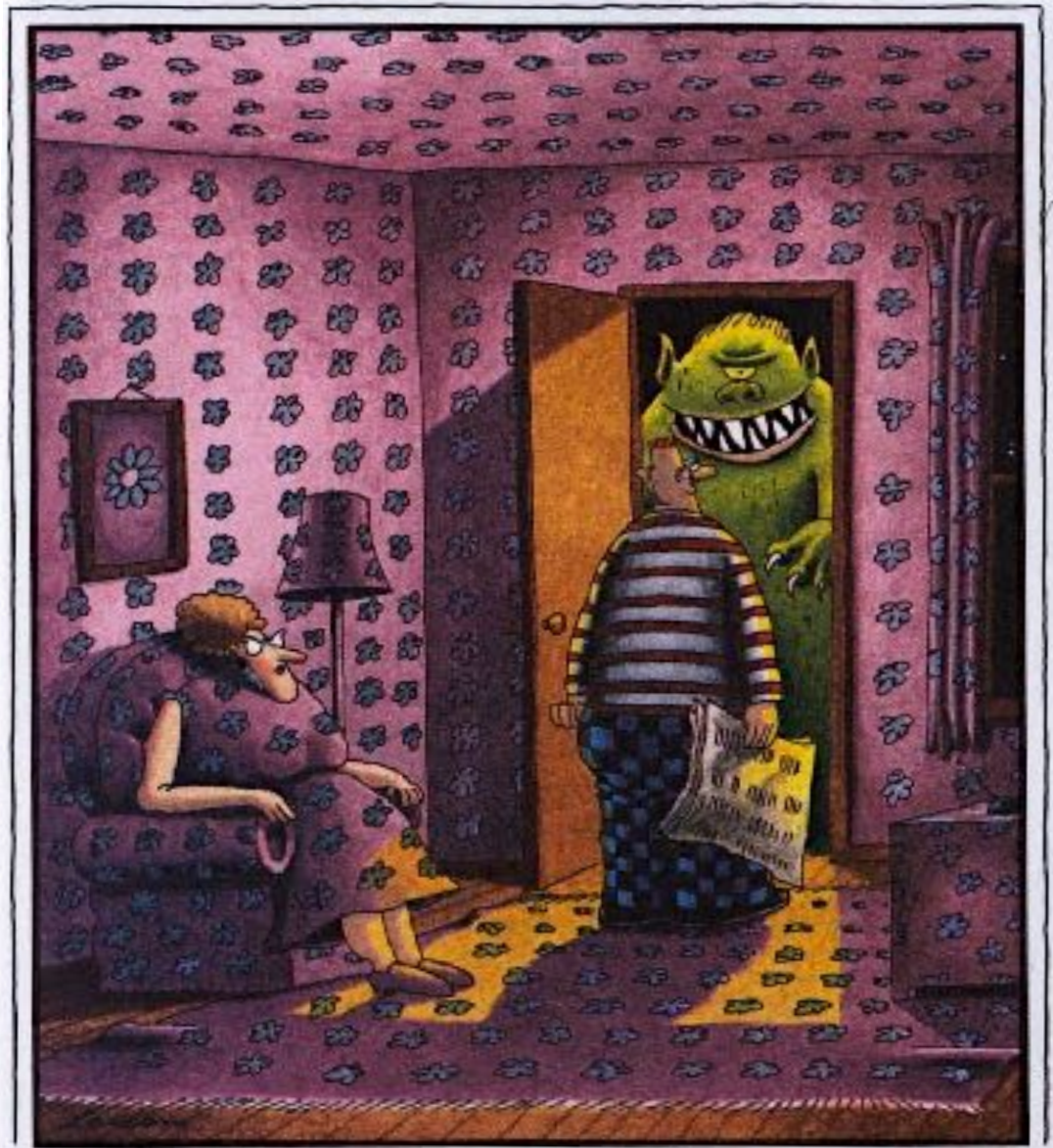


Habitat selection



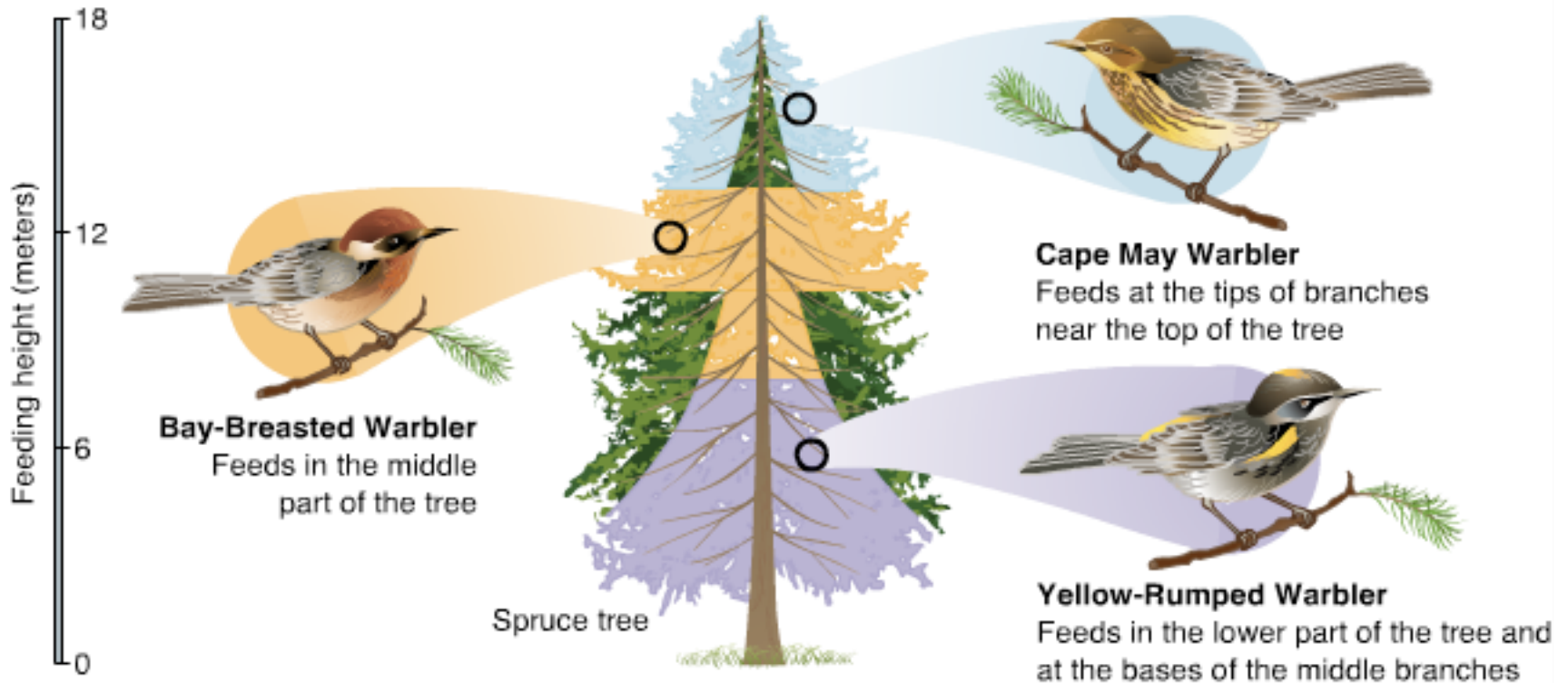
When the monster came, Lola, like the peppered moth and the arctic hare, remained motionless and undetected. Harold, of course, was immediately devoured.



"Look. We know how you did it —
now is no longer the question. What we now
want to know is why. ... Why now, brown cow?"

