



# Lecture 13

## Life history variation

WILD3810 (Spring 2020)

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- Trade offs

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Demographic traits that influence fitness (i.e., )

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- growth pattern
- age at maturity
- fecundity schedule
- mortality schedule

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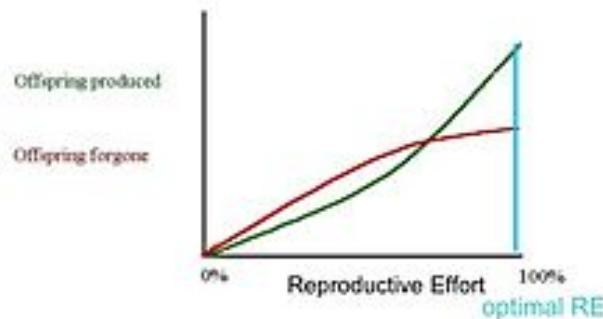
# Life history trade offs

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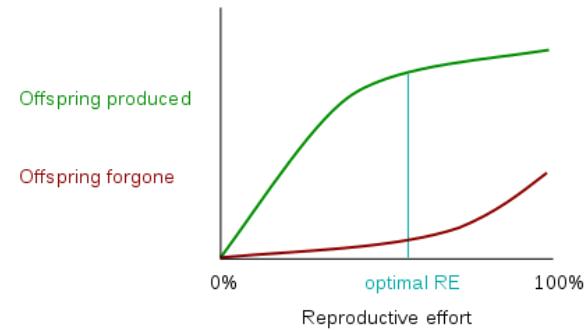
# Life history trade offs

Current reproduction vs. future reproduction

Semelparity

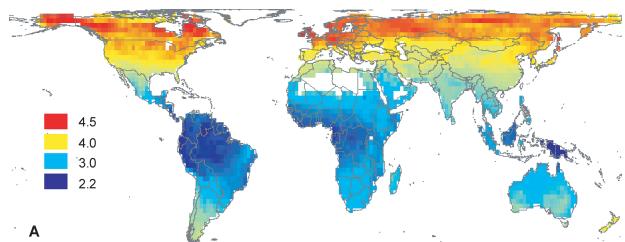


Iteroparity

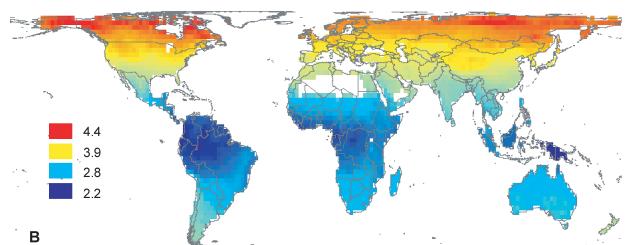


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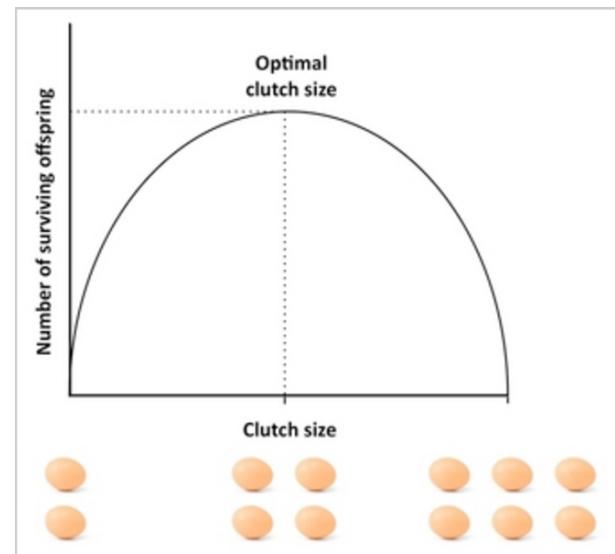
Offspring quantity vs. quality (Lack 1954,1968)



A



B



# r-K selection

Arises directly from logistic population growth model  
(MacArthur & Wilson 1967; Pianka 1970)

