Feeding III: Predatory Insects

Matt O'Neal
Dept. of Entomology
Michigan State University

Predation Syndrome

- Basic obstacles for all predators
  1. Search for prey required
  2. Ability to overcome and subdue active/mobile prey
  3. High energy costs to accomplish 1 and 2, for development and maintenance

Predation Syndrome

- To overcome these obstacle, following features are come to a generalized predator
  - Broad, generalized diet
  - Broad habitat tolerance
  - Inverse pyramid of habitats, higher order predators need to utilize more habitats
  - Lower species diversity – fewer oppurtunities to specialize
  - Large size, with respect to prey

- Contrast last two with herbivores and parasitoids

5 steps to successfully feed

1. Food habitat location
2. Food finding
3. Food recognition
4. Food acceptance
5. Food suitability

1. habitat location

- How to reduce cost of search
  - Adults lay eggs in/near prey habitat
    - Aphidophagous predators (Syrphidae, Chrysopidae, Coccinellidae larvae)
    - Females attracted to honeydew
    - Egg laying decreases as aphid # decreases, but increases with presence of honeyde and aphid odors
    - Carter and Dixon 1984; Dixon 1986

2. Food finding-predation tactics

- Numerous strategies and variations- the highlights
  - Sit and wait or “order in”
    - Pro = low search energy
    - Con = long periods of fasting, results in starvation tolerance

    Example: *Dendroleon jezoensis*

    Not all antlions build pits

    Sits for months of rocks, eventually covered in lichens in high density (344 /m2), life cycle is several yrs!

2. Food finding-active search

- "Search and Destroy"
  - Pros = increase search range
  - Cons = $Energy_{in} > Energy_{out}$
  - Ways to reduce E expenditure
    - Continuous travel vs. alternate pause-travel
    - Large size, increase range of and number of potential prey
    - Collect smaller than larger prey, reduce handling time
    - Gimmick – venom
      - Example of solitary vs social wasp venoms

3. Food recognition

- Issues
  - Visual cues may predominate
  - Search Image Hypothesis (Price 1991)\
    - Introduced by Tinbergen
    - “hunting for certain visual cues associated with relatively cryptic food while ignoring or overlooking others.” –(Price a la Alcock)
  - Evolutionary response of prey seen (or unseen) in mimicry and cryptic defenses –later lecture

4. and 5. Acceptance vs Suitability

- Difference in acceptable versus suitable
  - Suitable (Essential) – ensure completion of larval development and adult reproduction
  - Acceptable (Alternative) – serve as energy source and prolong survival only
- Huge issue in Biocontrol – Is a 24 hr feeding assay sufficient?
  - example of indigenous predators feeding on recently introduce soybean aphid