

Spatial Capture-Recapture II: Assumptions



PART II: BASIC ASSUMPTIONS OF MODEL SCR0

- Stationary home range. A central point about which an individual's activity is concentrated.
- $s[i]$ uniformly distributed in space (AND independent)
- State-space must be prescribed.
- $p[i]$ just depends on distance
- Individuals are encountered independently of one another.
- Encounters of the same individual are independent.

Wow this is so many more assumptions than an ordinary CR model! How can they be useful for anything?

Explicit hypotheses should be preferred to sweeping things under the rug. Cost of using spatial data is being explicit about spatial hypotheses.

STATIONARY HOME RANGE

- Home range is characterized by a stationary point s for each individual
- Closure: home ranges don't move or disappear or appear.
- Violated if: Dispersal/transience.
- Is this important? Probably not. If dispersal or transience is happening, it biases the parameter of the encounter probability model but doesn't seem to bias N or density.

UNIFORMITY

- The basic model we assume $s[i] \sim \text{Uniform}(S)$
- This is not a very important assumption:
 - Not an assumption of information but an assumption of lack of information. It imparts no specific information about location.
 - The posterior distribution of the activity centers can be strongly clustered despite the uniformity assumption. We conclude that the uniformity assumption is weak. N/D robust.
 - Can be generalized. $s[i] \sim \text{non-uniform point process}$

CHOICE OF STATE-SPACE

- Is the size and shape of S important? [will talk about this later]. It can be. **It is, after all, a prior distribution.**
- Should include all captureable individuals
- $E(y(d)) \rightarrow 0$ as d increases. So no contribution to the likelihood.
- Required in likelihood analysis also.

HOMOGENEOUS ENCOUNTER MODEL

- Encounter probability depends on Euclidean distance between x and s .
- Conjecture: estimates robust to this in many cases.
- Can be generalized

Royle, J. A., Chandler, R. B., Gazenski, K. D., & Graves, T. A. (2013). Spatial capture-recapture models for jointly estimating population density and landscape connectivity. *Ecology*, 94(2), 287-294.

Chris Sutherland's lecture tomorrow

INDEPENDENCE ASSUMPTIONS

- Encounter in traps are independent
 - Correlated space usage?
 - Behavioral responses
- Individuals are independent
 - Family groups?

OTHER THINGS?

SUMMARY

- Assumptions in SCR models: There are a lot of them
- We expect some robustness (and has been demonstrated)
- Generalizations of models have been made (resource selection, non-Euclidean distance, movement/dispersal)
- More work remains to be done.