

**Title:**

Allee effects plus noise induce population dynamics resembling binary Markov highs and lows

**Abstract:**

In this talk we show that the combination of Allee effects and noise can produce a stochastic process with alternating sudden decline to a low population phase, followed, after a random time, by abrupt increase in population density. We introduce a new, flexible, deterministic model of tempered Allee effects, which interpolates between the logistic and a usual Allee model. Into this model we incorporate environmental and demographic noise. The solution of the resulting Kolmogorov forward equation shows a dichotomous distribution of residence times with heavy occupation of high, near saturation, and low population states. Investigation of simulated sample paths reveals that indeed tempered Allee effects and noise, acting together, produce alternating, sustained, low and high population levels. We find that the transition times between the two types of states are exponentially distributed, with different parameters, rendering the embedded hi-low process Markov.

**Keywords:** Allee effects, environmental noise, demographic noise, binary Markov process