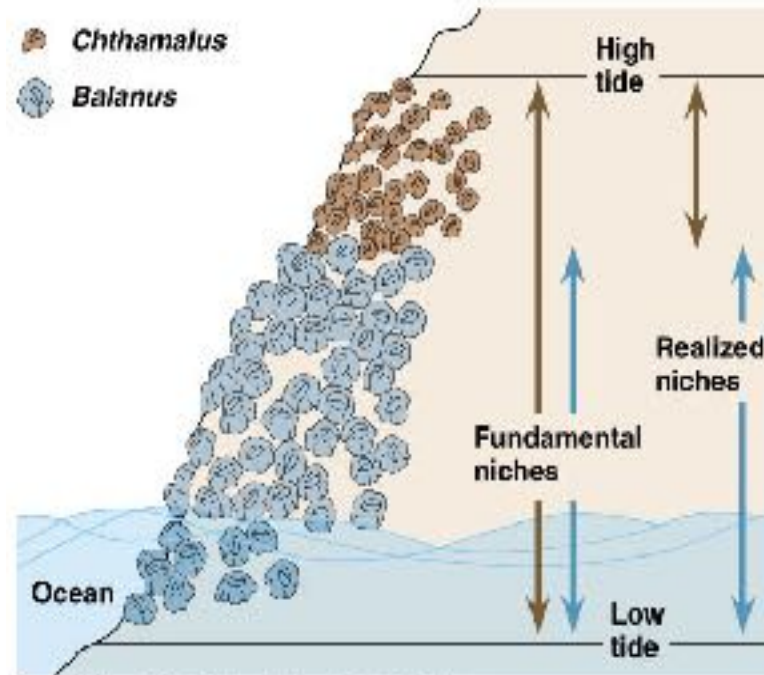
Niche diversity

Niche: interrelationship of a species with all the biotic and abiotic factors affecting it



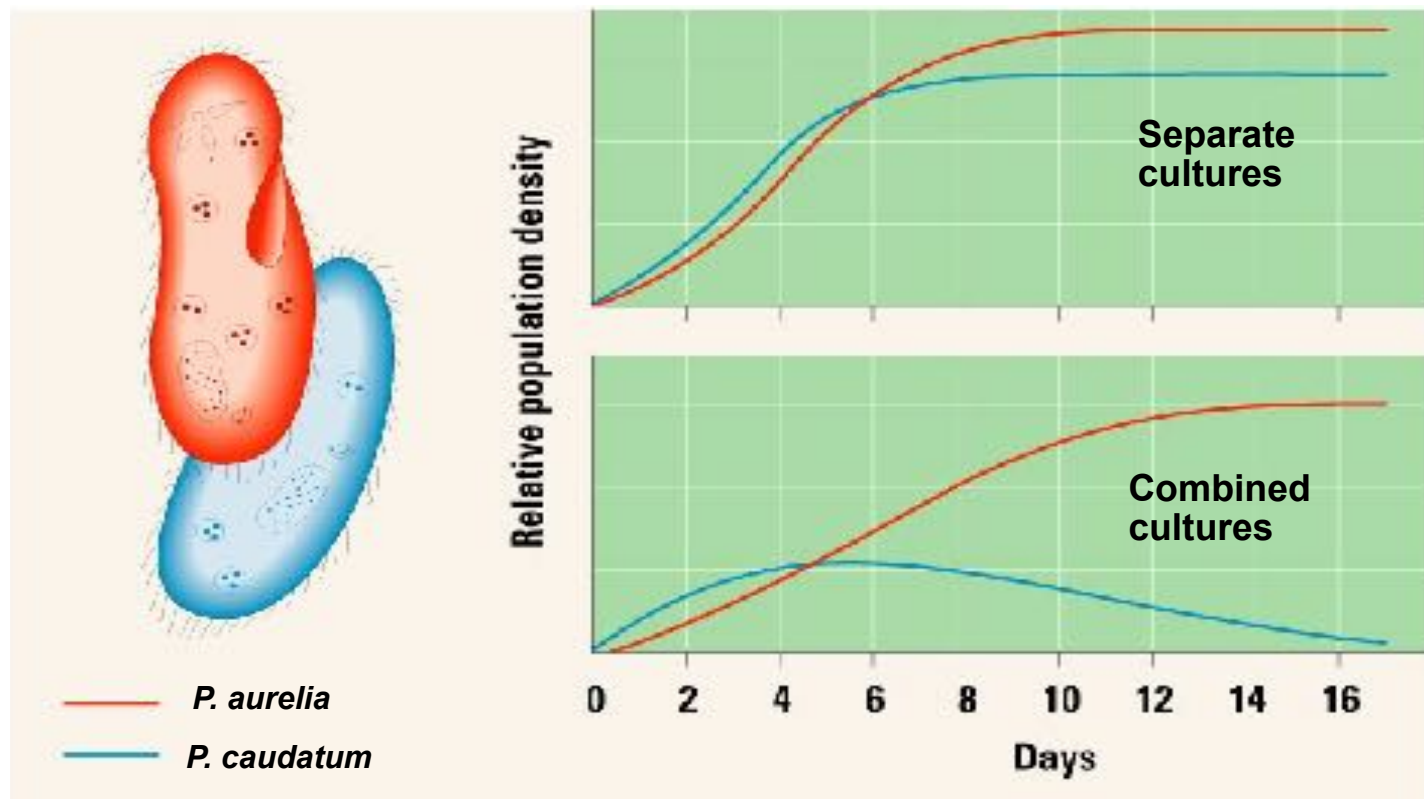
Realized vs. fundamental niche: Competition

- The space used by a species in a community
 - **Fundamental niche: mainly limited by abiotic factors**
 - Full range of conditions in which a species can maintain a viable population
 - **Realized niche: limited by biotic factors**
 - Space that an animal occupies in the presence of **competitors**, predators, pathogens and limited food



Realized vs. fundamental niche: Competition

- Two possible outcomes when species occupy identical niches
 - 1) Competitive exclusion: eviction (barnacles), extinction (paramecium)



Realized vs. fundamental niche: Competition

- Two possible outcomes when species occupy identical niches
 - 2) Resource partitioning: evolution to use different resources
 - Differentiation of niches enables similar species to coexist in a community



Habitat selection

- Sometimes there are options:
 - Why do animals live where they do?
 - Costs and benefits associated with habitat selection



