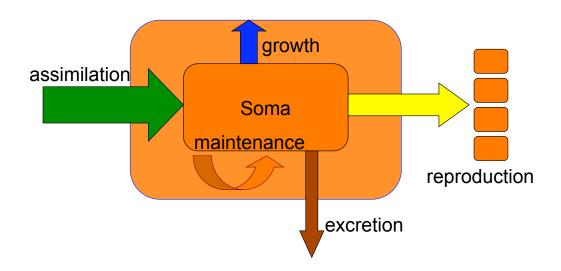
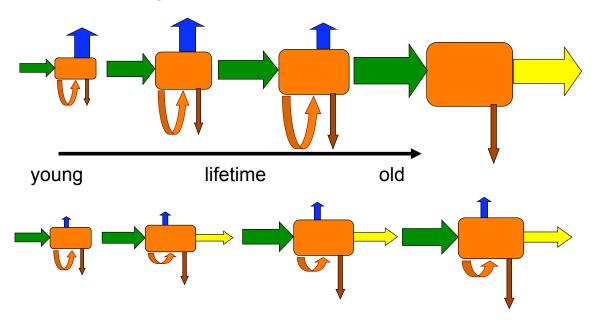
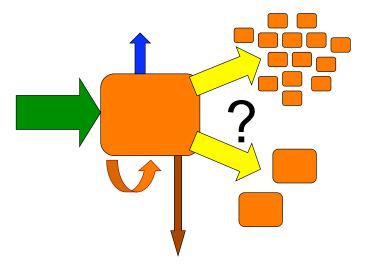
Principle of allocation



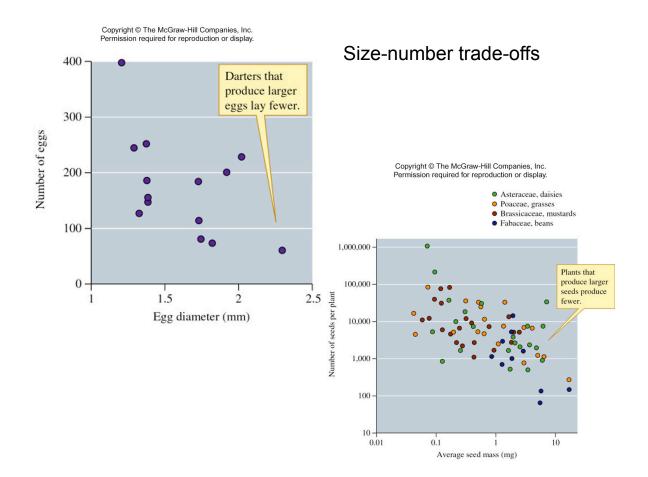
Life history - how allocation changes over the lifetime of an organism.

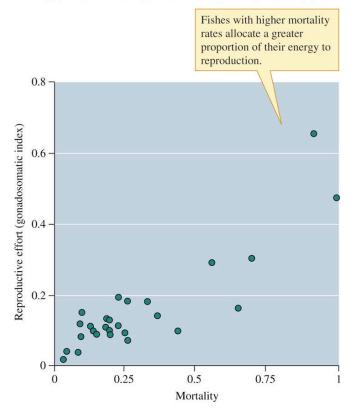


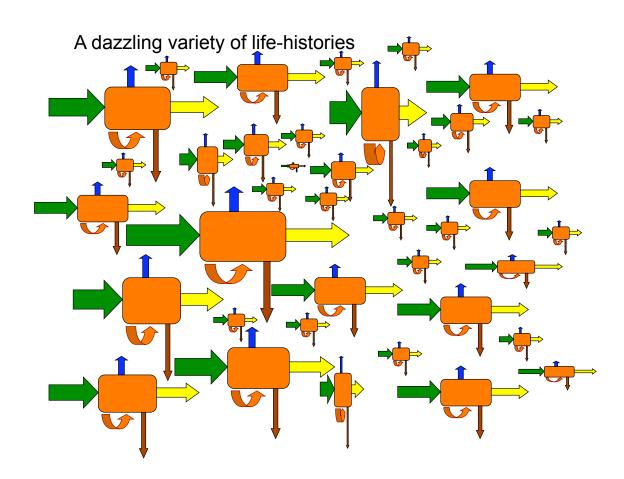
Principle of allocation leads to trade-offs



