

More dirty little secrets: effect of process and observation errors on inference in a nonlinear non-normal SSM

SSMs are a useful tool in ecology due to their flexibility and ease of formulation to model ecological processes. They allow flexible integration of various traits like random effects, facilitate separating the underlying biological process from the measurements made on that process, and naturally fit well in a Bayesian framework. However, when complex models are considered, we need to be cautious with interpreting the results. In a 2016 paper (doi: 10.1038/srep26677), Auger-Méthé and coauthors showed that estimation problems can even occur in simple linear Gaussian SSMs when observation error is larger than biological process error. We analyze the effects of changing the process and observation error in a non-linear and non-Gaussian population model of the UK Grey seal population. We demonstrate that even with a low observation error, posterior distributions can still be fairly uninformative if only the marginal posterior distributions of the parameters are considered. We also discuss the effect on the variance and bias of the posterior distribution when the ratio of process to observation error is changed.