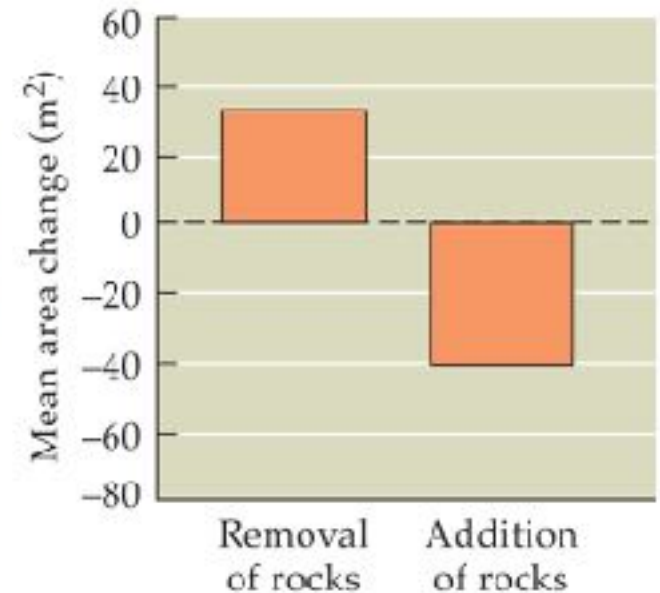
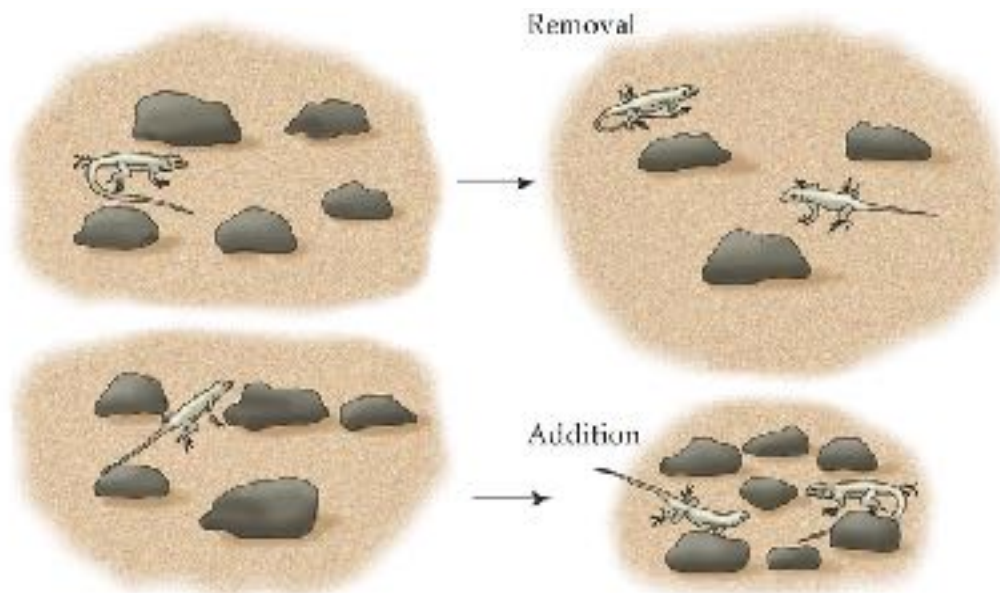
Despotic birds

- European great tits nest either in preferred woodlands or in hedgerows
 - Individuals in hedgerows switch to woodland if opening is experimentally created
 - RS in better quality habitat (woodland) generally higher
 - “Despots” in woodland force others to lower RS habitat
 - Birds in hedgerows make the best of a bad situation

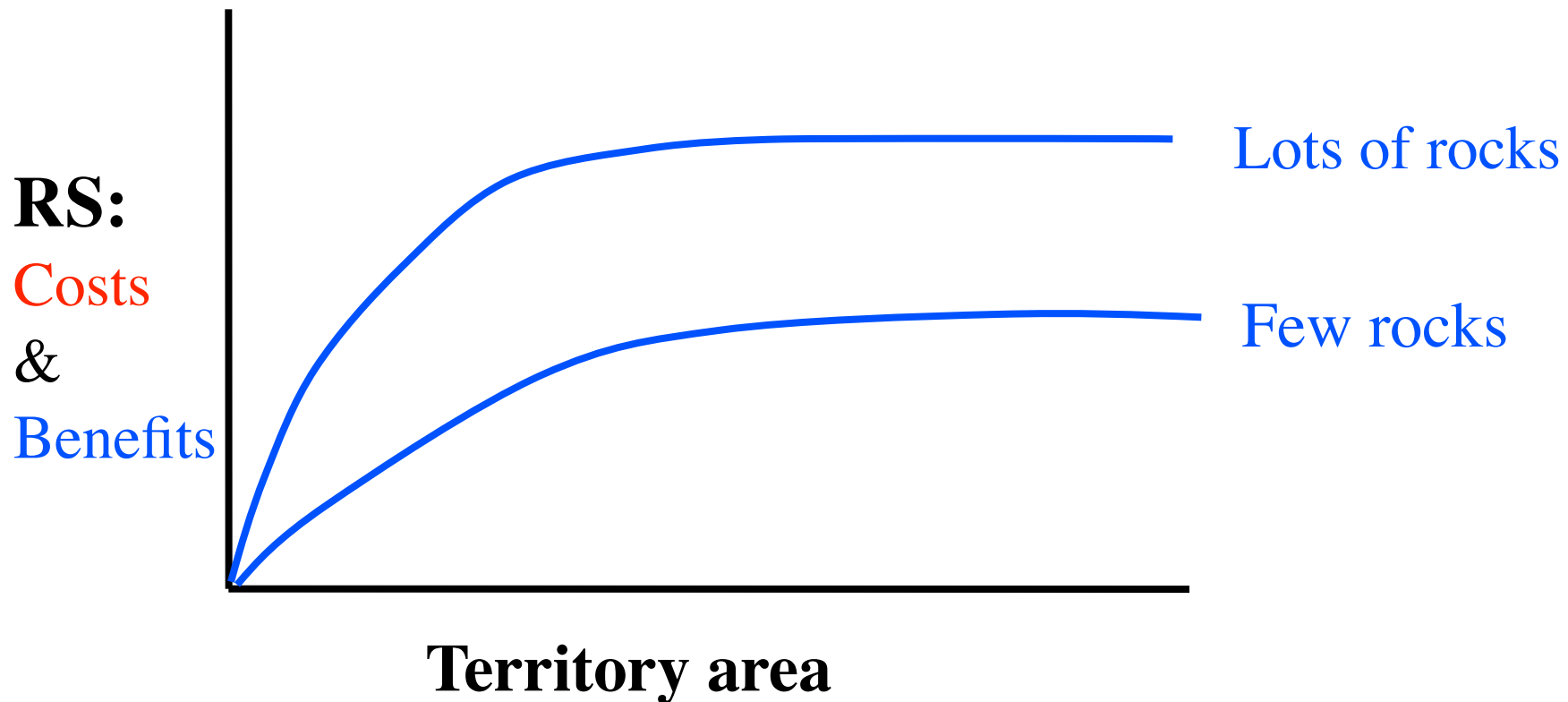


Despotic lizards and economic defense

- Individuals maximize RS, by minimizing costs of defense
 - Side-blotched lizards defend territories with basking rocks
 - Experimental manipulations result in optimal shifting of territory size
 - Reduce rocks: territory becomes larger
 - Add rocks: territory becomes smaller

