Bjornstad & Grenfell (2001)

STATS 631, Winter 2026

Impact

Bjørnstad, O. N., & Grenfell, B. T. (2001). Noisy clockwork: time series analysis of population fluctuations in animals. Science, 293(5530), 638-643. https://doi.org/10.1126/science.1062226.

- cited 763 times

Concluding challenges

1. both measurement and process stochasticity
2. mechanistic modeling of covariates
3. continuous-time models
4. effective dimension of field data
5. unobserved variables
6. spatiotemporal dynamics

Context

- 1990s advances in Monte Carlo methods had promise but substantial limitations. They proved insufficient to solve the challenges.
- Deterministic nonlinear dynamics provided candidate mathematical theory for population dynamics, but substantial stochasticity makes that of limited relevance.

Extra-demographic variation

(p 639, bottom left)

- Log scale variation inconsistent with Poisson and binomial variability

Wild populations

- Need long-term data, ideally including experimentation
- The (Long Term Ecological Research Network](https://en.wikipedia.org/wiki/Long_Term_Ecological_Research_Network) aims to provide this.

Since 2001

- What are the main advances (methodological and/or scientific) on this topic over the past 25 years?