**Spatiotemporal Models for Ecologists**

**Forecast interval coverage**

Goal: Practice and demonstrate ability to (1) estimate parameters for linear state-space models, and (2) explore interval coverage under a correctly specified model

**Parametric bootstrap**

Obtain data for flathead sole (from Chap\_3/Biomass\_index.csv). Then fit a state-space Gompertz model estimating biomass given average CPUE data for all years 1982-2017:

while specifying that process errors and measurement errors have equal variance ()[[1]](#footnote-1), and record the maximum-likelihood estimates for this fitted model. I recommend that you write your script from scratch using a conditional (rather than joint) formulation for the state probabilities, but feel free to look at Chap\_3/Gompertz\_dynamics.R while writing.

Now conduct a parametric bootstrap for this model. To do so:

1. simulate a new biomass time-series for all years 1982-2017, and simulate new CPUE data for these years, using the Gompertz state-space model and parameter values estimated previously.
2. Refit the Gompertz model to these simulated data, and record the estimated state-variable and parameters and
3. Repeat steps 1-2 to generate 100 replicates of the parametric bootstrap, and calculate the forecast interval coverage for each year.

Questions:

1. What do you notice about forecast interval coverage when the model is correctly specified?
2. What do you notice about parameter estimates for each bootstrap replicate for the correctly specified model?

1. We impose this restriction during the simulation experiment to avoid having to deal with complications arising when the MLE for or . In practice, this assumption would likely be replaced with a more biologically meaningful restriction, although we do not explore this here. [↑](#footnote-ref-1)