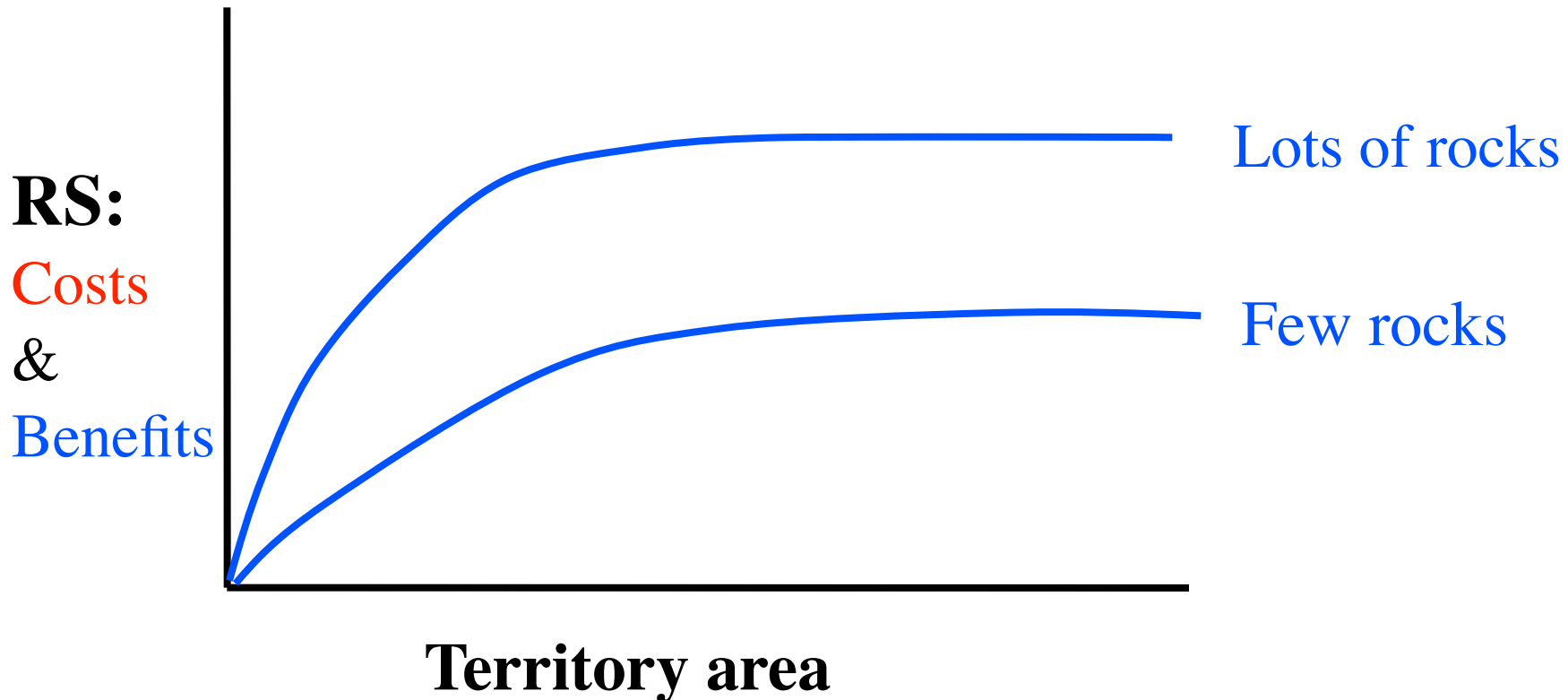


Despotic lizards and economic defense

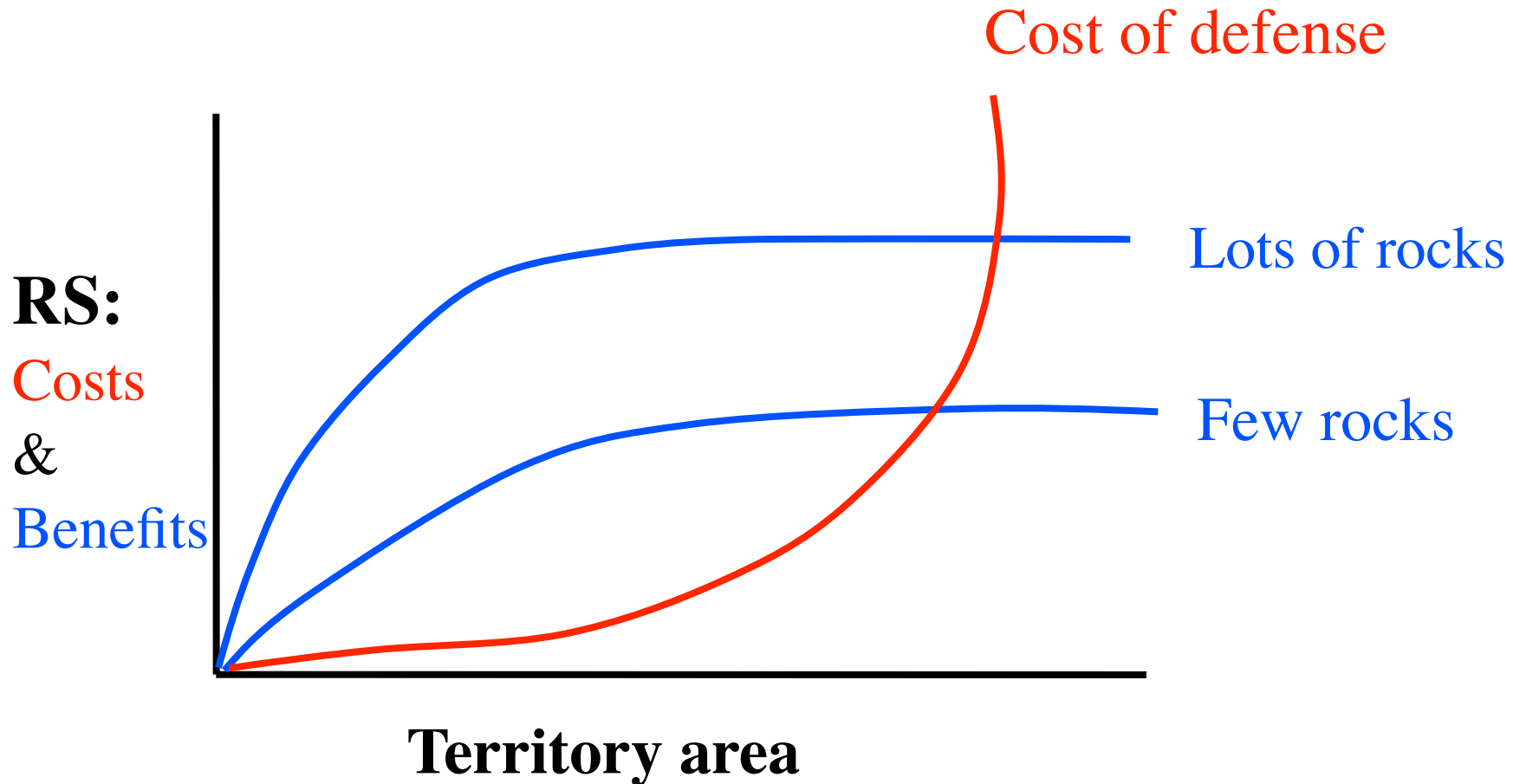


Despotic lizards and economic defense

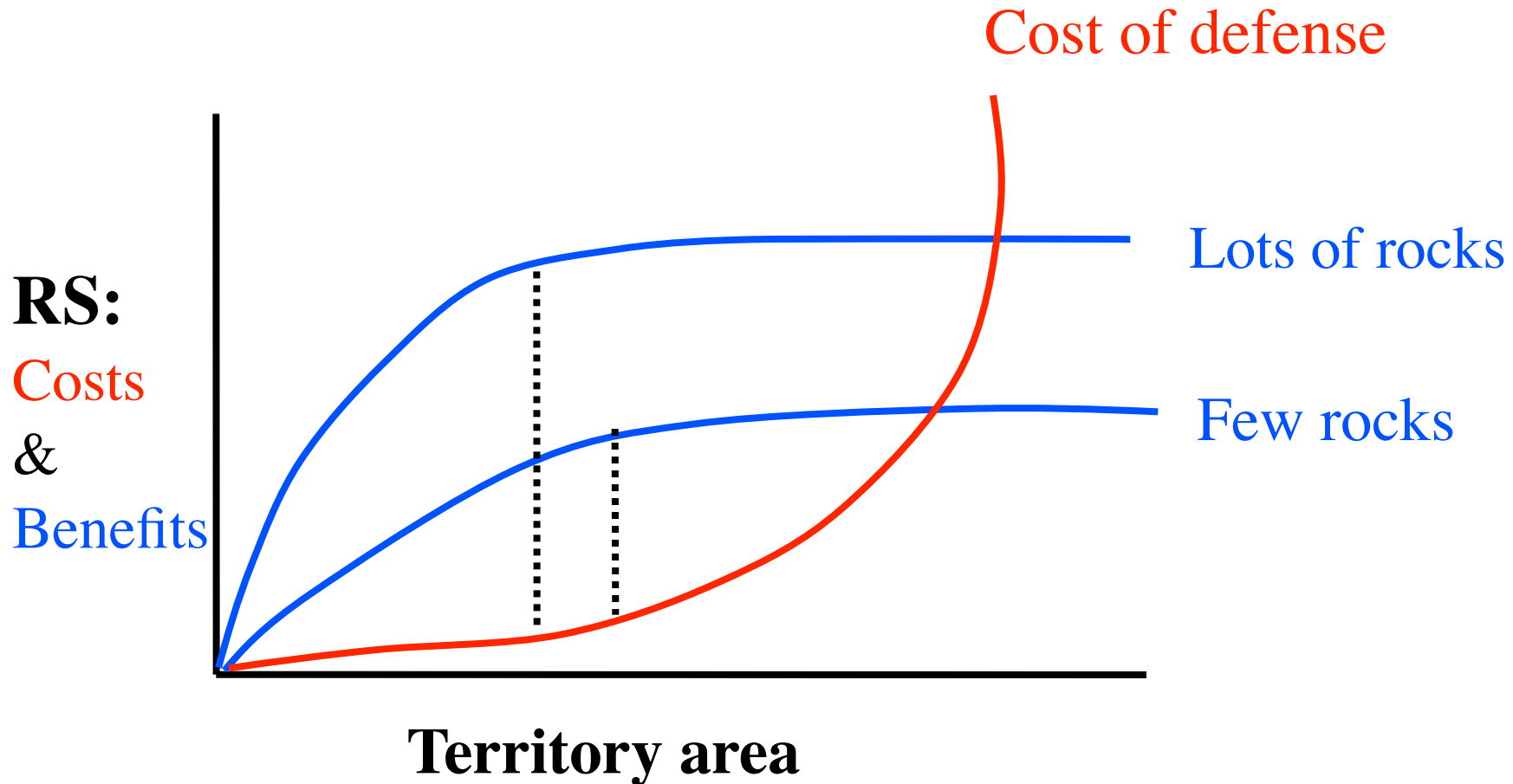
What size do you want your territory to be?
--It depends on the costs



Despotic lizards and economic defense



Despotic lizards and economic defense

