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# Spatial Decay of Synchrony in Predator-Prey Systems with Distance

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## Introduction

Spatial synchrony refers to the tendency for organisms to rise and fall in abundance simultaneously with other populations of their species. It has been observed in organisms of varied complexity and it has been noted that highly synchronized species are more likely to become extinct. The three mechanisms listed below are thought to contribute to synchrony in nature. It has been suggested that the pattern of decay of synchrony with increasing distance may be used to infer the mechanism generating synchrony. Until now, this suggestion has never been tested experimentally.

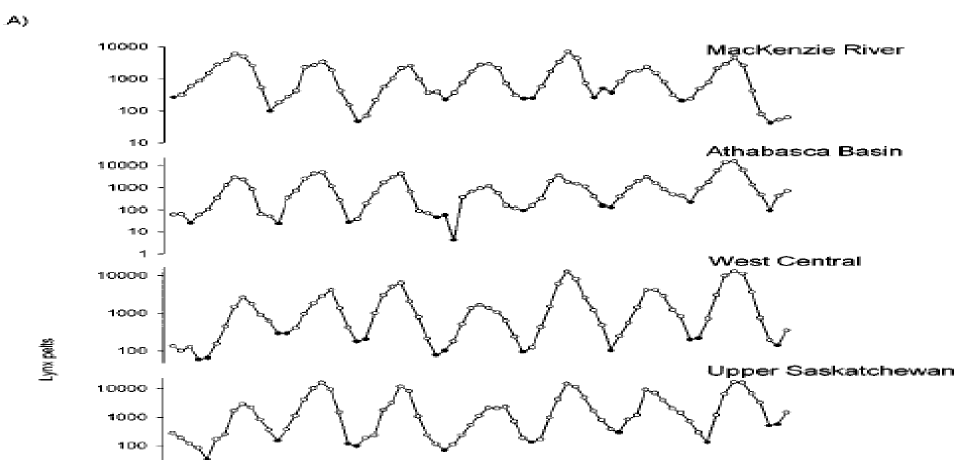



Figure 1. Elton and Nicholson`s (1942) data set for lynx pelts spanning the years 1821-1891 from the Hudson Bay Company`s trade records

## Mechanisms Known to Produce Synchrony

1) Dispersal – the movement of organisms to neighbouring populations
2) Moran effect- shared population dynamics due to shared environment
3) Phase locking- perfect synchrony of predator-prey cycles linked by dispersal

## Hypothesis

I tested how the spatial decay of synchrony due to the Moran effect is affected by dispersal and phase locking. The expectation was that dispersal would synchronize predator-prey cycles even at long distances, despite low environmental synchrony at long distances.

## The Experimental Design

**"The Predator"**

*Euplotes patella*

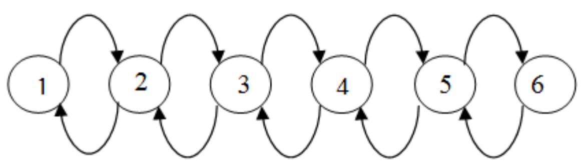
**"The Prey"**

*Tetrahymena pyriformis*

- 4 treatments x 4 replicates
  - ±Moran & ±Dispersal
- 1 replicate= 6 jar linear array
- 1 jar= *Tetrahymena* & *Euplotes*
- Jars were sampled weekdays for 50 days

## Dispersal

Exchanged 10% of medium with their immediate neighbours 3X per week




## Moran Effect

Moved individual jars between 20 º C and 30 º C incubators such that temperature synchrony declined with increasing distance within an array

