Life History

- Record of events relating to
  - growth
  - development
  - reproduction
  - survival

Characteristics that define life history
- Age and size @ sexual maturity < asexual / sexual
- Amount & timing of reproduction
- Survival and mortality rates

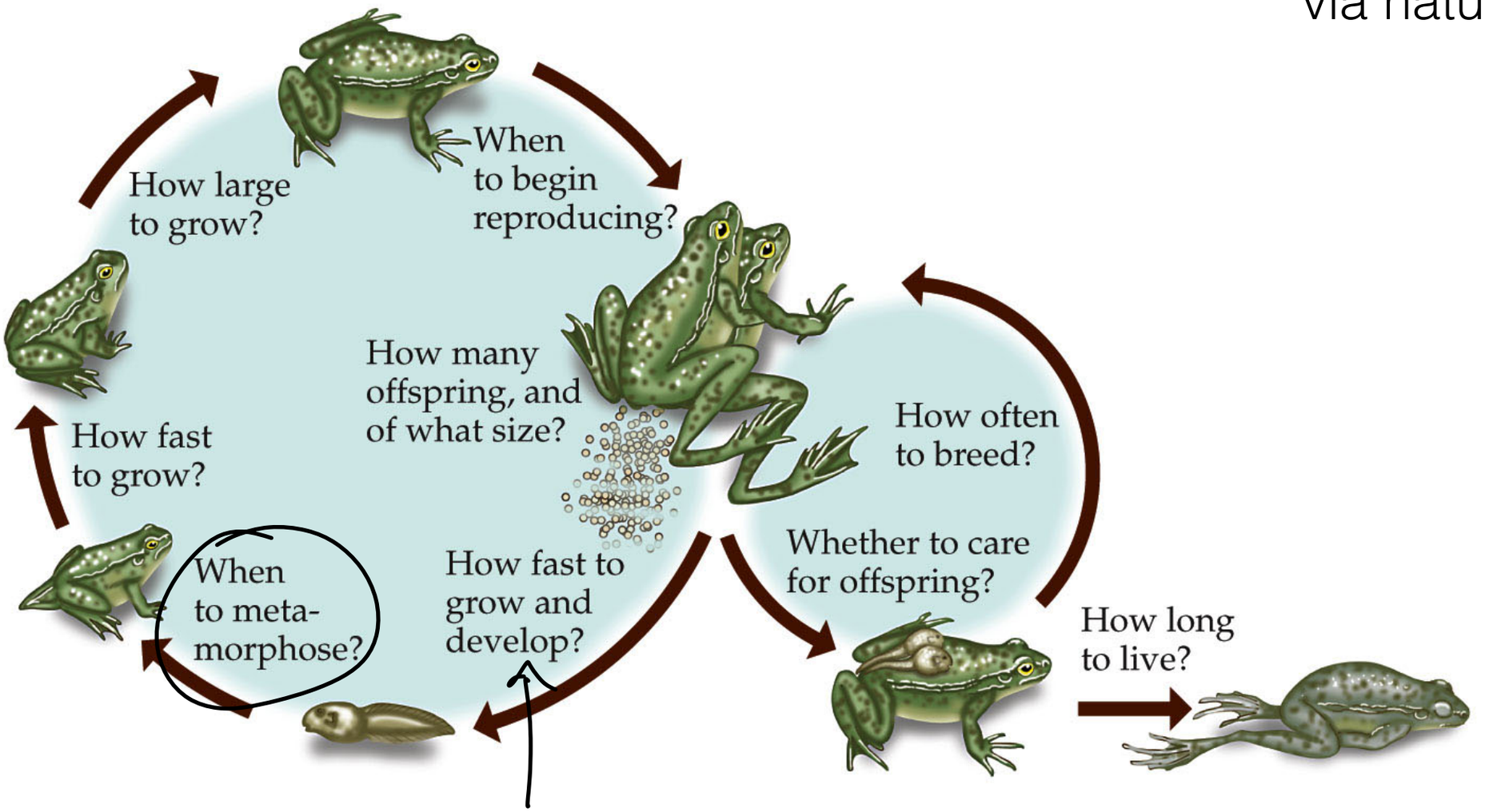
Life history varies within & among species
(sea otter diets)

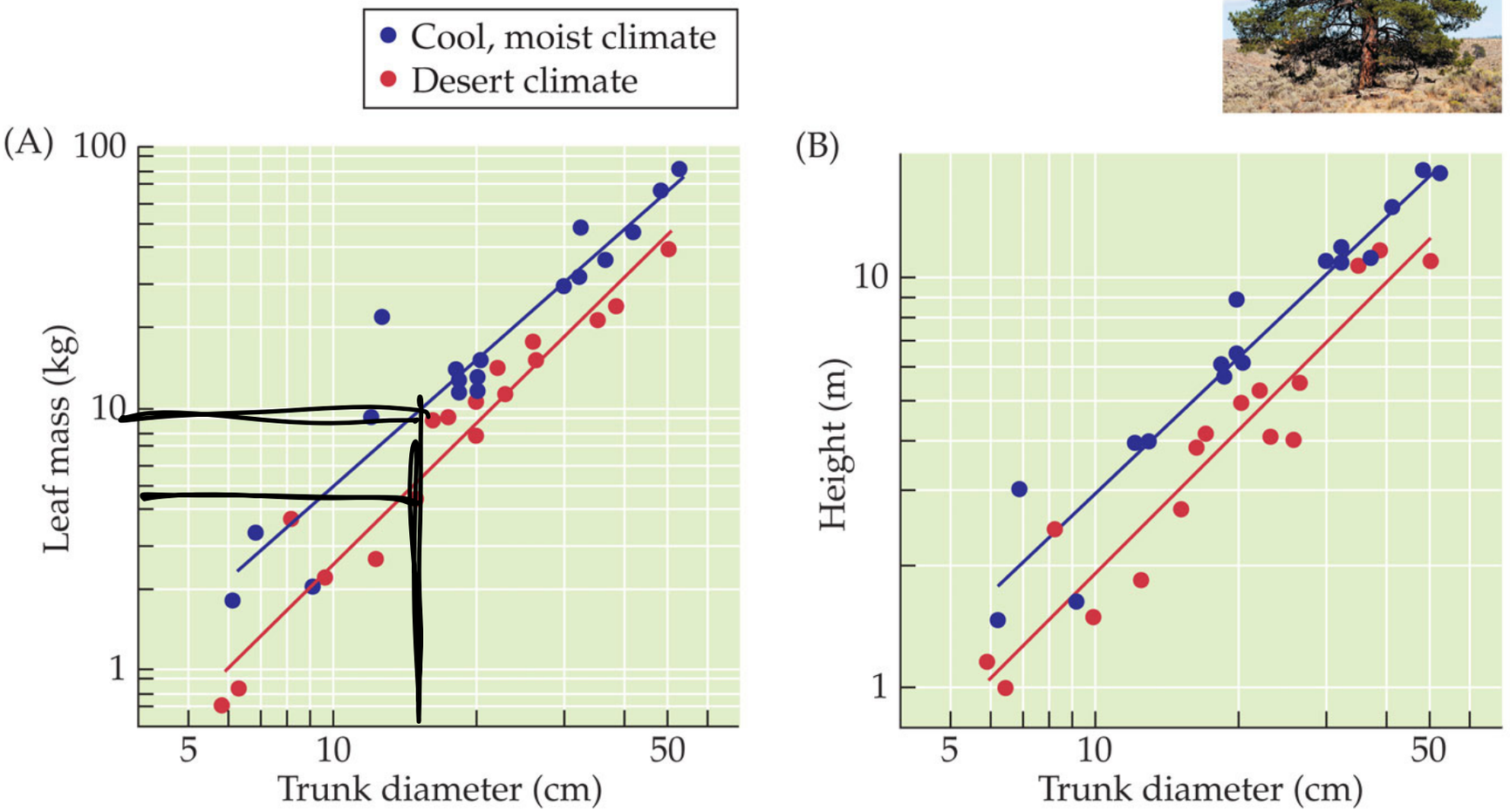
individuality
genetic variation or environmental conditions

