Outline for ANB 218B Paper - Memory and Foraging

What is memory in animals?

Thesis: A large body of evidence suggests many animals are capable of episodic memory, which can serve as a cue for decision processes. Foraging animals that use episodic memory as a cue are likely to make decisions that differ from standard optimal foraging theory.

1. Episodic Memory – Discuss “What, Where, When, Who?”
   * 1. Fagan et al 2013
   1. Where Memory
      1. Evidence of “where” memory
         1. Clark’s nutcrackers (Balda & Kamil 1992)
         2. Storing vs. non-storing tits (Krebs et al. 1990)
      2. Implications
         1. Optimization of Travelling Salesman (Janson & Byrne 2007)
   2. What memory
      1. Evidence of “what” memory
         1. Scrub Jay Caching (Clayton & Dickenson 1998)
            1. Degrading/Pilfering
            2. Modulate return time by quality of cache
         2. Primate (find citation)
      2. Implications
         1. Changes in MVT because of valuable nearby resources
   3. When memory
      1. Evidence of “when” memory
         1. Scrub Jay Caching (Clayton & Dickenson 1998)
         2. Capuchins remember resources regeneration and time since last visit (Janson 2016)
      2. Implications
         1. Avoidance of recently visited areas
            1. More optimal than simple random walk models
   4. Who memory
      1. Awareness of self in a memory?
      2. Theory of Mind/awareness of others?
      3. Social learning?
      4. Memory of predators and competitors
2. Type of spatial map animals use
   1. Mental Maps vs. Topological maps
      1. shortcuts
   2. Erhart & Overdorff 2008
3. Updates to Optimal Foraging
   1. Marginal Value Theorem
      1. Average time to patch vs known time to patch
      2. GUD as a function of known patches or environmental resource richness.
         1. You are at a better than average bar, but you know there is an even better one nearby.
         2. Type of uncertainty (finding a resource when moving randomly vs. unreliability of memory)
   2. Random Movement
      1. Animals without memory should respond to clustered patches differently than animals with memory
      2. For animals w/ memory, tradeoff between direct movement and random movement to sample for new/unknown patches
         1. Sampling of new patches (deviation from traplines)
      3. Route Planning?

Things not yet in framework:

1. Phenology & Seasonality
2. Social Learning
3. Cost of increased cognitive function
   1. Evolution of larger brains?