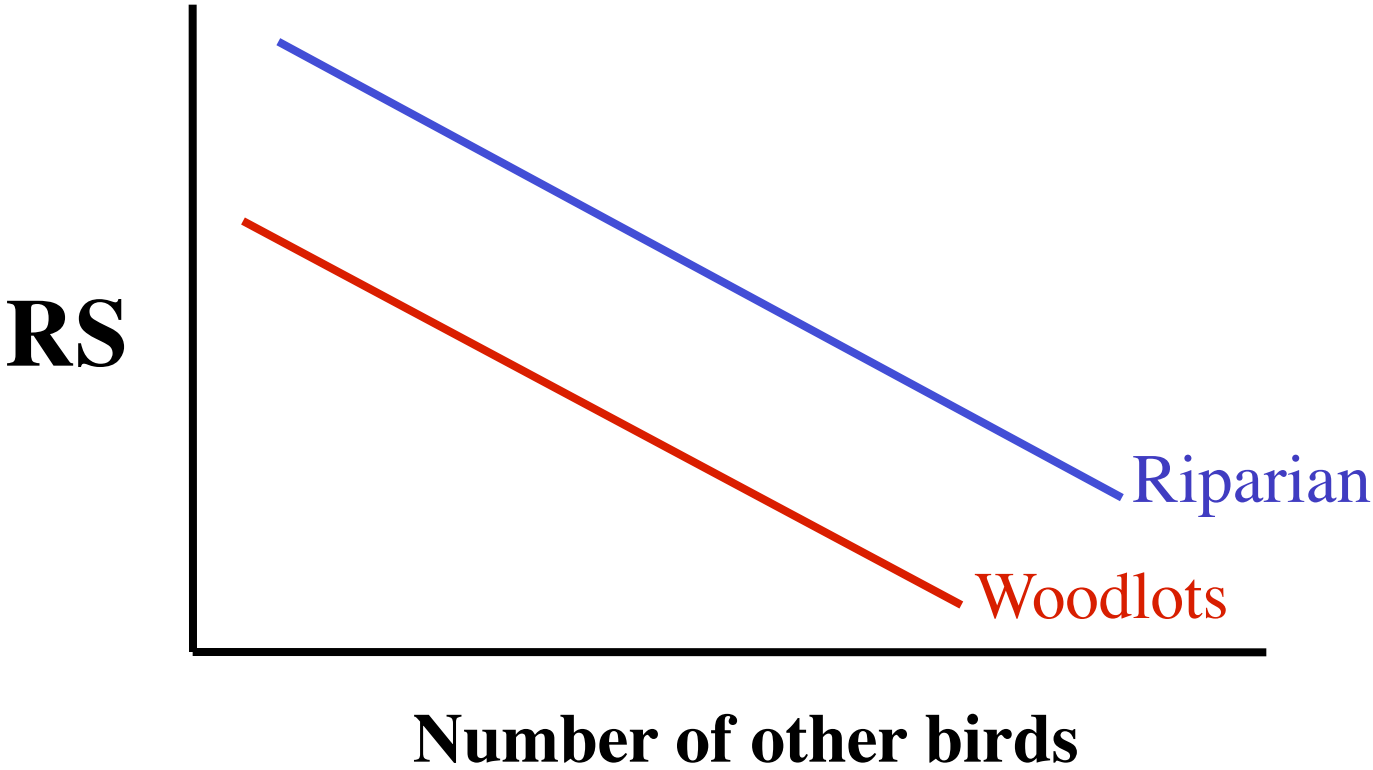


Ideal free distribution

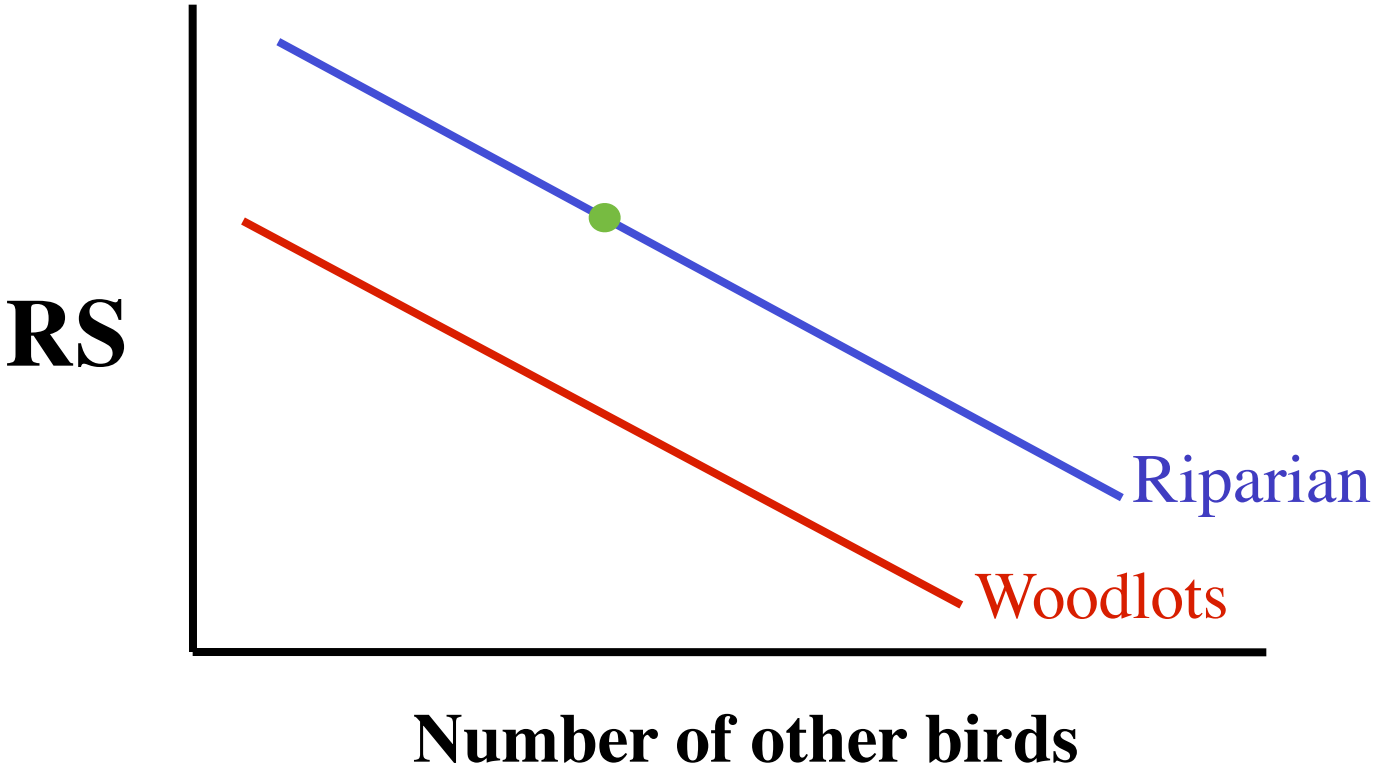
- Individuals may sometimes settle in sub-prime habitat due to other factors (other than being kicked out)
 - Blackcap warbler nests are placed in both prime riparian areas and sub-prime woodlots
 - We see that RS in two habitats is equal after riparian areas fill up
 - WHY???