Life history strategies: timing/nature of events
How does the organism allocate (divide) time/energy btw { somatic growth and maintenance / reproduction / survival }

Maximizing relative fitness by adjusting life history

via natural selection





ECOLOGY 3e, Figure 7.4
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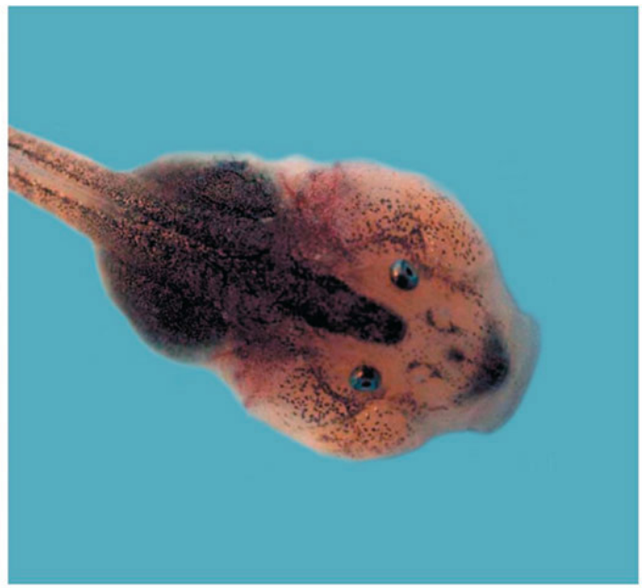
Phenotypic plasticity: one genotype produces different phenotypes under different environmental conditions

