Bigger brains outsmart harsh climates

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North American songbird, the Black-capped chickadee, has considerably larger brains than expected from their body size. Credit: Jack Douglas Waller

It helps to have a larger brain if you're living in an extreme climate, according to a study of birds published in *Nature Communications*. The research suggests that birds have evolved larger brains to cope in harsh environments where the tasks of finding food, evading predators and finding shelter are more demanding.

A team of international researchers, including scientists from the University of Bath's Milner Centre for Evolution, used brain size data from over 1,200 bird species to test whether large brains relative to body size are more prevalent in a harsh and unpredictable climate than small

brains.

The team found that birds that live in highly seasonal environments such as in polar regions, have significantly larger brains than those that live on the equator. They also found that birds living in habitats with an unpredictable climate, such as places where there are extreme fluctuations in weather from one year to the next, also had larger brains relative to their body size. This finding is surprising considering that having a large brain is costly in terms of energy.

Climate change

Tamás Székely, Professor of Biodiversity in the University's Milner Centre for Evolution, said: "Birds are amongst the brainiest creatures on the planet – they learn quickly, remember hundreds of locations and are capable of using and making tools. So it's not surprising that most birds have big brains compared to their body size.

"These results have significant implications for climate change. Since fluctuations in climate and the frequency of extreme events such as storms, floods and droughts, are expected to increase in coming decades; we predict that smart creatures may cope better with these changes than less brainy ones.

"However, to test this proposition, further work is needed to establish how brain size relates to survival. Our group has previously shown that bird species with larger brains survive better than birds with small brains, although it needs to be demonstrated that similar relationships operate within a species."

Evolution of brain size

The hypothesis that birds have evolved larger brains to help them cope with environment was proposed two decades ago but has proved difficult to test experimentally. The research team from Spain, Canada and the UK took a different approach to this problem, analysing phylogenetic data of brain size for each species and estimating the variation in plant production and snow cover in the geographic regions in which they live.

The team says further studies are needed to establish whether birds evolved bigger brains after spreading geographically to more seasonal climates or if they already had large brains which helped them survive after they relocated.

More information: Ferran Sayol et al. Environmental variation and the evolution of large brains in birds, *Nature Communications* (2016). DOI: 10.1038/ncomms13971

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