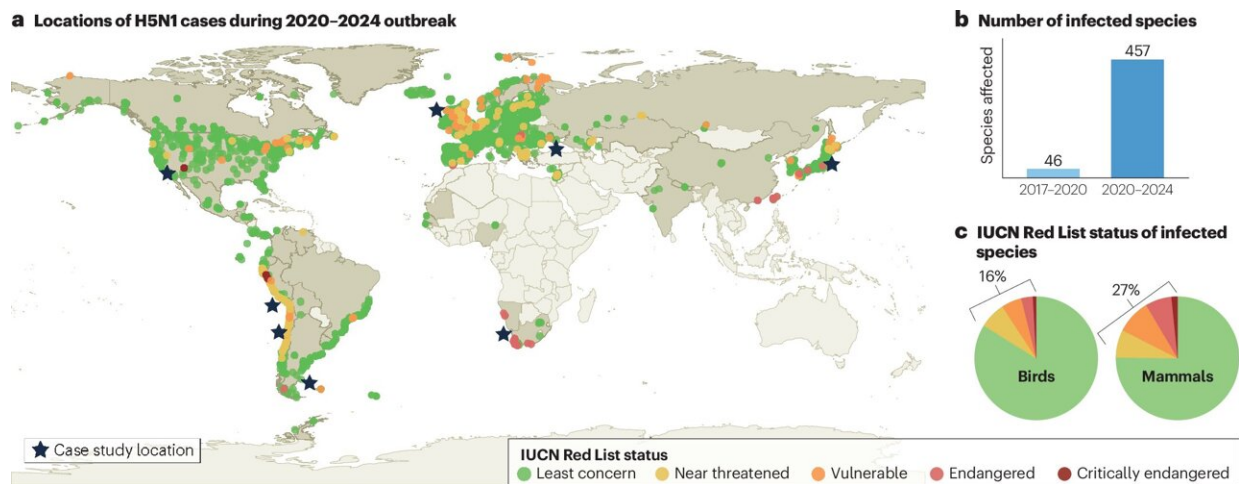


# A looming global threat: H5N1 virus decimates wildlife, disrupts ecosystems and endangers human health

March 4 2025, by Sergio Lambertucci, Andrea Santangeli and Pablo Plaza



Major mortality events in wildlife, including threatened species. Credit: *Nature Reviews Biodiversity* (2025). DOI: 10.1038/s44358-024-00008-7

We live in an era when human activities are negatively modifying the world at alarming rates. We are experiencing a massive species extinction due to environmental damage caused by human land use change, overexploitation, pollution, climate change, and the introduction of invasive species.

Our environmentally damaging, unsustainable production patterns (e.g., intensive livestock production), driven by profit-based economies, are also favoring the emergence of dangerous pathogens such as antibiotic-resistant bacteria and zoonotic viruses. These pathogens threaten biodiversity, ecosystems and human health.

The highly pathogenic avian influenza virus H5N1 is one of these emerging pathogens associated with environmental damage caused by intensive poultry production. Since 2020, it has caused the most severe panzootic ever recorded, leading to alarming impacts on animal and ecosystem health.

H5N1 virus also poses a threat to human health due to the risk of triggering a new pandemic. Human-to-human transmission, however, has not yet been reported, but its risk is increasing daily. Today, H5N1 has arrived on almost all continents, including the pristine Antarctica.

Avian influenza is killing many animals around the world, having serious implications for their populations. This virus also affects ecosystem functioning and the [ecosystem services](#) they provide. It looks like a perfect storm that could seriously affect the three spheres of One Health, with outcomes that are difficult to predict.

## **Why is this virus so concerning?**

The H5N1 virus has become an unexpected threat to many wild animal species. In a recent article [published](#) in *Nature Reviews Biodiversity*, we analyzed how the highly pathogenic [avian influenza](#) virus H5N1 is decimating both abundant vertebrate populations and endangered species, while compromising ecosystem functioning and services globally.

The impact of this virus could be considered catastrophic for some wild

species of seabirds, such as penguins, skuas, pelicans and many others. Available information suggests that millions of [wild birds](#) may have died due to H5N1. The 16% of the wild bird species affected by H5N1 are of conservation concern. It has even affected critically endangered birds, such as the California condor, compromising years of conservation efforts—at least 6% of their wild populations have died from this pathogen.

Just think about what 6% of a population represents for a critically endangered species with a low reproduction rate. These figures highlight that this virus is severely affecting populations of wild bird species.

Additionally, this avian pathogen is strongly affecting some mammalian species, an unexpected spillover. Massive mortalities have been reported in some species; for instance, more than 24,000 sea lions died in coastal areas of South America in less than one year. The 27% of the mammalian species affected by H5N1 are also of conservation concern. Some viral mutations suggest that the virus has adapted to infect mammals, and mammal-to-mammal transmission could be the cause of massive mortalities.

Of concern, available figures generally underestimate actual mortalities due to a widespread lack of monitoring, testing, and reporting—especially in remote areas and developing countries. We know little about what is happening in several regions of the world such as Africa. We need information to take action, but this virus imposes logistical restrictions on early diagnosis because it is causing mortality events in areas with difficult access; In fact, remote protected areas cannot protect species from this virus.

The impact of this virus on ecosystem functions due to the huge mortalities is now undeniable. For instance, the loss of top predators and scavengers can change the abundance and composition of the species

that inhabit those ecosystems, also affecting their contributions to people.

The huge quantity of animal carcasses produced by the mortalities associated with H5N1 virus cannot be scavenged by available animals or removed from the environment by people. These carcasses can also be a source of H5N1 and other dangerous microorganism infections, not only for animals but also for humans. New dangerous pathogens could emerge comprising the One Health and producing a vicious circle.

Apart from the intrinsic value of wildlife being lost and the changes in ecosystem function, ecosystem services being lost are associated with the loss of wildlife. For instance, massive mortalities of marine birds could result in lower production of guano, producing economic losses to many local people. Guano is an important source of fertilizer for some communities and an important economic resource for countries that export it.

Ecotourism and cultural services such as recreation, and spiritual enrichment could also be affected by the loss of some charismatic wild animals (e.g., penguins, marine mammals) in diverse geographical regions.

## **Looking forward, what can we do?**

This H5N1 panzootic and the consequences that it is producing on biodiversity and ecosystem health is a clear example that we are not going in the right direction. Mapping the risk of H5N1 infection would help to prioritize surveillance efforts. We need to escalate the monitoring of marine birds and mammals, as well as terrestrial scavengers, because those groups appear to be infected at the highest rates. We also need better monitoring of birds whose flyways include currently unaffected regions.

Vaccination of threatened species against avian flu should be debated and considered in some specific cases, such as critically [endangered species](#). Finally, [international collaboration](#) and information-sharing is essential for surveillance, [early diagnosis](#) and the provision of financial and technical instruments to enable worldwide actions.

However, it is important to realize that pathogens such as the H5N1 occur in unsustainable production systems that mostly look to improve profits, even when they produce large environmental damage. These production methods can put people at risk for emerging pathogens, with unexpected consequences.

Therefore, we need production systems that consider the well-being of humans and nature as a whole, not harming the environment. Reducing unsustainable production patterns and promoting other environmentally friendly forms of production can help to reduce the emergence of dangerous pathogens for people and nature. We must be aware of our dependence on a healthy nature to have a good quality of life.

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