- ~~cond~~ continuous

(A) Omnivore morph

Omnivores feed on the pond bottom on detritus

(B) Carnivore morph



Carnivores feed in the water column on fairy shrimp

***ECOLOGY 3e*, Figure 7.5**

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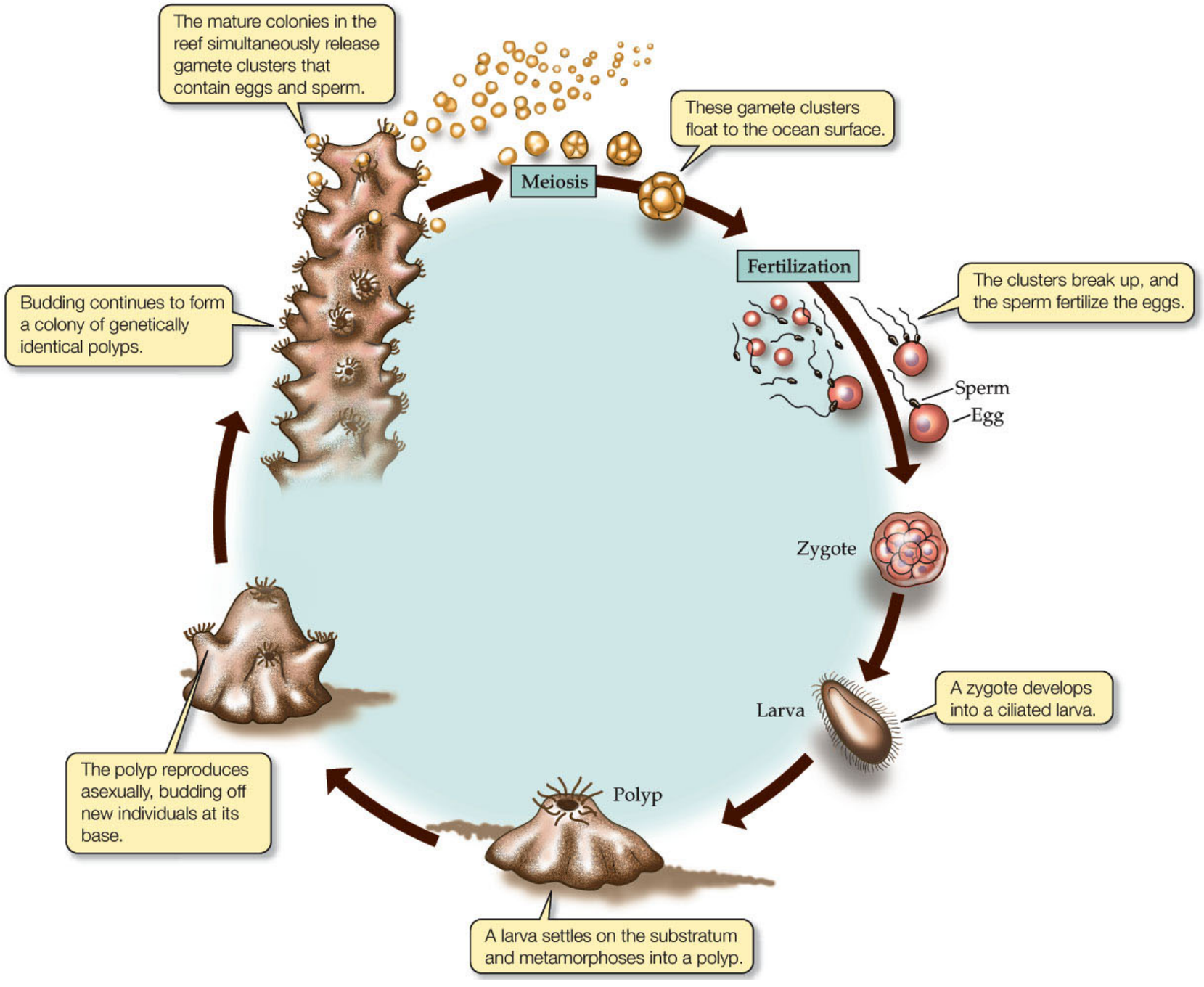
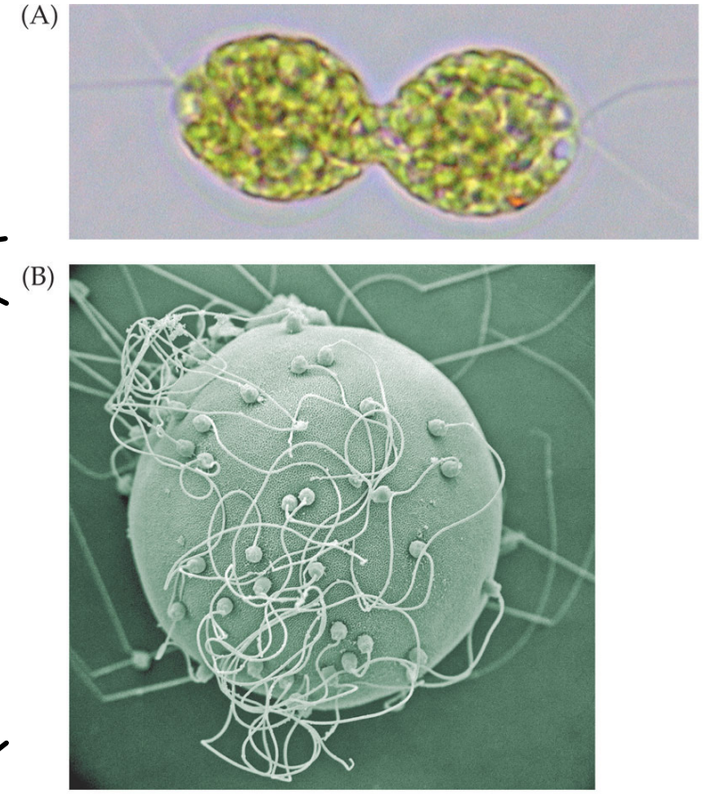
- grow slowly
- ↑ body condition

Ephemeral ponds (dry up)

- grow quickly


The mature colonies in the reef simultaneously release gamete clusters that contain eggs and sperm.
These gamete clusters float to the ocean surface.
Meiosis
Fertilization
The clusters break up, and the sperm fertilize the eggs.
Sperm
Egg
Zygote
Larva
A zygote develops into a ciliated larva.
Polyp
A larva settles on the substratum and metamorphoses into a polyp.
The polyp reproduces asexually, budding off new individuals at its base.
Budding continues to form a colony of genetically identical polyps.

Asexual: simple cell division (prokaryotes and many protists)



ECOLOGY 3e, Figure 7.7
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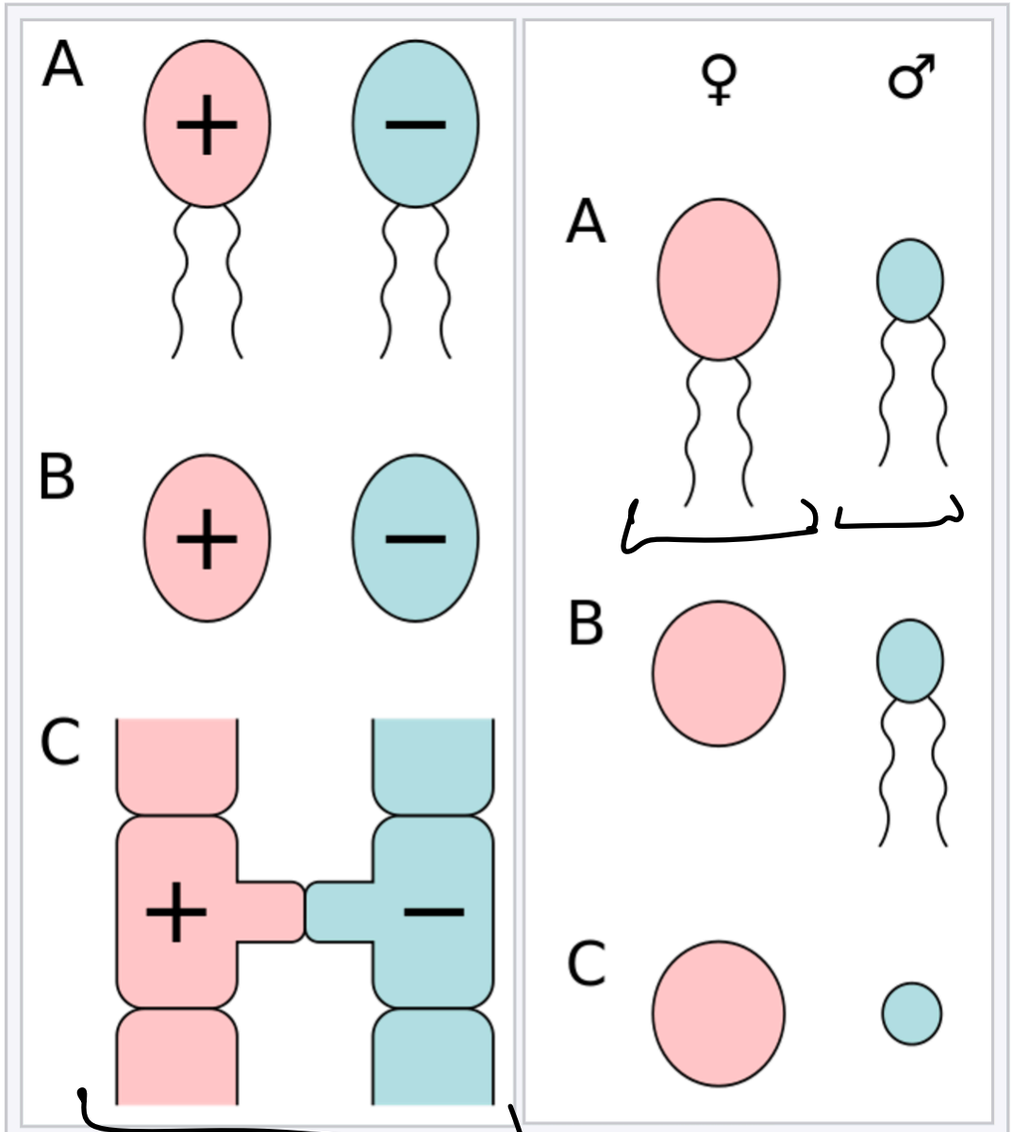
Sexual: Costs