- : density-independent rate of population growth
- : carrying capacity

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- selection for ability to colonize and reproduce rapidly
- good colonizers, poor competitors

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- $r$ : density-independent rate of population growth
- $K$ : carrying capacity

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## K-selected species

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# Life history trade offs

Predictions (based on Pianka 1970)

	r-selection	K-selection
Mortality	Variable & unpredictable	Constant & predictable
Population size	Variable & below K	Constant & close to K
Competition	Variable & weak	Strong
Selection favors	Rapid development, early reproduction, small body size, semelparity	Slow development, delayed reproduction, large body size, iteroparity
Length of life	Short	Long

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# r-K selection

The predictions of r-K selection stimulated vast amounts of research on life history evolution

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But...

- Many species don't fall neatly into these categories (combinations of r-selected traits and K-selected traits)
- Predictions are vague enough that many different results are "consistent" with them
- Carrying-capacity is not a demographic parameter so traits that influence resource use do not directly translate to a specific K

# Fast-slow continuum

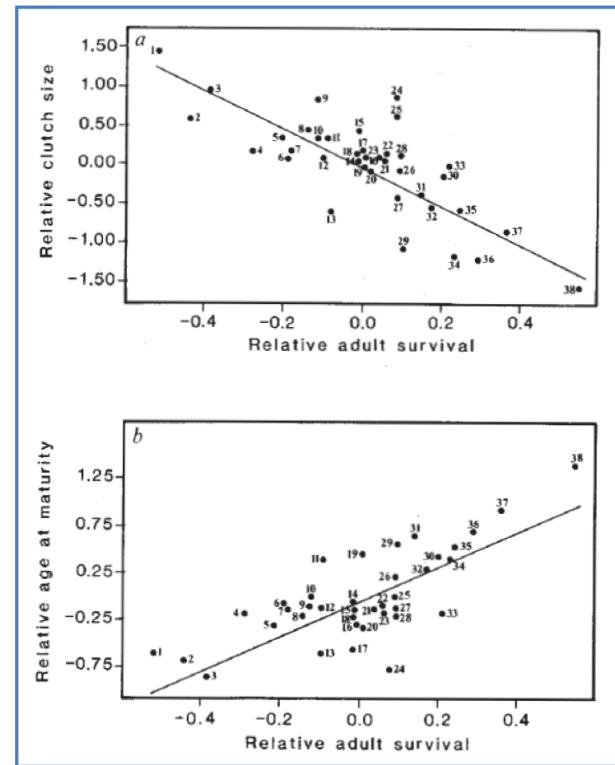
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# Fast-slow continuum

More recent studies view life history variation as existing on a continuum:

Slow species	Fast species
Low reproductive effort	High reproduction
Delayed maturity	Early maturity
High survival	Low survival
Long generation time	Short generation time

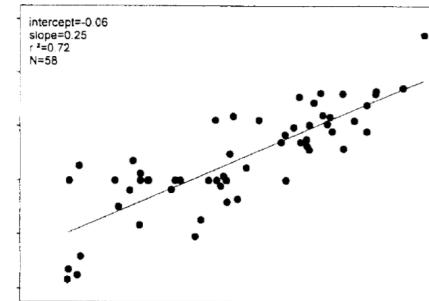
# Fast-slow continuum in birds



# Fast-slow continuum in mammals



Age at 1st reproduction vs. adult body mass



Adult lifespan vs. adult body mass

# Fast-slow continuum and elasticities

Is the fast-slow continuum related to which vital rates influence ?

- Explicit connection between evolved pattern of life history vital rates and impact on population dynamics
- Elasticities are useful to guide conservation & management

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# Fast-slow continuum and management

Distinctive demographic elasticity patterns across bird, mammal, and plant life histories

- Elasticities can be reasonably assessed from limited knowledge of an organisms life history (e.g., clutch size, age at maturity, etc.)
- Managers can assess whether to focus on managing survival (e.g., through harvest or wintering habitat) or reproduction (e.g., spring and summer habitat)
- Very important for the conservation of rare species
  - Detailed demographic studies not possible