**Dr Nicholas Clark**

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Dear Dr Ellison,

We are pleased to submit our manuscript “Dynamic Generalised Additive Models (DGAM) for forecasting discrete ecological time series” for consideration as a research article in *Methods in Ecology and Evolution*.

There is broad consensus among scientists and decision-makers that anticipating probable future states is vital to mitigate harmful impacts of environmental change. The rapidly growing subfield of “ecological forecasting” aims to tackle this global challenge by making ecology a more predictive discipline. To improve our ability to produce useful and robust forecasts of ecological phenomena, open-source tools are needed to translate ecological domain knowledge into probabilistic models that can analyse and forecast the types of discrete time series that dominate ecology.

Generalised Additive Models (GAMs) are increasingly popular in ecological time series analysis for representing smooth functions for discrete responses that encompass complex ecological features. However, GAMs are less useful for producing forecasts as their smooth functions provide unstable predictions outside the range of training data. We demonstrate how smoothing splines can be estimated jointly with dynamic latent temporal processes to improve inference and forecasts for autocorrelated nonlinear time series.

Our Bayesian Dynamic GAM (DGAM) models provide a general solution to the problem of estimating smooth functions while generating reliable probabilistic forecasts. Using simulations and a comprehensive set of real-world applications, we introduce our open-source R package *mvgam* (https://github.com/nicholasjclark/mvgam), which provides functions for estimating parameters of DGAMs in a Bayesian Markov Chain Monte Carlo framework via the Gibbs sampling software JAGS. Our approach will be particularly useful for exploring competing dynamic ecological models that encompass different hierarchical smoothing structures, tasks that are becoming increasingly important in applied ecology.

The challenges that environmental change poses for global ecosystems is a topic of considerable concern for researchers, policy makers and the general public. Our research will be relevant for a wide range of ecologists working in diverse regions and systems. We hope that you agree *Methods in Ecology and Evolution* is an appropriate venue for this research. Our manuscript has previously been lodged as a preprint on the *biorxiv* (doi**:** https://doi.org/10.1101/2022.02.22.481550), but none of the material in our paper is under consideration elsewhere. Finally, we have suggested three potential expert reviewers from around the world.

Thanks very much for considering our study. We look forward to hearing from you in due course.

Sincerely,



Nicholas Clark