- $\frac{1}{2}$ genome transmitted
  - It takes 2 growth rate of populations is much lower

- recombination
  - ✱ introduces variation



Different forms of isogamy: A) isogamy of motile cells, B) isogamy of non-motile cells, C) conjugation.

Different forms of anisogamy: A) anisogamy of motile cells, B) oogamy (egg cell and sperm cell), C) anisogamy of non-motile cells (egg cell and spermatia).

Large expensive eggs

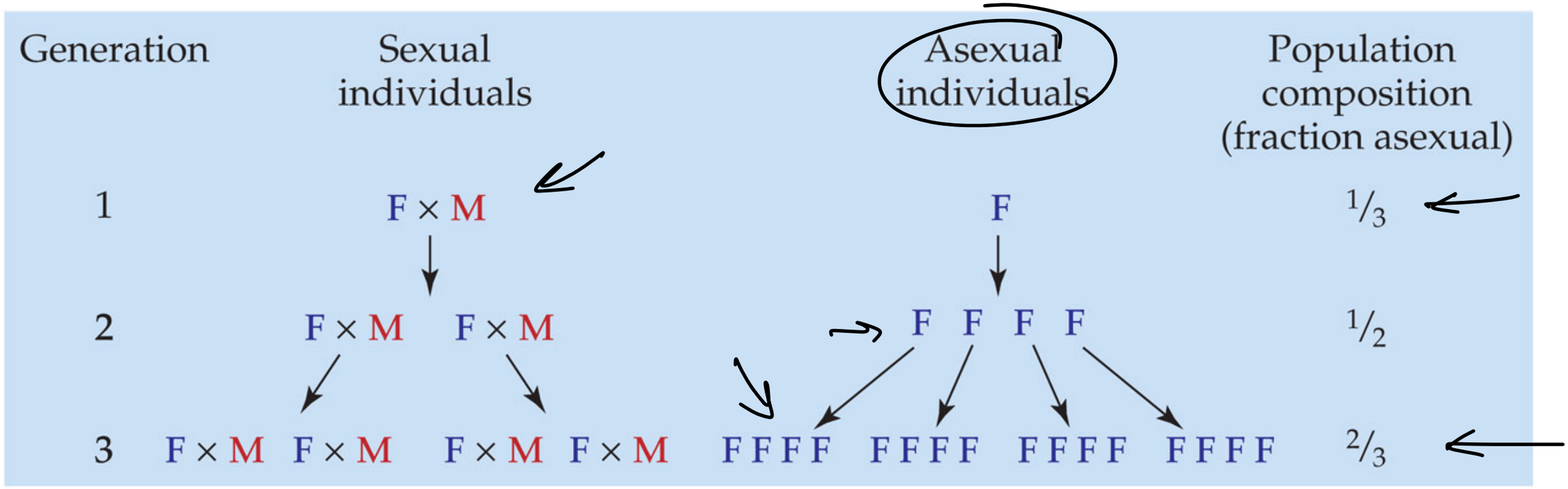
small cheap sperm

Each sex optimized to maximize its reproductive potential

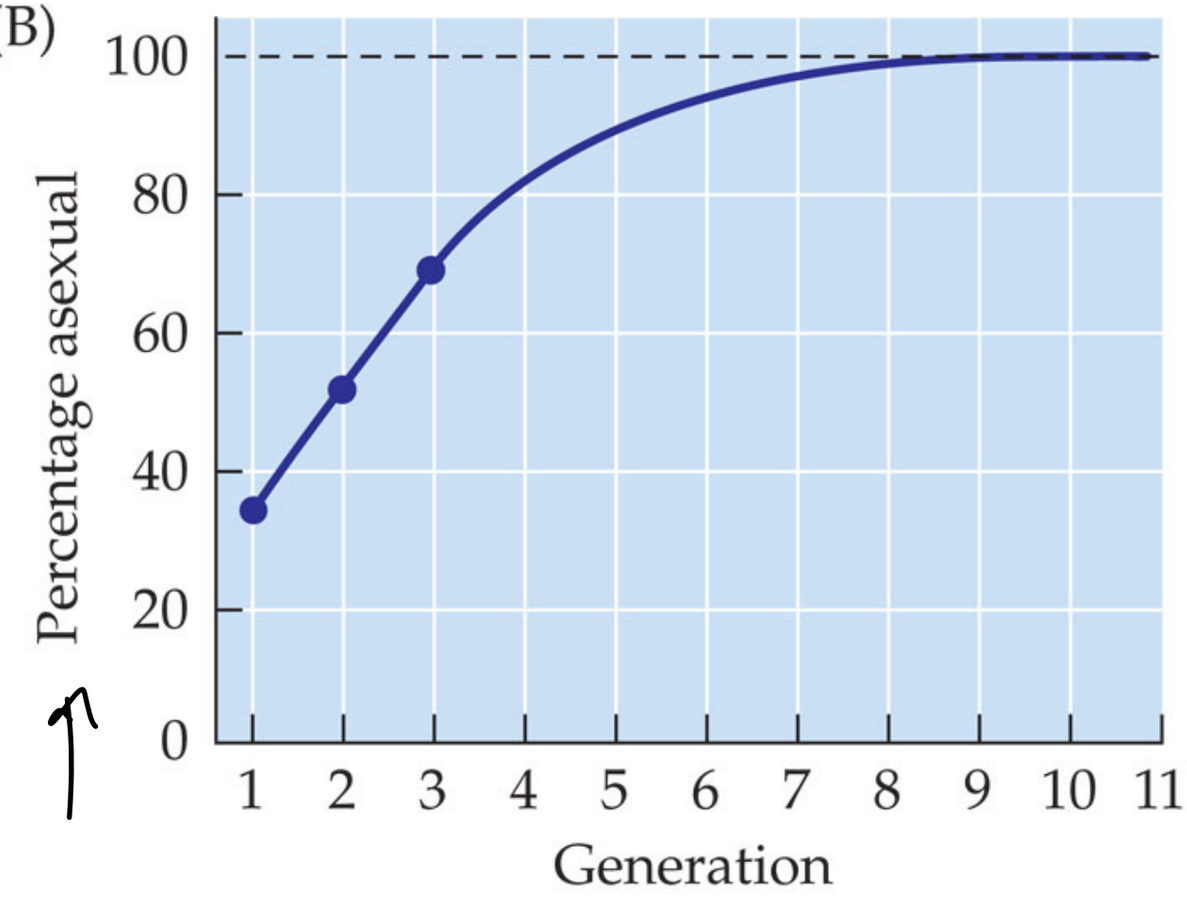
- ♀ are the limiting factor bc they birth and often rear offspring

