Extreme events in the framework of species distribution models: a Bayesian approach

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Extreme events have been studied in the field of ecology for many years, either from a purely descriptive point of view in its principles, or last decades from an inferential and/or predictive perspective to try to understand them.

The first problem to be addressed in the study of extreme events is the definition of the event itself: can we speak of an extreme event with a simple 2% daily mortality of a species if its usual mortality is 0.5%, or can we speak of an extreme event if the sea temperature increases by $2°$C in 48 hours?

In the present work, included in a project to study extreme events and climate change, we want to study the relationship between certain types of extreme events (DANA, heat waves, etc.) and how they affect the species in their environment. To do this, we will use species distribution models adapting them, that is, incorporating this exceptionality to the model so that the model is able to absorb this information without detecting these observations as anomalous, but as the extreme events that they are.

In this initial phase of the project, different approaches such as Hurdle models, triangular distributions or others present in the literature have been tested in order to observe advantages and disadvantages of each of them and to be able to provide improvements in the inferential process as well as which covariates of the environment can help to predict or anticipate the harmful effect that an extreme event can cause on certain species populations, such as storms in fish farms or heat waves on birds in wetlands, etc.

All models and their possible improvements will be approached from a Bayesian perspective either by making the study only temporal or by including spatial information with spatio-temporal studies.

Keywords: extreme events, Bayesian modelling, species distribution models.