**Spatiotemporal Models for Ecologists**

**Lab #1 – Generalized linear models in Template Model Builder**

Goal: Practice and demonstrate ability to (1) estimate parameters for generalized linear models in Template Model Builder, (2) use a simulation experiment to demonstrate that correctly-specified models are statistically consistent, and (3) use cross-validation to evaluate model performance in using a real-world data set.

**Part 1 – Case study demonstration**

First, please load survey catch rate data for Alaska Pollock in the eastern Bering Sea using “EBS\_pollock\_data.csv”. Feel free to base this on textbook code from [Chap-1](https://github.com/James-Thorson/Spatio-temporal-models-for-ecologists/tree/main/Chap_1), e.g., “Poisson\_point\_process.R” and “poisson\_glm.cpp”

This data set contains the catch rate (labelled “catch”) as well as some potential covariates.

Then, write a template file in TMB that can be used to estimate parameters for three alternative generalized linear models. Please use a single TMB template (i.e., a single “.cpp” file), where the file can be used to run all three models depending upon a user-defined input. Please use the following three models:

1. A generalized linear model (GLM) with a delta-lognormal distribution using design matrix **X**=**1** and a log-link (i.e., only a single intercept)
2. A GLM with a delta-gamma distribution only using a single intercept and a log-link
3. A GLM with a distribution of your choice, potentially involving covariates, but which in some way differs from #1 and #2

Please provide a results table listing the following three results for each model:

1. The log-likelihood of the data;
2. The number of parameters
3. The log-predictive score per datum from a 10-fold crossvalidation experiment