Life history

An organism’s overall pattern of growth, maintenance, and reproduction in response to its environment.

A few life history traits

- Life span
- Number of offspring
- Size of offspring
- Age at first reproduction
- Amount of parental investment
- Etc.

The principle of allocation is central to life history evolution.
Organisms have limited time & energy to allocate to different functions

Time/energy used for one function → cannot be used for other functions

Life history “strategies” involve trade-offs that affect fitness

Reproduction trade-offs in fish: few large eggs or many small ones?

Larger females produced more but smaller eggs

What are the trade-offs?

Turner and Trexler (1998)
Reproduction trade-offs in plants: few large seeds or many small ones?

Seeds occur in great diversity of shapes and sizes

More seeds, smaller size

Stevens [1932]

How are these life history patterns determined by environmental conditions?

Many small seeds

Low energy reserves
High dispersal, less competitive

Few large seeds

More robust seedlings
More competitive, limited dispersal

In plants, seedling mass is influenced by seed mass

Larger seedlings grew from larger seeds
Larger seedlings more likely to survive
There is a trade-off in clutch size and fledging rate in many birds

Most chicks fledged at largest clutch size found in nature (7)

Number of fledglings limited by parent ability to supply food

Clutch size can also affect the survival of parents

A larger parental investment lowers parent survival

How do environmental conditions affect the evolution of life history traits?

“Variable” environment

reproduction

Allocation

“Stable” environment

growth/survival

r-selected

K-selected

r-K life history traits involve a trade-off between reproduction versus growth/survival

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<thead>
<tr>
<th>r-strategist</th>
<th>K-strategist</th>
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<tbody>
<tr>
<td>High reproductive rate</td>
<td>Low reproductive rate</td>
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<tr>
<td>Rapid development</td>
<td>Slow development</td>
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<tr>
<td>Low parental care</td>
<td>High parental care</td>
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<tr>
<td>Short-lived</td>
<td>Long-lived</td>
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An r-strategist

Midge fly (*Mycophila speyeri*)

- Feeds on common edible mushroom (*Agaricus campestris*)
- In nature, *Agaricus* fruiting brief & variable
- Key life history traits:
  - Generation time: 2 wks
  - Midge reproduces asexually (parthenogenetically)

A K-strategist

Elephants are long-lived and produce few offspring

- Their environment is relatively stable
- Key life history traits:
  - Low reproductive rate
  - Delayed reproduction
  - Long-lived
  - High parental care
**r- and K-strategists also tend to show different patterns of population dynamics**

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<thead>
<tr>
<th>r-strategist</th>
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<tr>
<td><img src="image1.png" alt="Graph" /></td>
<td><img src="image2.png" alt="Graph" /></td>
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Adapted to **variable** availability of resources  
Adapted to **stable** availability of resources