- ♂ are cheap

(A)



(B)



The cost of sex
i.e. the cost of males

***ECOLOGY 3e*, Figure 7.8**
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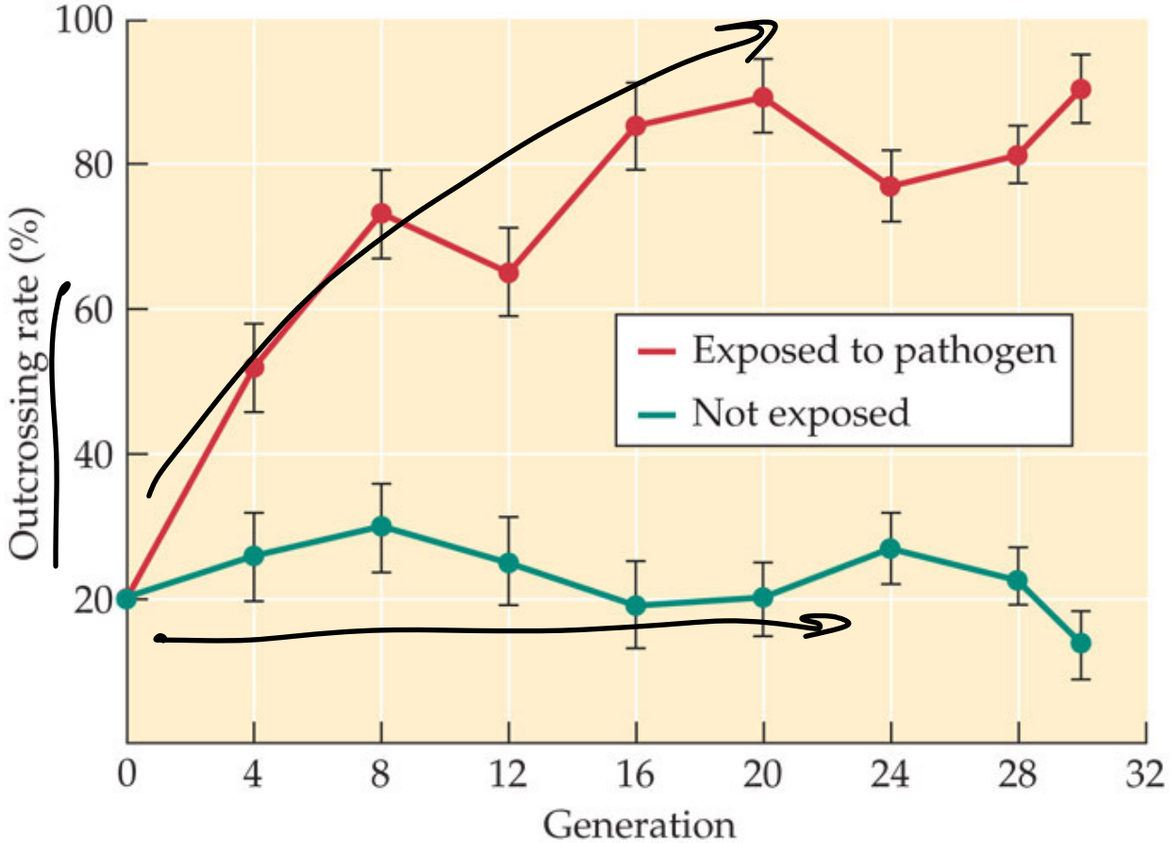
(A)