## Results

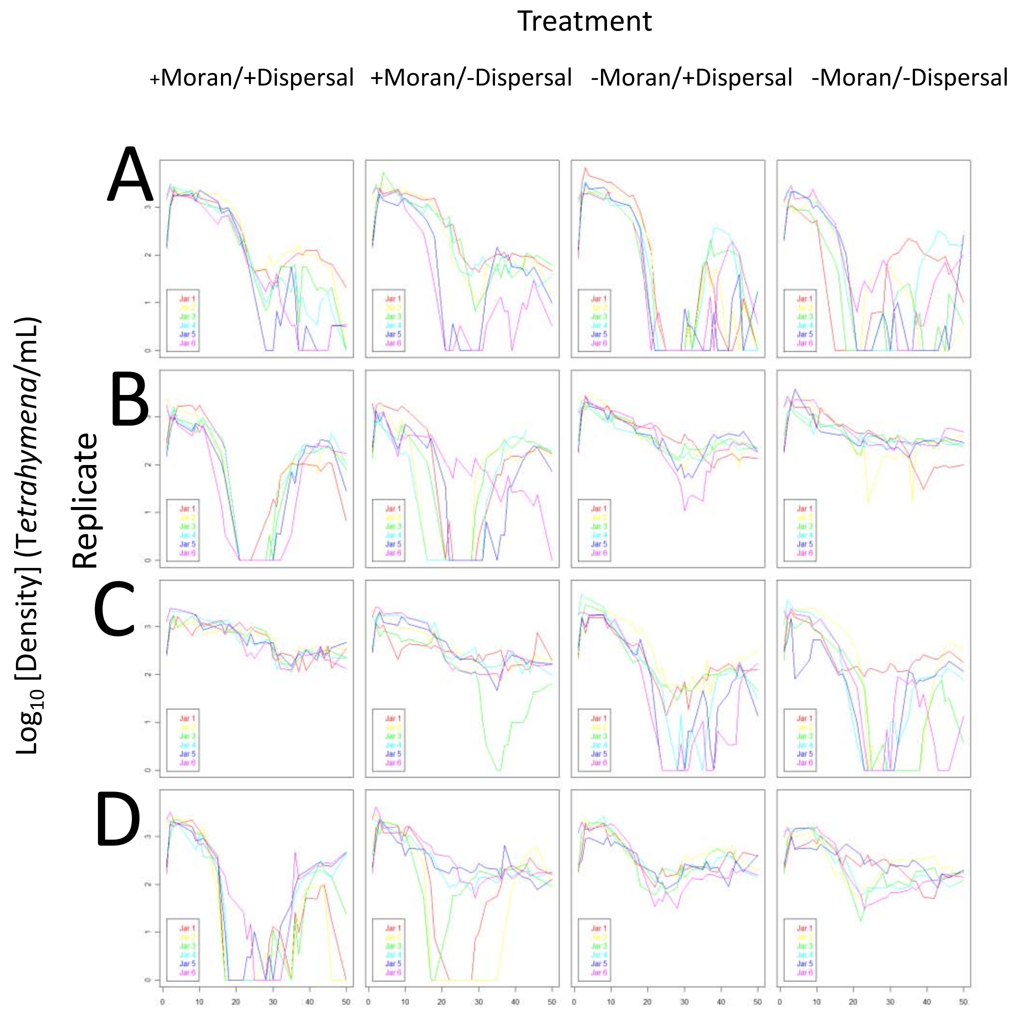



Figure 2. Prey population dynamics over time.. Note greater synchrony with dispersal, but synchrony is rarely perfect.

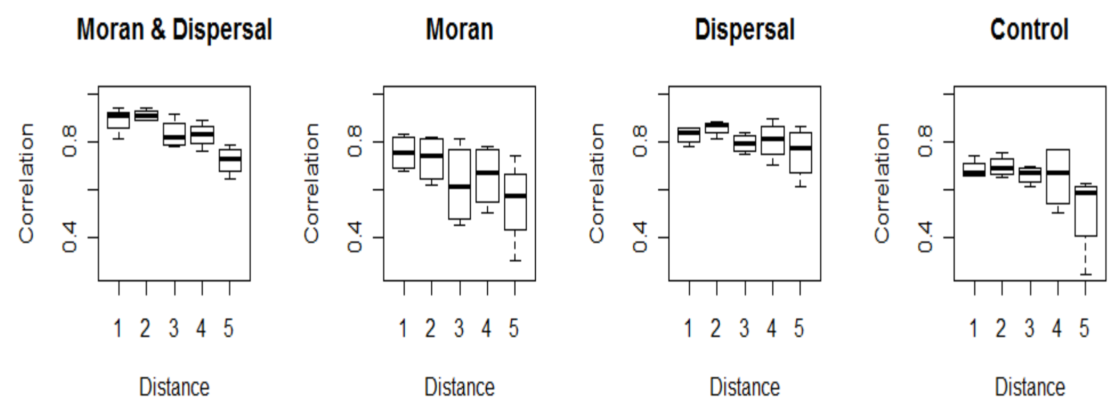



Figure 3. Correlation in density as a function of distance between jars for *Tetrahymena.*

## Conclusions

- In the absence of dispersal, arrays with decaying temperature correlation experienced decreasing synchrony with increasing distance
- Dispersal synchronized predator-prey cycles at long distances, even in the presence of decreasing environmental synchrony with distance