Predator-prey dynamics: analysing contemporaneous spatio-temporal data in an ecological context

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Offshore renewable energy (ORE) is a growth industry in the UK and is key to achieving net zero in Scotland by 2045 through reductions in gas emissions and developing clean sustainable energy sources. The industry is also economically important, providing jobs and income, which can be crucial to communities in remote rural areas such as the Islands.

Understanding the potential impacts of ORE on the marine environment is critical to maintain a healthy ecosystem. However, building an evidence base is challenging given the dynamic nature of the environment. Two large-scale projects are currently running to collect detailed data on seabirds and fish in the Firth of Forth. Continuous acoustic fish data from transects, pelagic trawls and grab samples are collected using a boat, underwater autonomous vehicle and unmanned surface vehicle, aerial surveys provide information on seabirds at-sea, and seabirds tagged with GPS devices collect data on individuals' movements. As far as possible, these spatio-temporal data are collected contemporaneously. However, analysing data to answer ecological questions on predator-prey dynamics is challenging given the context of 3D space, time, and scale. We are currently developing spatial frameworks using inlabru to investigate multispecies predator-prey dynamics and incorporate dynamic environmental covariates into the models.