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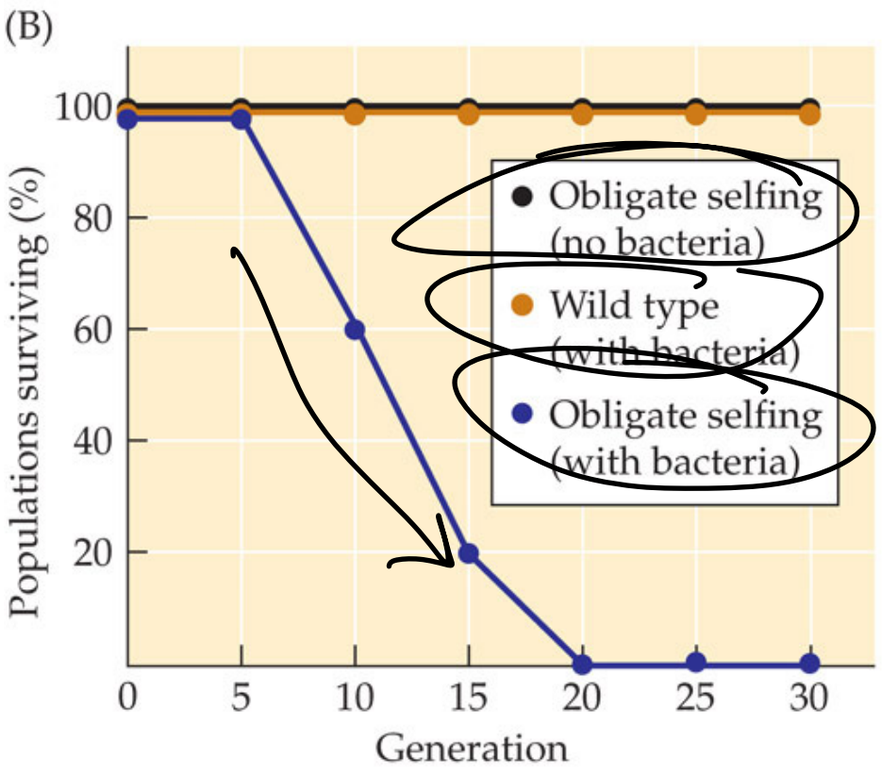

C. elegans ♂ or hermaphrodites

- Hermaphrodites can reproduce by selfing OR mating w/ ♂

- genetic manipulations result in obligate < outcrossers / selfers

vs.

wild type

(+) bacterial pathogen

↑ genetic variation is key to living w/ pathogens

***ECOLOGY 3e*, Figure 7.9**

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Some organisms have complex life cycles
(plants, fungi, algae, protists)

- Alternation of generations [Haploid phase, Diploid phase]

i.e. Multicellular diploid sporophytes

Wasps…

BBC

BBC

Number of reproductive bouts

Semelparous - reproduce 1X
- annual plants
- some Pacific salmon
- rare in vertebrates apart from bony fish

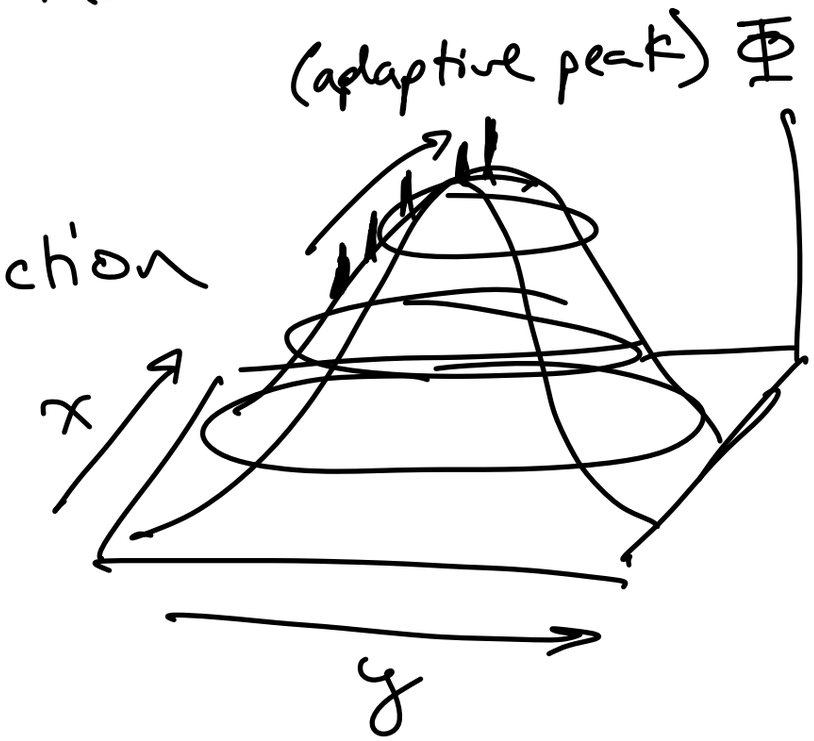
Iteroparous - spp. reproduce multiple times
- birds, reptiles, mammals

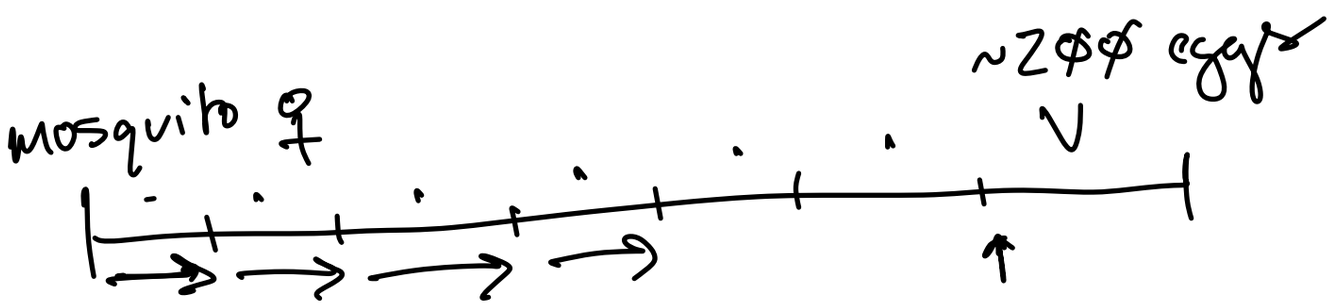
[r-Selected
(many offspring)
Invest little energy
in each] ⟷ [K-selected
(few offspring)
Invest a lot of energy
in each]

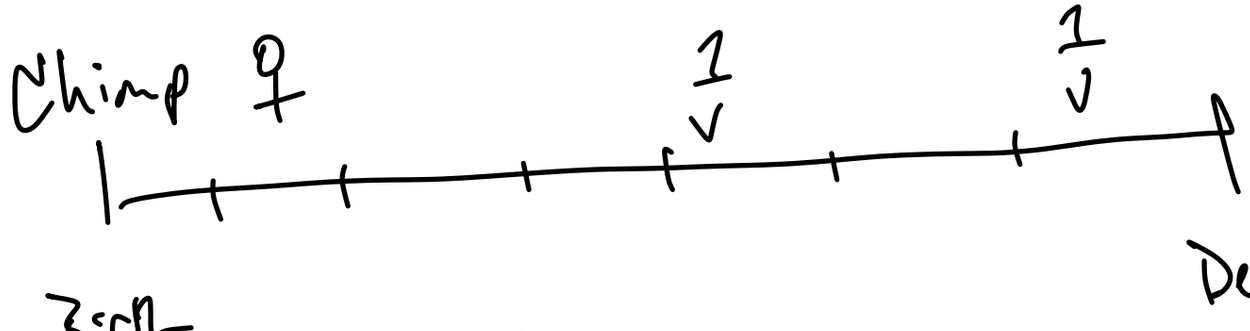
Φ = Lifetime Reproductive value of an individual

