**Life Histories**

The “schedule” of an individual’s life, including age at maturity, number of offspring, life span, number of reproductive opportunities (maturity, fecundity, aging, parity)

On average, all individuals have **one offspring** that reaches reproduction---from dandelions to house finches to humans

**Why must this be the case?**

**Then why so many different “ways” to achieve the same outcome?**

**1. Basic components of life history**:

* + 1. Maturity: age at 1st reproduction
    2. Parity: number of reproductive episodes/lifetime
    3. Fecundity: number of offspring produced/episode
    4. Life span: survival schedule, aging & senescence

**a. Terms:**

* + 1. **Semelparity**: reproducing only once before programmed death

**Iteroparity**: reproducing multiple times

* + 1. For plants specifically, **Annual**: living one year

**Perennial**: living >1 year

**Examples**:

Some species have life histories with high fecundity, short time to maturity, and poor survival (**Asian tiger mosquito**)

Somewhere in between (**Cascades frog**)

Some species have life histories with low fecundity, long time to maturity, and high survival (**African elephant**)

* 1. Life history diagrams summarize average life history events (usually involve 1-year time steps)
  2. Life histories are the result of natural selection. They represent successful ways of allocating limited resources to carry out various functions of living organisms.

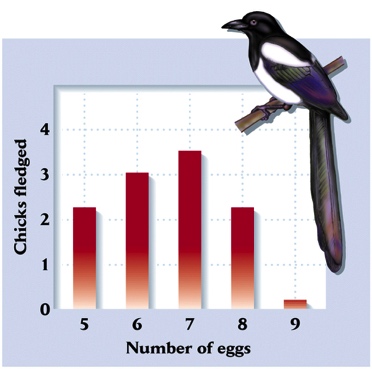
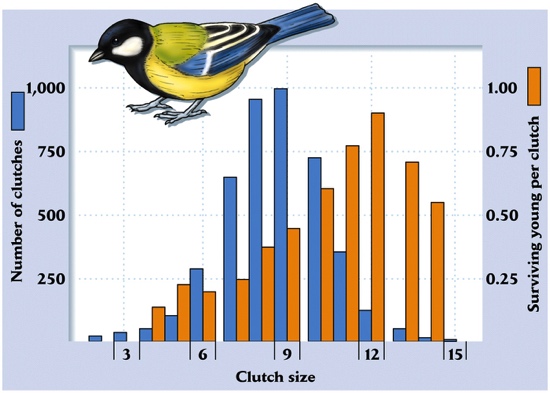
1. **Tradeoffs exist in the allocation of resources**.

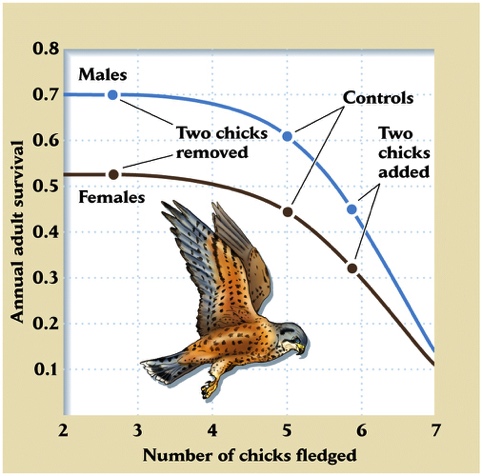
Goal is to maximize **lifetime reproductive success** with limited resources.

These are hypotheses that can be tested experimentally.

When to begin breeding? How often to breed? How many offspring per event?

* 1. Clutch size vs lifetime number of offspring. What is the evidence for the “**Lack clutch**”?



1. Fecundity and adult survival

General pattern for birds

European Kestrels

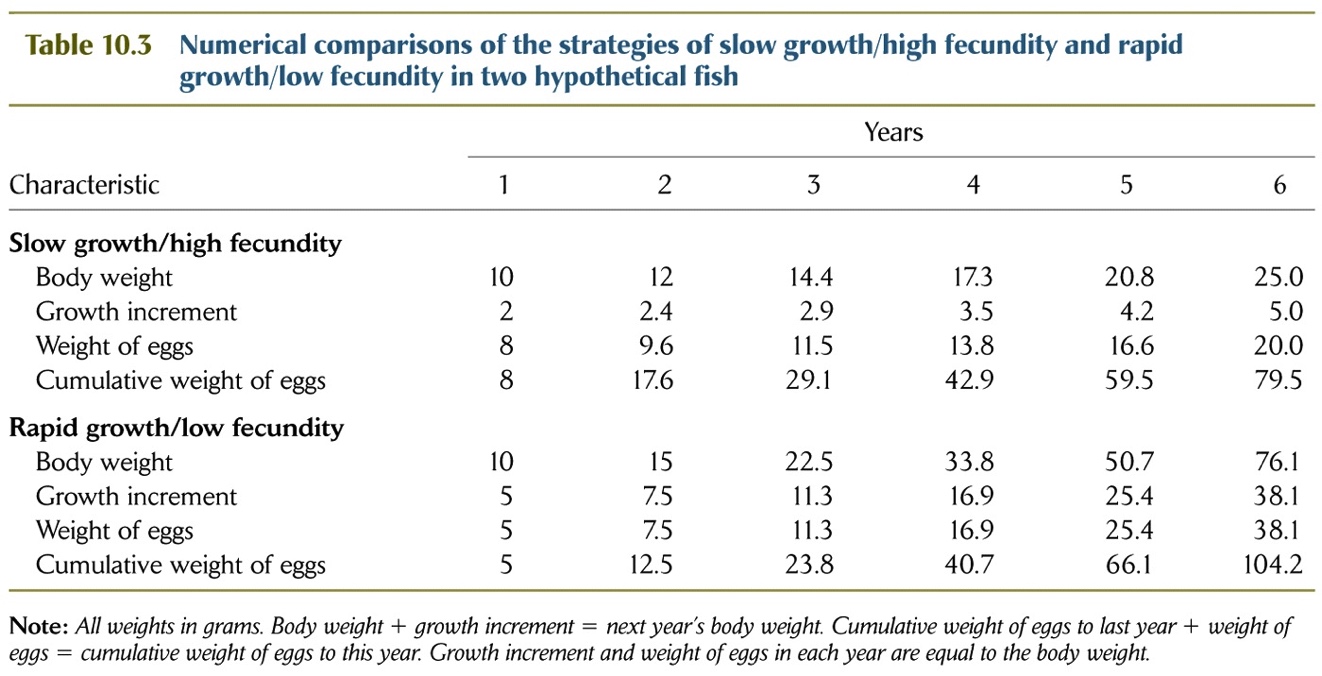
1. Age at first reproduction (reproduce now or later): Delayed reproduction in organisms that learn or grow
   1. **Example with table below**
      1. Rules: If an organism does not reproduce, then its annual reproductive output increases by 10 offspring
      2. This output continues through the lifespan of the individual