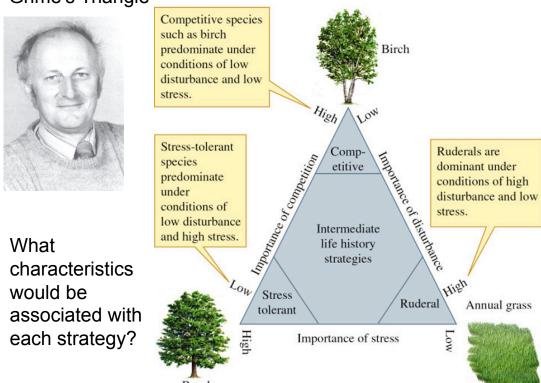
Example: Size vs. number of offspring



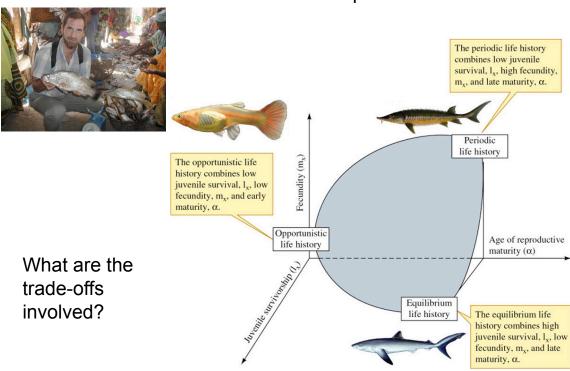




Grime's Triangle



Winemiller and Rose's classification space



Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display. Compared to other vertebrate groups, fishes include a much greater range of life history strategies. Fishes Amphibians and reptiles Ocean sunfish 10 -Periodic Periodic Fecundity Fecundity Sturgeon Toad Crocodile Galápagos tortoise Age of Age of Opportunistic Opportunistic maturity maturity Equilibrium Desert tortoise Compared to other vertebrates, mammals show the least Birds variation. Mammals $10^{8} 10^{8} -$ Periodic Periodic Fecundity Fecundity Ducks Ostrich Deer mouse Age of Age of Opportunistic Dog Opportunistic maturity maturity 0 Polar bear 20 yr Human

Competition

Condor

Booby

Equilibrium

Albatross



G.F. Gause

"Competitive exclusion principle"

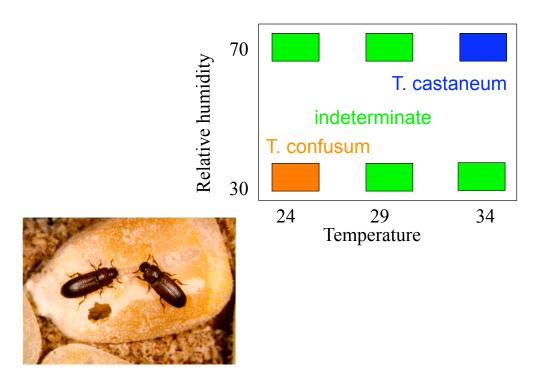
Equilibrium

No two species sharing identical niches can coexist indefinitely...

Tribolium flour beetles



Park's flour beetles Warm and humid Cool and dry When grown separately at 34°C and 70% relative humidity, populations of *T. confusum* and *T. castaneum* both did well. When grown separately at 24°C and 30% relative humidity, *T. confusum* populations did well, while *T. castaneum* populations died off in about 500 days. Growing Number of adults (per g of medium) Number of adults (per g of medium) separately 25 10 -200 400 200 600 Days Days When grown together at 24°C and 30% relative humidity *T. castaneum* populations died off in less than 400 days, while *T. confusum* persisted. When grown together at 34°C and 70% relative humidity *T. confusum* died off after 430 days, while 30 Number of adults (per g of medium) Number of adults (per g of medium) 25 25 Growing 20 20 together 10 -200 600 200 400 600 Days Days



Theory of competition

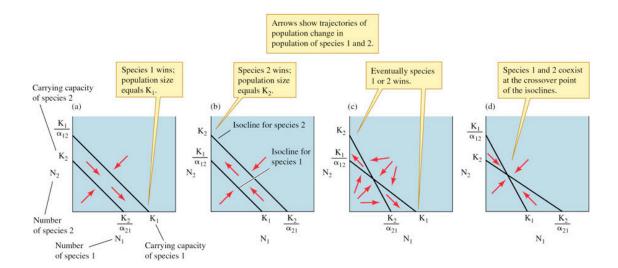


Vito Volterra



Alfred Lotka

ZNGIs in the Lotka-Volterra models



Warbler Feeding Niches limit competition