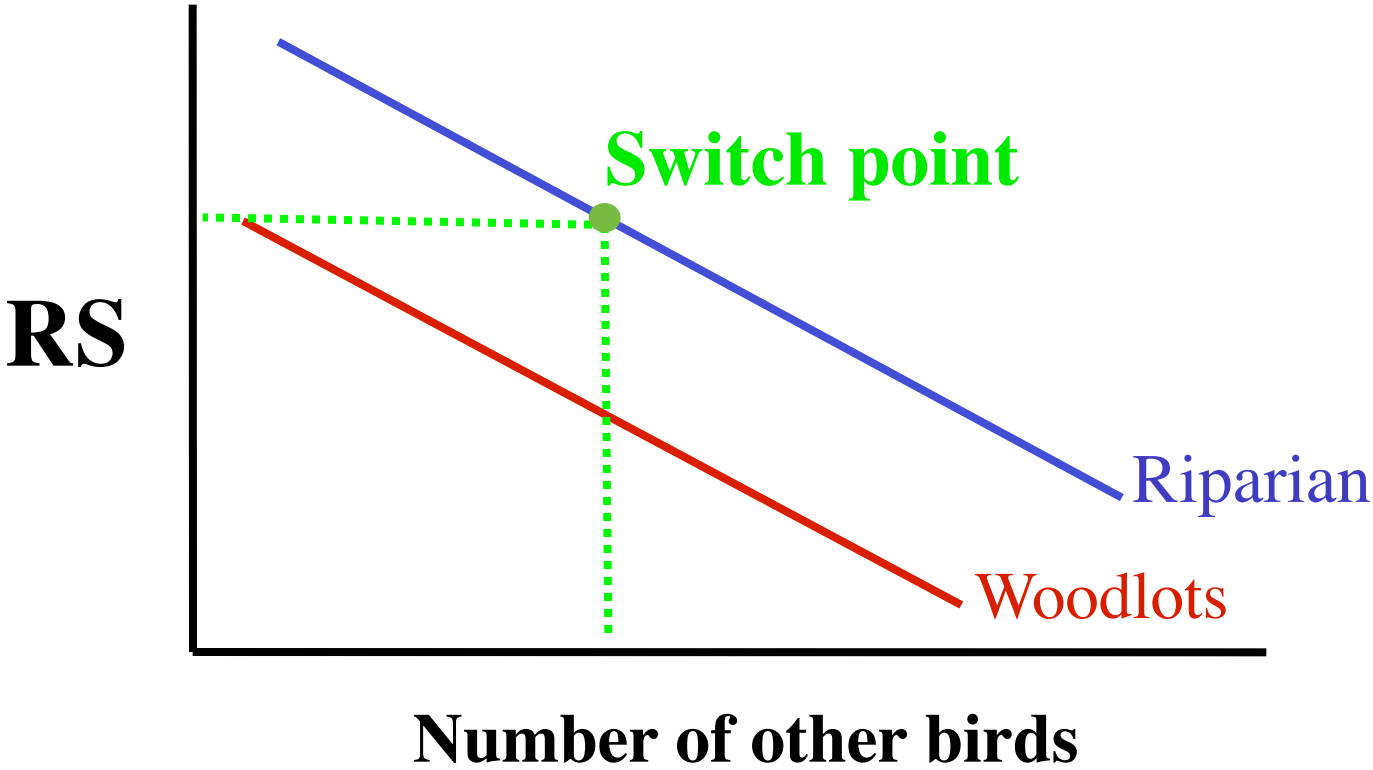
Ideal free distribution



Ideal free distribution



Ideal free distribution



Aphid territories

- Most systems combine despotic and ideal free
 - ex. Gall aphids
 - Females fight for access to big leaf (bigger leaf yields more RS)
 - Loser can either be 2nd on big leaf, or choose smaller leaf



Aphid territories

- Within a leaf, despots monopolize more RS
- Losing female chooses between second-fiddle on leaf or being top-aphid on smaller leaf:
 - yield roughly equal RS



TABLE 1 Effect of leaf size and position on gall on the reproductive success of female poplar aphids

Number of galls per leaf	Mean leaf size (cm)	Mean number of progeny produced		
		Basal female	Second female	Third female
1	10.2	80		
2	12.3	55	74	
3	14.6	138	75	29

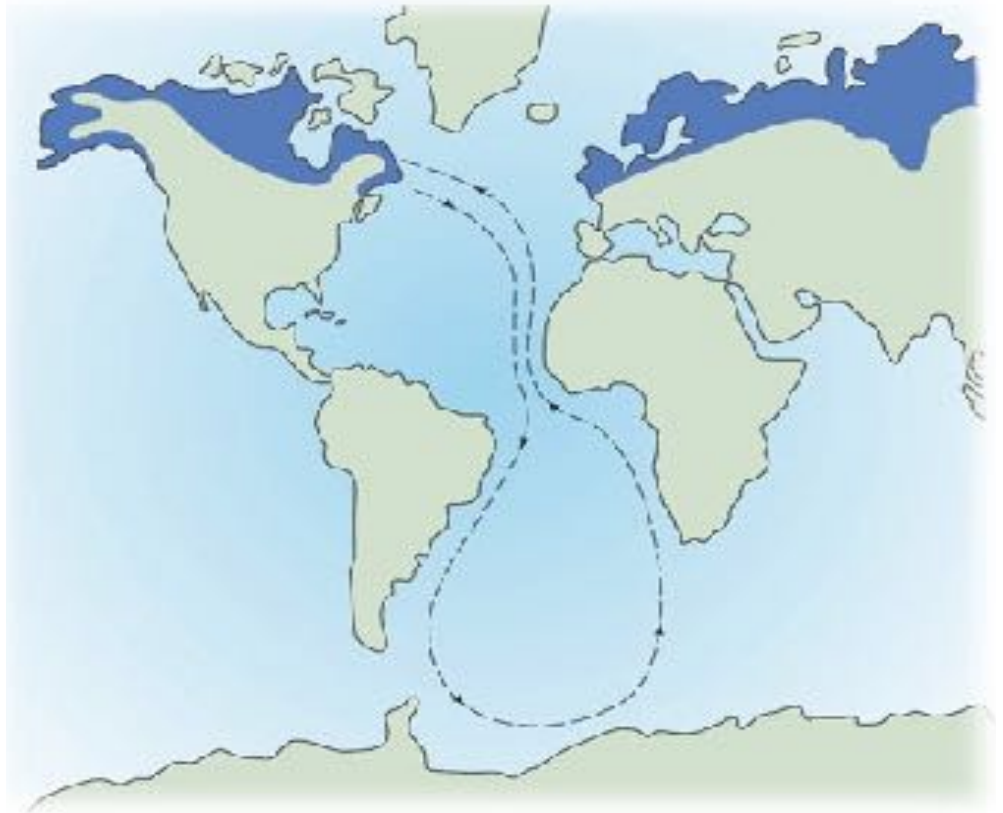
Benefits of habitat selection & dispersal

Exploitation of seasonal food source

- Long-range migration
 - Access to abundant prey during long days.