TOTAL EGGS PRODUCED

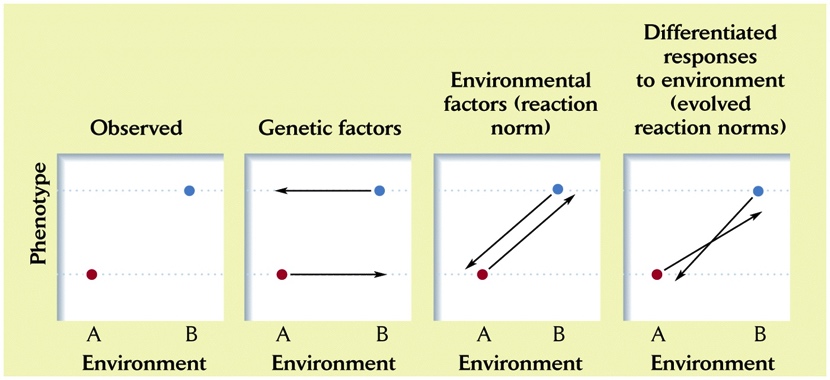
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Age at 1st repro | Lifespan: 1 yr | 2 | 3 | 4 | 5 |
| 1 |  |  |  |  |  |
| 2 | -- |  |  |  |  |
| 3 | -- | -- |  |  |  |
| 4 | -- | -- | -- |  |  |
| 5 | -- | -- | -- | -- |  |

1. Fecundity and growth
   1. **Determinate** vs. **Indeterminate** growth

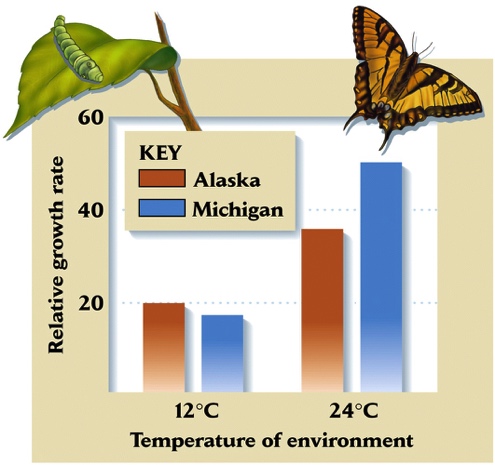
b. How does allocation of energy to growth versus reproduction affect lifetime reproductive output?



1. **Environmental conditions affect life-history**
   1. Most traits under strict genetic control (generally)
   2. Some life history traits that respond to environmental cues = **phenotypic plasticity**
   3. Said another way, phenotypic plasticity is change in phenotype due to variation in the environment
   4. **Reaction norm** describes how (if) the phenotype varies with environment

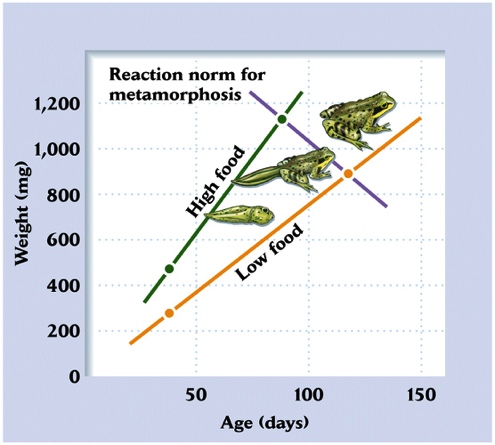


* 1. Physical (abiotic) environmental variation (temperature, resources---which can affect reproduction, metamorphosis, etc.)



Test for differences between populations of the same species with **reciprocal transplant experiment**

* + 1. Time to metamorphosis: depends both on food availability and predation risk



Constant weight threshold

Constant age threshold

Some other combination of cues

* 1. **Genotype x environment interaction**: plasticity itself can adapt

Are populations diverging?