# Predators, prey and pattern at disparate scales 

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## INTRODUCTION \& METHODS

Individuals, populations and species are distributed unevenly across natural landscapes. Spatial variation in environmental resources and species interactions affect where individuals are located.

We are interested in how differences in the scales at which interacting species perceive the environment interacts with resource variation to affect the distribution of populations across a landscape.

Schematic of our model (left) Dispersal occurs between
neighboring cells only.

Example output (right), with 25 prey populations per predator population and varying environmental frequency ( $f$, repeats per landscape)

vve use a coupied tattice model with an underiying matrix containing a sinusoidal environmental pattern ( $100 \times 100$ cells). Each lattice cell represents one population with discrete Lotka-Volterra dynamics and dispersal. We increase perceptual scale disparity between the species by adjusting the coarseness of the predators' lattice. Predators do not distinguish any pattern at smaller scales, but detect environmental pattern indirectly through variation in the total prey population sizes that they encounter.

## RESULTS

## How does prey-predator scale disparity affect the prey's ability to track differently sized environmental patterns?

Prey fidelity to the environment decreases slightly in environments with a smaller pattern size (higher environmental frequency), but does not differ significantly with scale disparity in most cases (below; right).


* Similarity Metric:
$1-\sum\left(\mathcal{F}(s)_{i j}-\mathcal{F}(e)_{i j}\right)^{2}$
where $i j$ are the pixels of the Fourier transformed image of the species ( $s$ ) and the environment (e) respectively.


## Predators' fidelity to the

 environmental pattern depends on environmental pattern size (left) and preypredator scale disparity (right).At the minimal and maximal scale disparities, environmental pattern size has little effect on the predators' distribution. At intermediate scale disparities, predators cannot track environmental pattern when that pattern size was smaller than the predators' lattice cells.


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