~ future reproductive success

- Maximized under mass selection







♀

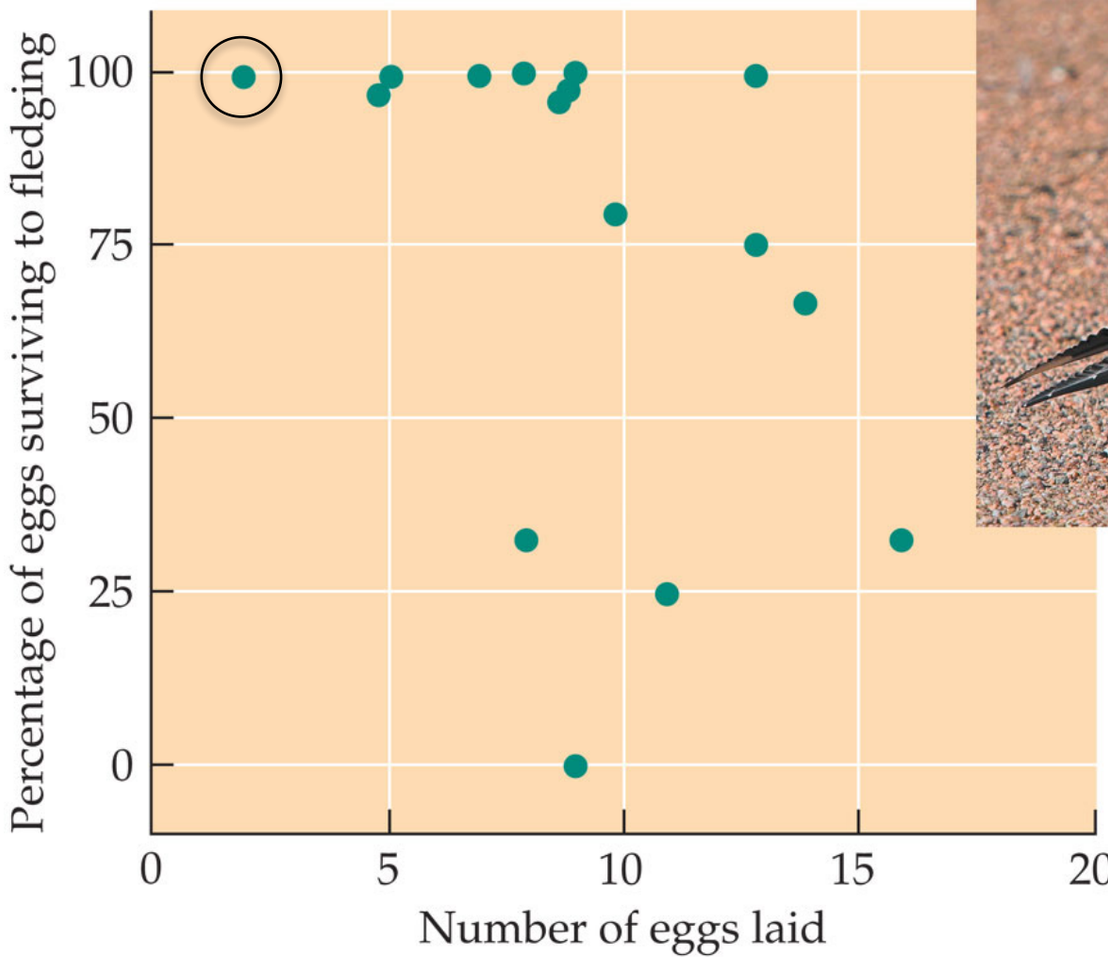
γ ~ prob. of mortality within a time bin

μ_0 - mortality of offspring

$$\Phi = (1-\gamma)(1-\gamma)(1-\gamma)(1-\gamma)(1-\gamma)(1-\gamma)$$

$$= (1-\gamma)^6 \times 200 \times (1-\mu_0)$$

Trade offs!



