

Using Patch Isolation Metrics to Predict Animal movement in binary landscapes

Bender, D. J., Tischendorf, L., & Fahrig, L. (2003)

Topic

Using patch isolation metrics to predict animal movement in binary landscapes

Objective

The goal of this study was to determine which isolation metric provided the most reliable measure of patch isolation as it relates to dispersing organisms

Patch Isolation

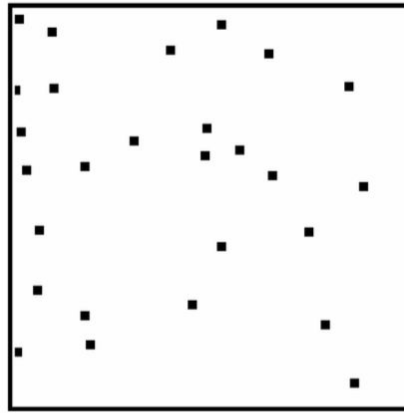
= “A key component of patch-based approaches that seek to predict the distribution of organisms in spatially-subdivided populations”

Example of approaches

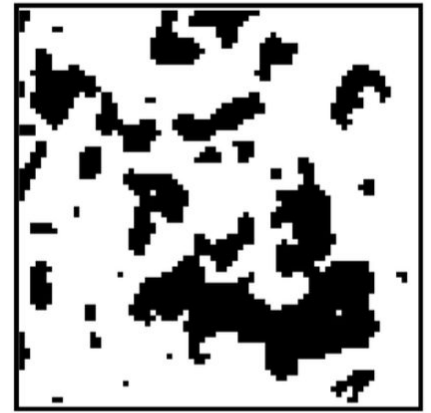
- Theory of island biogeography
- Metapopulation theory

Influenced the way we think about spatially-subdivided populations + Embedded in language of landscape ecology studies

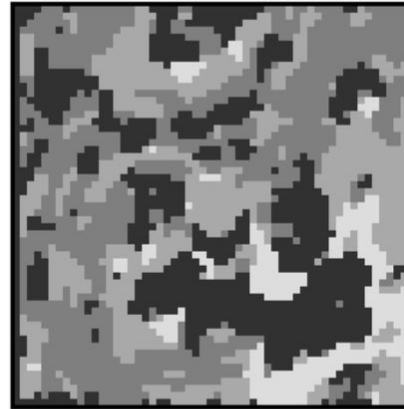
Types of landscapes



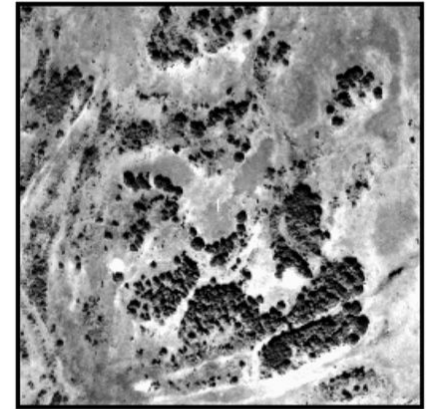
a. Point pattern



b. Realistic binary



c. Mosaic

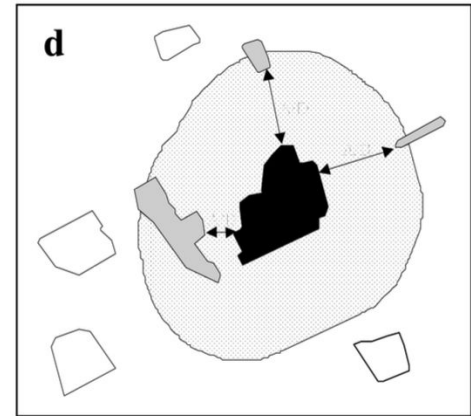
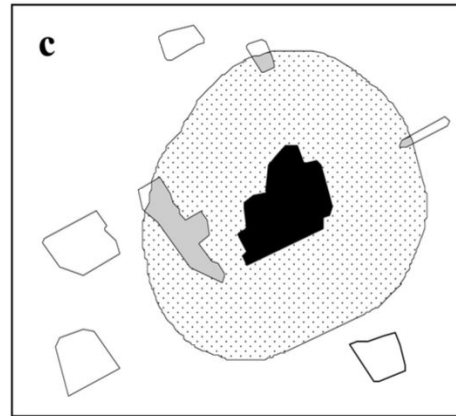
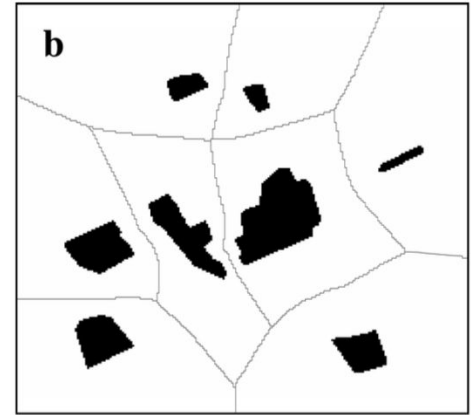
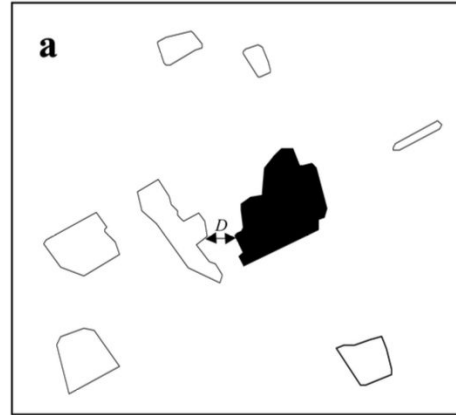


d. Raster image

Figure 1. Four general ways that landscapes can be mapped.

Types of metrics

- a) Nearest-neighbor distance
- b) Voronoi polygons
- c) Proximity index
- d) Habitat buffers



Methodology

Simulated data

Generated point pattern vs. realistic forest vegetation maps

Modeled in 100 artificially-generated point-pattern landscapes and 95 realistic binary landscapes

Simulated stochastic, rule-based movement of animals across the landscape

Results

Immigration rate best predicted by area-informed metrics (Buffer Area + Proximity Index) → High r^2 values

Voronoi polygons → Lowest r^2 values

Immigration rate **increased** as nearest-neighbor distance and Voronoi polygon area **decreased**

Immigration rate **increased** as buffer area and proximity scores **increased**

Results

- Area-informed metrics out-performed distance based isolation metrics
- Nearest-neighbor distance and Voronoi polygons are calculated using only the distance to neighboring patches
- Do not account for the amount of habitat that occurs within the neighborhood

Limitation

- Setting radius of the buffer parameters can be tricky
- Optimal buffer radius is one that reflects the average dispersal distance of a migrating organism

Evaluation

- Well rounded paper and methodology
- Ignores important immigration attributes

Score: 8/10

Thank you!