Hemiptera: Lygaeidae
Photo by J. Patterson

Effects of habitat type on arthropod community structure in a heterogeneous urban environment

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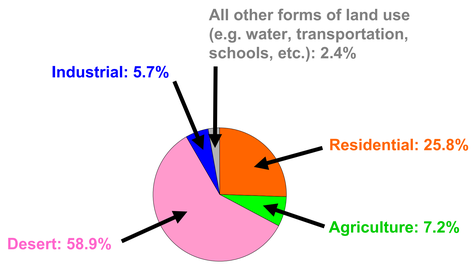
Coleoptera: Meloidae
Photo from Colorado State University

Research objectives

- describe composition and turnover of arthropod communities in 4 types of urban land use in the Phoenix, Arizona, metropolitan area
- determine which taxa are indicative of the area's dominant forms of urban land use
- explore how variation in physical habitat structure may explain variation in arthropod communities

Land use: Phoenix metropolitan area

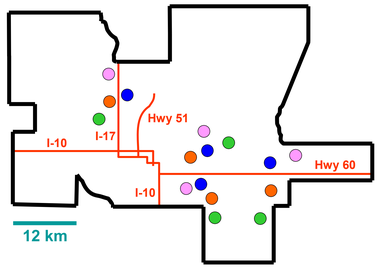


data source: Maricopa Association of Governments, 1998

Arthropod collecting sites were chosen to represent the 4 most dominant forms of land use in Phoenix.

Methods: long-term arthropod monitoring

black lines denote boundaries of the Phoenix, Arizona, metropolitan area; red lines denote major roads



- 16 sites: 4 residential
  4 industrial
  4 agricultural
  4 desert remnant
- 10 pitfall traps per site
- trapping 3 days per month, June 1998 - May 1999

pitfall trap

Methods: physical habitat structure

Percent ground cover of each of the following was measured in a 25-m-diameter circle, centered around each site:

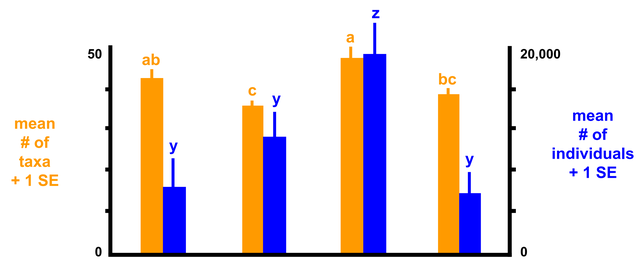
buildings	native trees	grass
bare ground	native shrubs	herbaceous
gravel	exotic trees	agricultural crop
concrete	exotic shrubs	
rock	cactus	

Overall results

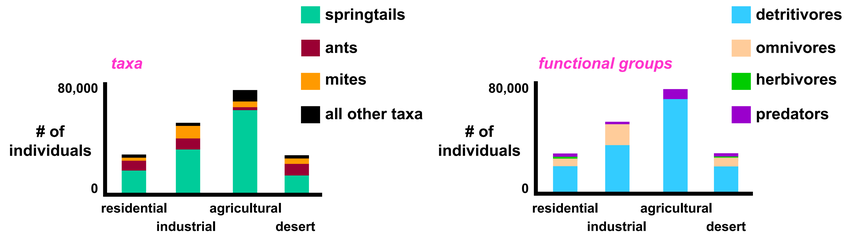
- Arthropods from 88 taxa (21 orders, 65 families) were collected. Ants, mites, and springtails were ubiquitous and accounted for 93% of individuals captured.
- As many taxa were found in agricultural and residential lands as in native desert. The fewest taxa were found at industrial sites.
- Taxonomic richness tracked temperature more closely than it did precipitation.
- Differences in community composition among land-use types corresponded to differences in habitat structure with land use.

Results: arthropod richness

Tukey's test

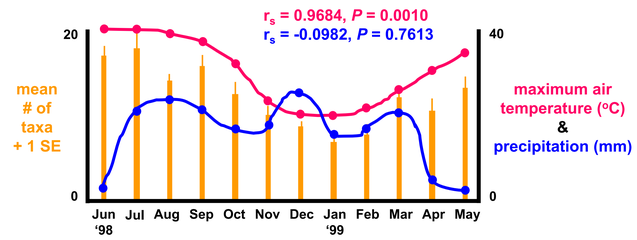


Results: community composition



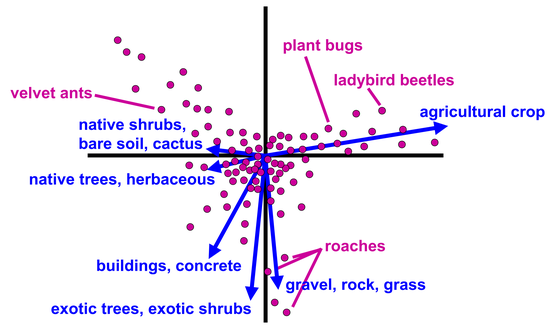
Results: seasonal richness with climate variables

Spearman correlation analysis



Results: habitat structure and community composition

Canonical Correspondence Analysis



- = abundance of each taxon (n=88 taxa)
- = linear combinations of physical habitat features:
  arrow length = importance of habitat feature
  angle between arrows = correlation (small angle = high correlation)

- most anthropogenic habitat features are situated in lower portion of graph
- the abundance of points clustered around origin indicate that most taxa are habitat generalists
- named taxa illustrate patterns of arthropod abundance as related to habitat structure

Implications

- the presence of spatial heterogeneity within the Phoenix metro area boosts the overall arthropod diversity of the region
- although the number of taxa is similar among land-use types, the community composition differs, reflecting differences in the physical habitat structure with land use
- there are arthropod communities that are characteristic of different forms of urban land use, which may be very useful in detecting latent effects of future urban development

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Coleoptera: Coccinellidae
Photo by N. McIntyre