Thursday Lecture

2024-09-12

**Habitat Suitability**

Quiz:

What does the observation that American kestrels immediately stared using nest boxes tell us about the auditability of the Hammerstrom study area for kestrel breeding? *All other resources were present, nest cavities were a limiting resource, kestrels were already familiar with the area.*

What did the Nelson et al. experiment with house mice show about the role of conspecifics in habitat selection? *The presence of conspecifics can have a strong, negative effect on an individual’s choice to settle or select a given area.*

**Kellner *et al*.**

* λ (lamda) = net population change; growth > 1, decline < 1
  + Decrease through death or emigration
  + Increase through birth or immigration
* Their issues with habitat suitability indices:
  + heavy reliance on structural habitat characteristics as representative for all factors that influence HS
  + reliance on density as an indicator of a habitat's ability to support a species
  + do not indicate where on their scale a habitat becomes capable of sustaining a population
* Issues/differences with Kellner *et al*. definition of habitat and classic definition
  + Suitable habitat is redundant and unsuitable habitat is an oxymoron
  + The authors discuss in the context of a single population *or* *a community* of organisms. Classic definition is for a specific organism, which is more applicable to conservation management
* They specify the ***expected* value of λ**. Remember in lab when we discussed the expected value in a linear regression model. *Because of variability/error, the average of all individual values to be the mean or expected value.* ***Average finite rate of population growth (λ) over time.***
  + Focusing on that expected value is looking at the average growth rate for a population over time because there will be fluctuations within a time period.
* Limitation of defining habitat suitability by the population growth rate, does this tell us anything about residing?
  + A population can be reproducing and surviving without growing. You could have a decline in pop growth rate, but individuals are still residing there and reproducing
  + If we limit our definition of habitat to populations that are on average growing, we might ignore other declining/persisting populations (λ ≤) residing in habitats that are viable for that species in a conservation perspective.
  + Focusing on growth rate is very difficult to do in practice (requires long-term, >8y, monitoring) and potentially over restrictive (ignoring viable habitat with populations that are declining/persisting, potentially for a reason outside of habitat suitability)
* **Habitat Quality**: the expected value of λ
  + That value may be of limited use for practical application of habitat conservation. What do you do when someone gives you a number?
    - You might have a net decline in population, but the necessary conditions for an organism may still be there
    - **Does not tell you why** it’s that number. If it’s dependent not on birth/death, but rather on immigration/emigration, this could be a source sink. Somewhere around there’s a pop producing an excess of emigrants that are moving into this supposedly suitable habitat, but are not reproducing
* What is useful about their definitions is that they do relate habitat quality/suitability to population demographics. However, they describe four potential flaws.

1. Populations residing in suitable habitat can undergo long-term declines due to factors outside the habitat
2. Changes to habitat may reduce carrying capacity, but not eliminate the potential to support a viable population
3. Problematic to determine when populations are maintained through immigration
4. In a highly fragmented landscape, none of habitat fragments may represent suitable habitat

We will talk more about why focus on λ is unrealistic/difficult to use as a measure of HS/HQ. Probably will discuss the points made above.

For next lecture, think about: does every habitat study need to be long-term to be worthwhile?