

Habitat: Evolutionary Perspective

- Current distributions and adaptations are the result of evolutionary history
- Bottlenecks
- Co-evolution
 - Food webs
 - Keystone species concept
- Extinction & endangered species

Current distribution and habitat use is the result of evolutionary history

- Ability to adjust to future conditions (natural or human induced changes) depends on _____
- Animals may be maladapted to current conditions
- Current populations are result of history and are still evolving – but

Examples: Pikas and glacial refugia

- Fossil record indicates wider distribution
- Evidence of climatic change since last advance of ice age
- Current distribution represents populations in isolated refugia

Examples: Pleistocene & wood warblers

- Retreat of glacial ice opened vast areas to generalist species (able to adapt) who colonized from refugia or southern habitats
- Subsequent advances of ice isolated populations that either adapted to the changed conditions or went extinct
- Surviving (now distinct) species were able to expand their ranges with the next glacial retreat.

Ecological concepts - bottleneck

- When selective pressures reduce populations such that very small genetic diversity remains as the population recovers
 - Examples
 - cheetah
 - deer example

Ecological concepts - bottleneck

- Importance in fragmented landscapes

Ecological concepts – food web

- Ecosystem functioning, resilience, resistance, nutrient cycling
- Impacts of toxins, consequences of removal/introductions of members

Ecological concepts - keystone

- Keystone species concept
 - Presence is crucial to maintain diversity of community – *modifies the environment in some way*
 - Exceptional importance in relation to rest of community
 - e.g. beaver, alligator

Ecological concepts - keystone

- Kinds of keystone species
 - Modifier
 - Predator
 - Prey
 - Plant
 - Link

Frequently confused terms

- Habitat use
- Habitat selection
- Habitat preference
- Habitat requirement

Habitat Use, Habitat Selection, Habitat Preference, Habitat Requirement

- Habitat use = _____
 - implies used 'for something'
- Habitat selection = _____
 - May select certain habitats for specific behaviors (breed, feed, rest...)
use < or > availability
- Habitat preference = _____
 - Preference exists even if habitat is not there.
- Habitat requirement = _____
 - Differs from preference in that you may prefer 1 among several types that all meet your requirements

How do animals select habitat ?

- Is habitat selection and innate ability or a learned trait ?
 - Experiments with field mice
 - Harris (1952)
 - Wecker (1963)
 - Laughing gulls in N. Carolina
 - Klopfer & Hailman (1965)

How do animals select habitat ?

- Concept of stimulus summation
 - Hilden (1965) habitat selection in birds
- Crayfish example (Tash et al 1990)
 - experiments to determine what constitutes habitat
- Consequences of not being able to recognize suitable habitat.
- Niche gestalt
 - James (1971) early attempts to evaluate Hutchinson's (1957) n-dimensional hypervolume
- Competition and Predation effects on habitat selection
 - Nelson and Mech (1967) wt deer and wolves

Levels of Habitat Selection

- At the broadest level habitat selection is innate
- Evolution led to choices that constrain animals to certain geographical boundaries
 - within this 'range of tolerance' limited by historical events, animals make choices

Hierarchical levels of habitat selection

- Johnson (1980)
 - 1st Order - _____
 - 2nd Order - _____
 - 3rd Order - _____
 - 4th Order - _____
- Diagram of hierarchical levels
- A = Continental
 - 1st order
- B = Habitat
 - 2nd order
- C = Components
 - 3rd order

Habitat selection leads to differential population densities

- Not all parts of distribution have equally good 'habitat quality'
- What factors lead to population densities in a species habitats?
ASK