Climate change risk for animals living in prime conditions

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A first-year Penn State College of Information Sciences and Technology doctoral student spent four months observing birds in an effort to learn what it would mean to design technologies from a more-than-human perspective. Her autoethnographic study contributes to addressing the challenging research problem of how to operationalize posthuman concepts into practice for human-computer interaction. House finchnigel. Credit: Wikimedia Commons

Animals living in areas where conditions are ideal for their species have less chance of evolving to cope with climate change, new research suggests.

The study examined whether birds might be able to evolve to adapt to changes to the natural environment within their range - the geographical area where the birds nest, feed, migrate and hibernate over the course of their lifetimes.

It found that populations that experienced both the most favourable conditions, usually at the centre of their species' range, and toughest conditions found at the very edges of the range had the lowest evolutionary potential. The populations that displayed the greatest potential to evolve with changing conditions were found living between the two extremes, the study showed.

The research team, including scientists from the University of Oviedo, University of Málaga, Doñana Biological Station, the University of Exeter and the University of Western Australia, studied data on 12 European bird species.

"We were surprised to find reduced evolutionary potential among birds living in the centre of a species' range," said co-author Dr Regan Early, of the Centre for Ecology and Conservation on Exeter's Penryn Campus in Cornwall.

"The reasons for this are not clear, but high levels of competition in prime areas might lead birds with certain traits to survive - meaning little genetic variety in the population and consequently little scope for evolution.

"We found that populations of birds on the edge of a species' range - like those in the centre - had a reduced ability to evolve," said lead author Dr

Jesus Martinez-Padilla, of the University of Oviedo.

"This is probably because they already live in tough conditions for their species. As climate warms, these populations will probably have to move or die out. This is what might happen to populations of the Pied Flycatcher in southern Europe. These populations have little genetic variation compared to northern populations, so they won't be able to adapt to a changing climate. The birds living in places neither the best nor the most hostile environmental conditions - appear to have the best evolutionary potential."

"Evolution could prolong the period in which these populations are able to survive in situ as conditions worsen, or allow these populations to evade local extinction altogether", Dr Regan Early pointed out.

Understanding the likelihood that evolution may occur could improve our understanding of how species will respond to climate change, the scientists say.

The paper, published in the journal *Proceedings of the Royal Society B*, is entitled: "Evolvability meets biogeography: evolutionary potential decreases at high and low environmental favourability."

More information: Evolvability meets biogeography: evolutionary potential decreases at high and low environmental favourability, *Proceedings of the Royal Society B*, rspb.royalsocietypublishing.or … .1098/rspb.2017.0516

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