Arctic Tern



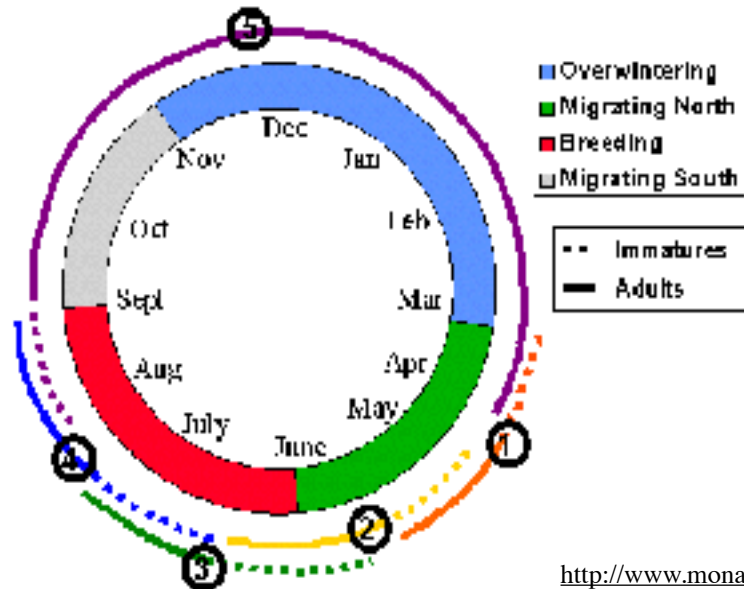
Benefits of habitat selection & dispersal

Exploitation of seasonal food source

- Long-range migration
 - Monarchs
 - Follow milkweed from spring → fall
 - (Winter protection from freezing)



Yearly Life Cycle



<http://www.monarchlab.org/lab/biology/AnnualLifeCycle/Default.aspx#Gen34>

Benefits of habitat selection & dispersal

Safe place to raise offspring

- Gray whales migrate from Alaska to Baja California to give birth to calves in protected, warm, shallow lagoons



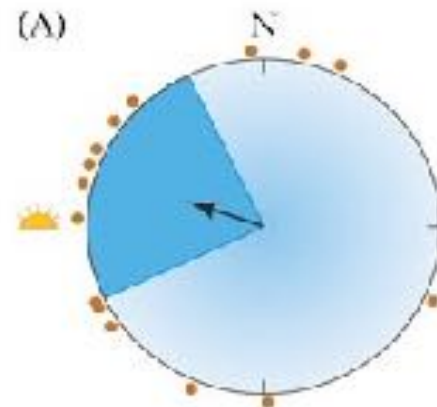
Costs of habitat selection & dispersal

Energy costs

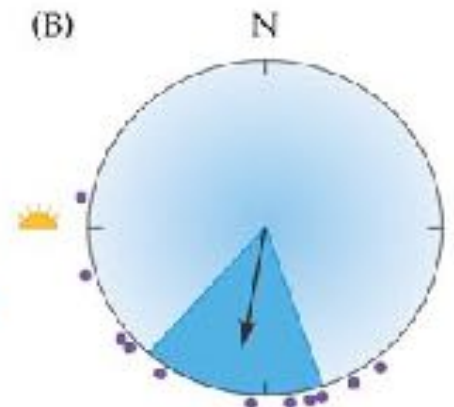
- HUGE energy investment (and predation risk)
 - Body condition affects migratory route
 - » Prefer to head south...but can't make it with low fat reserves, so birds in low condition change course



Red-eyed vireo



poor condition



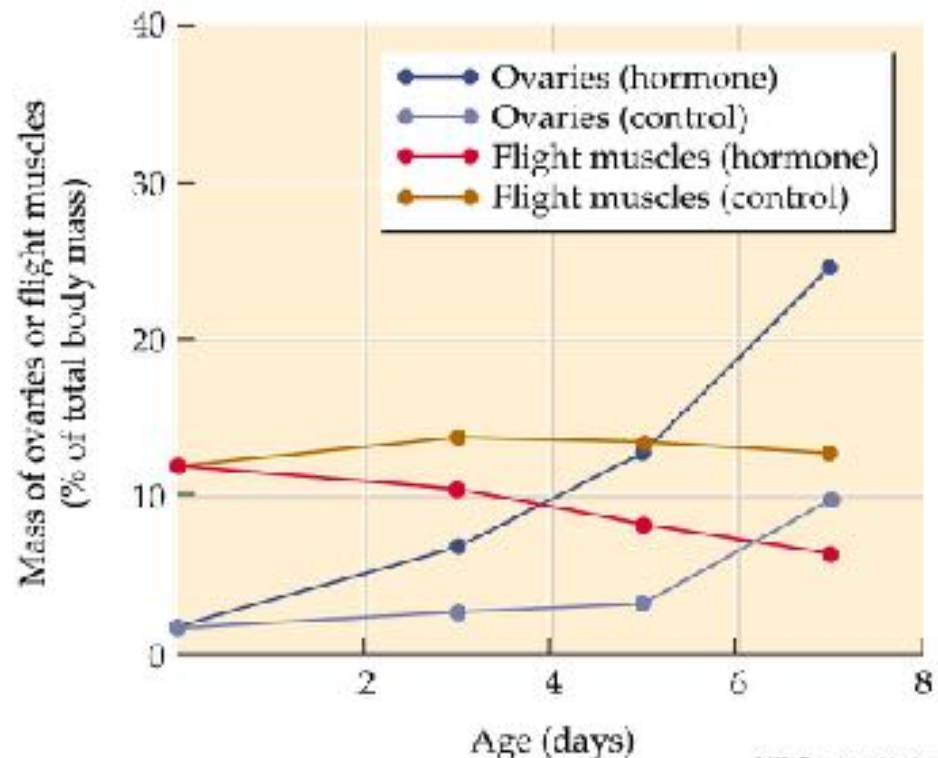
good condition

Costs of habitat selection & dispersal

Energy diverted away from other activities (reproduction)

