Volume 13

Washington University
Undergraduate Research Digest

Spring 2018

Are Populations More Stable at the Center of Their Geographic Range? A Test Using Big Data Sets

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Are Populations More Stable at the Center of Their Geographic Range? A Test Using Big Data Sets

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The prediction that species are more abundant and stable at the center of their geographic range has been assumed for several decades. This pattern is thought to reflect the environmental gradient underlying the species ranges, as populations can persist in higher numbers in areas that better meet their ecological requirements. As conditions become less suitable, populations will become less abundant. Additionally, population stability is predicted to follow a similar pattern, with populations becoming increasingly variable the closer they are to the edge of a range. Despite the general acceptance of this principle, it has not been rigorously tested using large data sets. Using data from the North American Breeding Bird Survey and BirdLife, we tested whether two important components of population stability—persistence and variability—were correlated with the population's distance from the edge of the species' geographic range across approximately 400 bird species. For approximately 35% of species studied, the distance from the edge of the geographic range was significantly positively correlated with population persistence; however, there were no broad trends in the variability of populations across species' ranges. Given the general acceptance that populations are more abundant at the center of their geographic range, we also tested whether population variability was correlated with population abundance. We found that for 40% of species studied population variability was significantly negatively correlated with population abundance. Our data suggest that a population's location within a species' geographic range could have important implications for the stability of the population. Further studies are needed to make more precise predictions about population stability, which have the potential for important real-world applications in predicting species' responses to climate change and for making conservation plans.