10 January, 2019

Professor Rob Freckleton  
University of Sheffield  
Executive Editor  
Methods in Ecology and Evolution

Dear Professor Freckleton;

I am pleased to submit "The Regime Shift Detector: a model to identify changes in dynamic rules governing populations," for your consideration for publication in Methods in Ecology and Evolution.

Aburpt changes, or regime shifts, in ecological processes and dynamics are an important area of research, because understanding the drivers of transitions is a key factor in ecosystem management. Yet, although theoretically well described and understood, empirical tools for evaluating and characterizing these shifts are lacking: Bestelmeyer et al (2011, Ecosphere) called for better methods for identifying these shifts in empirical data. This manuscript presents the development and testing of a tool to address this knowledge gap, with a specific focus on populations shifting between dynamic states. My co-author and I developed a modeling strategy, the “Regime Shift Detector” to detect changes, weigh the evidence of their occurrence, and characterize the magnitude of the shift. We then test the performance of the RSD model under a variety of simulation conditions, and using two real-world case studies: the decline of Monarch butterflies at their overwintering grounds in Mexico, and the invasion process of Multicoloured Asian Ladybeetle to the US Midwest. We show the RSD model was not only able to consistently detect regime shifts of various characteristics in simulated data, but also shifts corresponding to human land use change in both monarchs and ladybeetles.

Thank you for your consideration. I look forward to hearing from you.

Yours sincerely,  
 

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