Tuesday Lecture

2024-09-24

**Sources and Sinks vs. Ecological Traps II**

Quiz:

What needs to happen for a site to become a source? *A net surplus of individuals (that can emigrate from this site).*

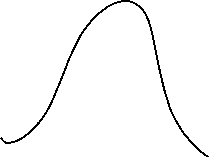
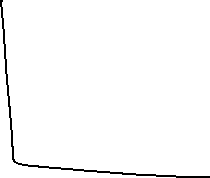
What makes a site an ecological trap? *All the cues to indicate high-quality habitat are present, but there is either some novel feature that increases mortality and/or decreases reproduction or some appropriate resource is now lacking. E.g. Open meadow-nesting birds nesting in hay fields before the first hay cutting or amphibians laying eggs in anthropogenic wetlands with insufficient hydroperiods.*

**Which are more common, sinks or ecological traps?**

* Sink, assuming sub-optimal habitat that individuals have to go to because they have nowhere else to go.
* Traps, a cue is causing individuals to want to settle there.
* Battin: “An ecological trap is a habitat “low in quality for reproduction and survival [that] cannot sustain a population, yet . . . is preferred over other available, high-quality habitats” (Donovan & Thompson 2001). Thus, a trap is simply a sink habitat that is preferred rather than avoided (Fig. 1), or an “attractive sink” (Delibes et al. 2001).”
* Something in the environment has changed, maybe not the sign stimuli, so individual does not leave. Evolution has not caught up to this sudden change and the animal stays there, despite lack of fitness.

Javan’s thoughts: Ecological traps more common - humans have so greatly changed the landscape, but in ways that may not have changed the sign stimuli. Habitat fragmentation changing sign stimuli for forest dwelling songbirds.

* **Extreme fitness consequences of habitat selection so natural selection works strongly on settling response**, so difficult for sinks to persist long-term in a landscape that is not being modified. Does it make sense for an animal to settle in an environment where it knows it will incur no fitness? No, natural selection should weed out those individuals that would select habitat that the sign stimuli indicates to them as non-habitat. Natural selection will hone in the tendency for species to select low quality habitat.



Selection

Frequency

How would we go out and actually determine which is more common?

* Looking at lambda over short period of time, we have too much variability to know. So need to look at expected lambda.
* Very difficult to determine survival, reproduction, immigration, and emigration.
* When people look into source-sink and traps, often people report incomplete measures. Battin sources often used just reproduction and survival.

**Natural selection will act quickly on individuals with settling response to sign stimuli that indicate non-habitat, but difficult to act on individuals settling in ecological traps.**

Something about the trap still looks good to the individual.

**Mannan et al. (2008) - Coopers Hawks**

Tucson has good nesting habitat for coopers hawks, but also evidence for less optimal breeding habitat due to nestling parasite due to pigeons and doves.

* High nest density, high prey delivery rates, high adult survival, small breeding season home range
* 85% nestling parasite infestation in urban areas, 40% of nestlings killed annually by diseases from parasite
* Sound like an ecological trap? **What does lambda say??**
* Lambda = 1.11 (P = 0.0073 that lambda < 1)
* Ecological trap? They argue no.
  + High post-fledgling juvenile survival, which contrasts to patterns in non-urban raptors where high 1st winter survival is common.