Larus fuscus

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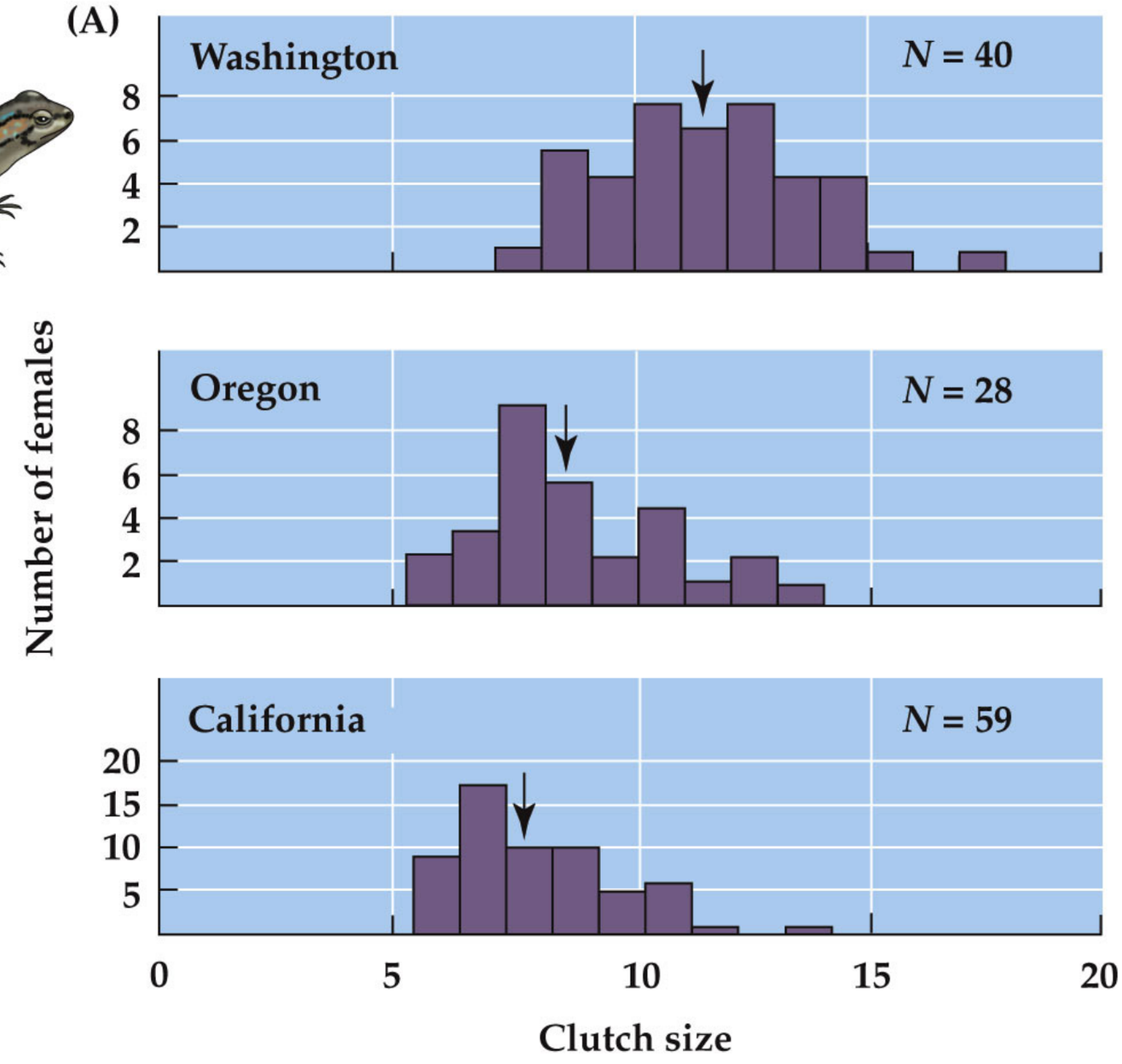

Western fence lizards

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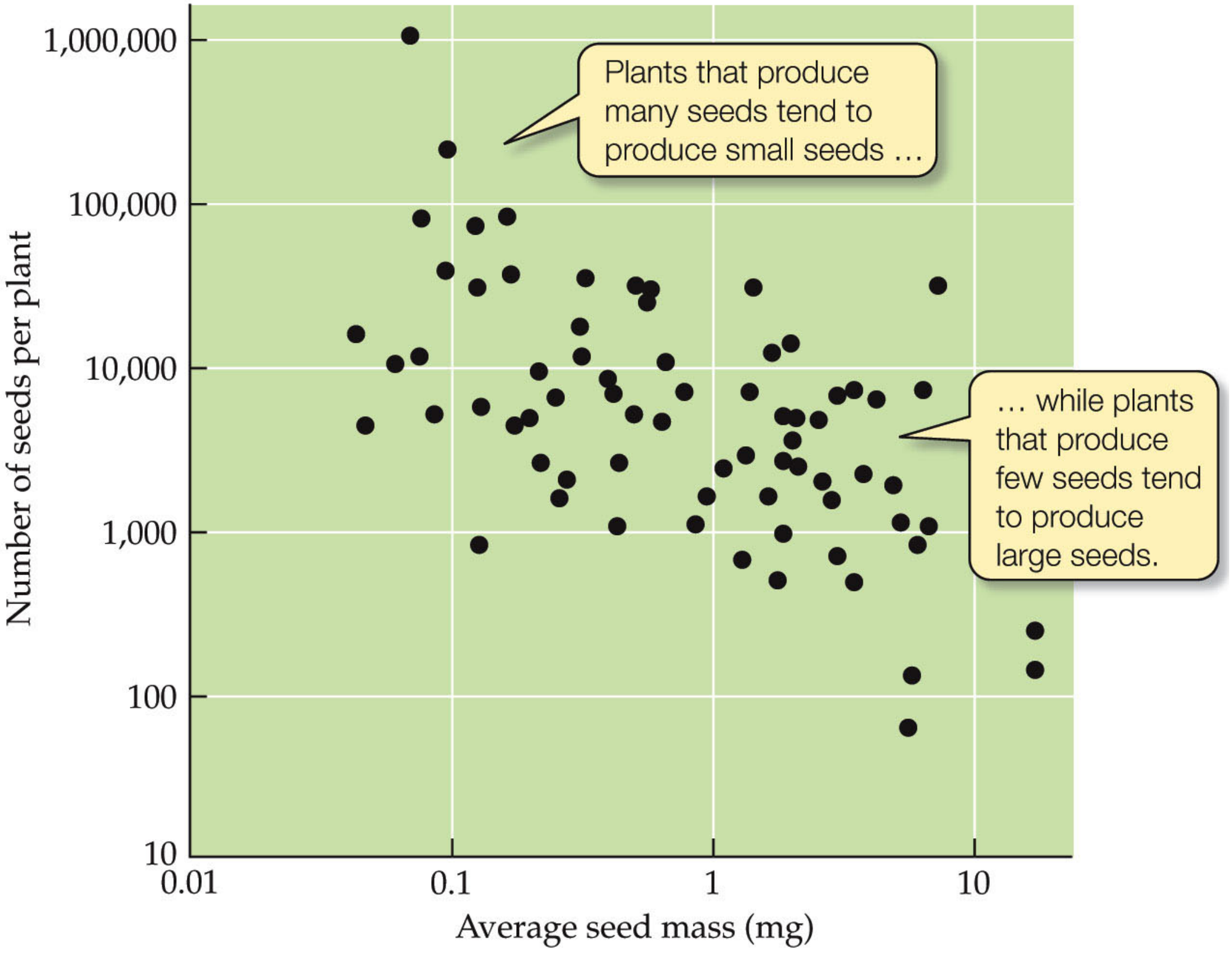
1,000,000
100,000
10,000
1,000
100
10
0.01
0.1
1
10
Number of seeds per plant
Average seed mass (mg)
Plants that produce many seeds tend to produce small seeds …
… while plants that produce few seeds tend to produce large seeds.