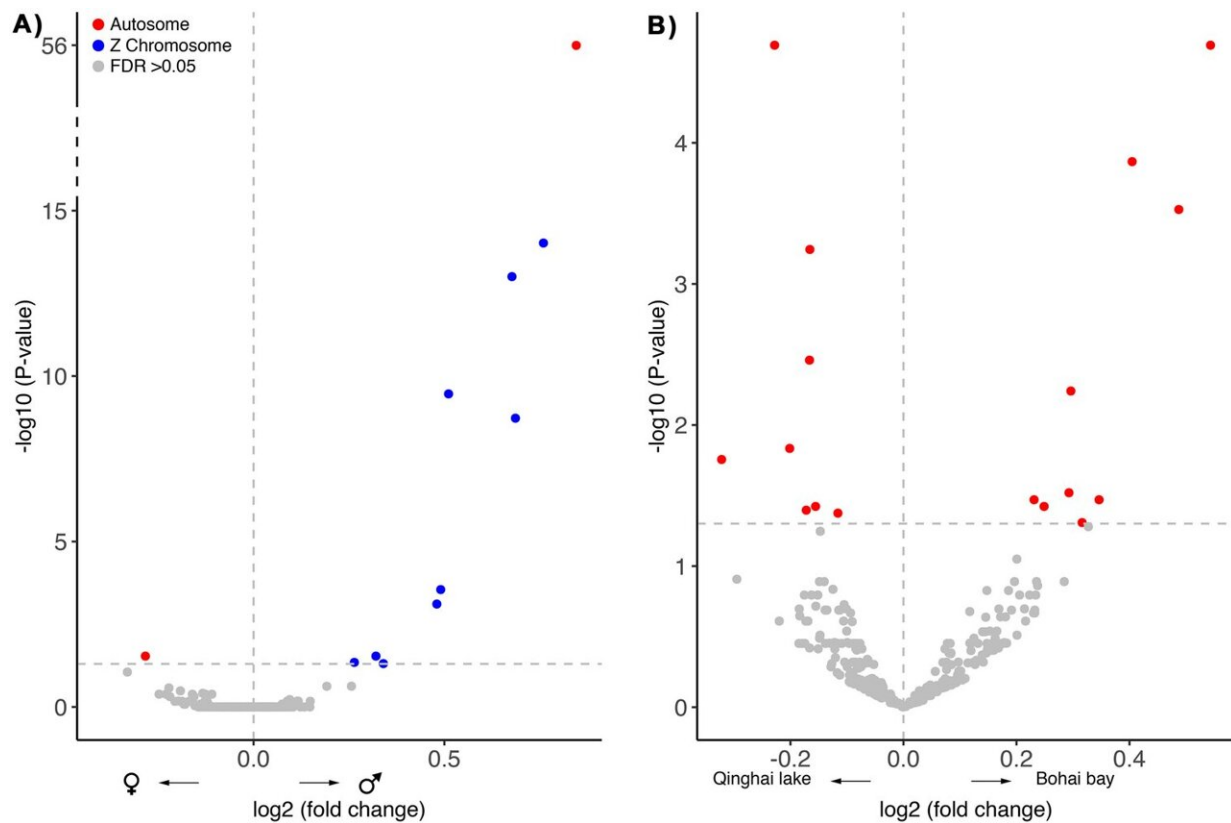


Research suggests male birds have stronger immune system than females

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Biases in immune gene expression in brain tissue in Kentish plover. A Sex-specific immune gene expression where positive values indicate male-biased expression and negative a female bias. B Immune expression bias in relation to habitat. Colors indicate chromosomal location of the differentially expressed genes. The horizontal dashed line indicates a false discovery rate (FDR) threshold of 0.05. Credit: DOI: 10.1007/s00251-022-01253-w

While human males tend to suffer more than females from infectious diseases like COVID-19 or flu, for birds it's the males that appear to have stronger immune systems, suggests a new study led by the University of Bath.

A team of international scientists looked at differences between the sexes in the expression, or activity, of immune genes in Kentish Plovers, a common species of shorebird that live on coasts and lakes all over the world.

The researchers studied populations living in coastal and high-altitude inland areas in China.

While they found no significant differences in immunity between the birds from the two habitats, they found evidence of a difference between the immune systems of male and female birds.

In humans, males have an X and a Y chromosome whereas females have two copies of the X chromosome, however only one of these two X chromosomes is activated, meaning both males and females have just one active X chromosome.

In contrast, in birds it's the males that have two copies of the sex chromosome Z, with females having two different chromosomes, Z and W. However in males, both copies of the Z chromosome are active.

Many of the genes linked with immunity are on the Z chromosome, so the researchers suggest that by having two active copies of these genes, males might have increased activity in their immune systems, resulting in lower mortality compared with females.

Dr. José Valdebenito, Research Associate from the Milner Centre for Evolution at the University of Bath, said: "Whilst in humans women tend

to live longer than men, the opposite is true of birds, so we wanted to find out why.

"For the first time, we've found evidence that there is a difference in the activity of the immune genes in male and female plovers, suggesting that males have stronger immune systems which could explain why they tend to survive longer than females.

"In plovers, the higher mortality in females causes an imbalance in the [sex ratio](#), which has a knock-on effect on the mating and parenting behaviors of this species.

"Currently we are working on a project that investigates the relationship between sex differences in immunity and mating system variation, by looking at the [immune genes](#) across several shorebird species.

"Hopefully this will help us expand our understanding on the drivers behind sex differences in mortality in birds."

Dr. Araxi Urrutia, Senior Lecturer from the Milner Centre for Evolution and senior author on the paper, said: "This was an exciting project, and I was glad to coordinate fieldwork, [data analyses](#) and writing up of this joint project between the Milner Centre, Chinese and Hungarian scientists.

"The next step is to expand this approach to other shorebirds. From [demographic data](#) we know that in some shorebirds the [males](#) live longer than the females whereas in other shorebirds the male lives longer than the females.

"My group is striving to understand the genomic causes of the sex different mortalities—this work is important not only for fundamental science but also [biodiversity conservation](#) since these data will help

protecting these species in their natural habitats."

The study is published in *Immunogenetics*.

More information: José O. Valdebenito et al, Sex differences in immune gene expression in the brain of a small shorebird, *Immunogenetics* (2022). [DOI: 10.1007/s00251-022-01253-w](https://doi.org/10.1007/s00251-022-01253-w)

Provided by University of Bath

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