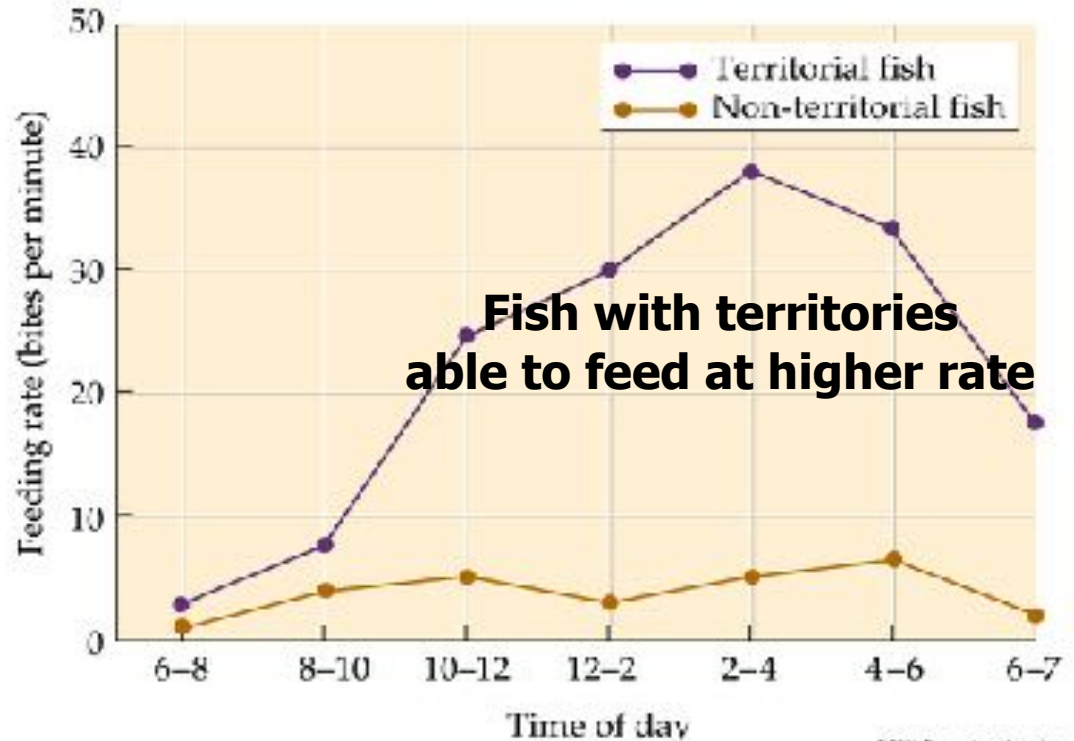
– Cricket species with two morphs: flying & flightless

- Developing female crickets treated with JH (makes them flightless) have smaller muscles - but larger ovaries



Territoriality: benefits

- Territory = a resource/area that an animal defends against intruders (usually conspecifics)
 - Benefits of territoriality
 - 1) Greater access to food (also: shelter, hiding places, water, mates, etc.)



Territoriality: benefits

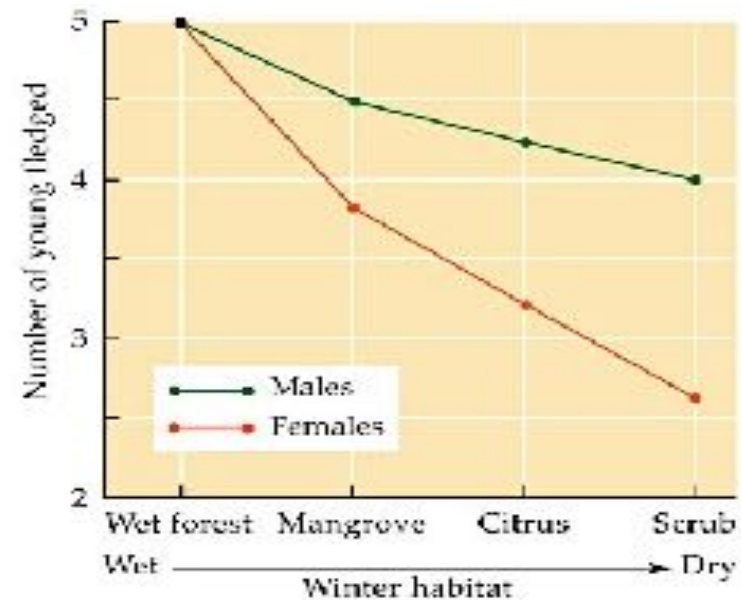
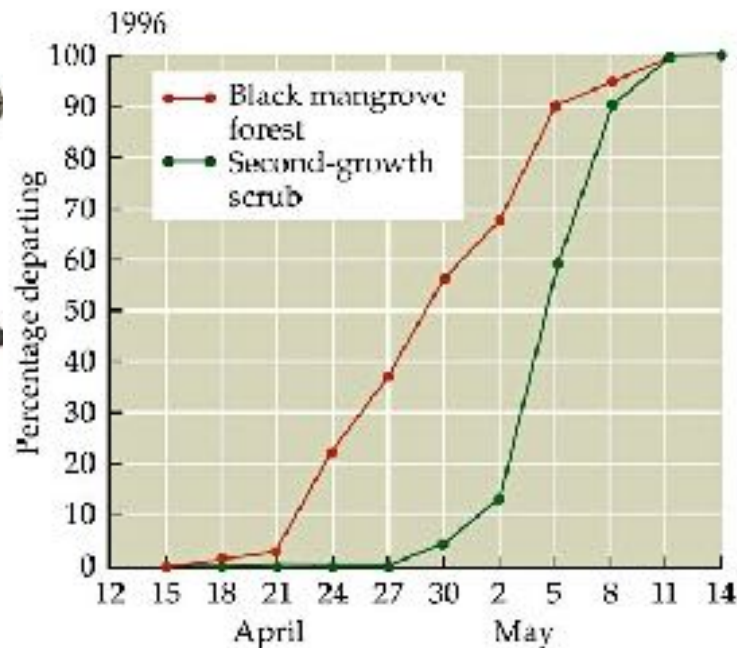
- Territory = a resource/area that an animal defends against intruders (usually conspecifics)
 - Benefits of territoriality
 - 2) b/c more resources, can breed earlier, and have more young in season



American redstart (female)

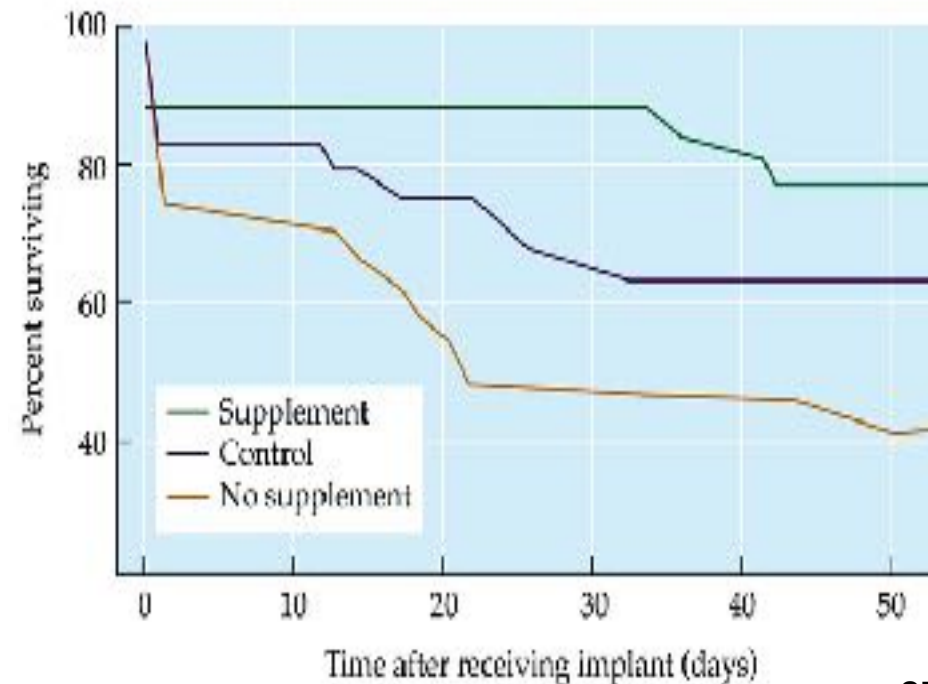
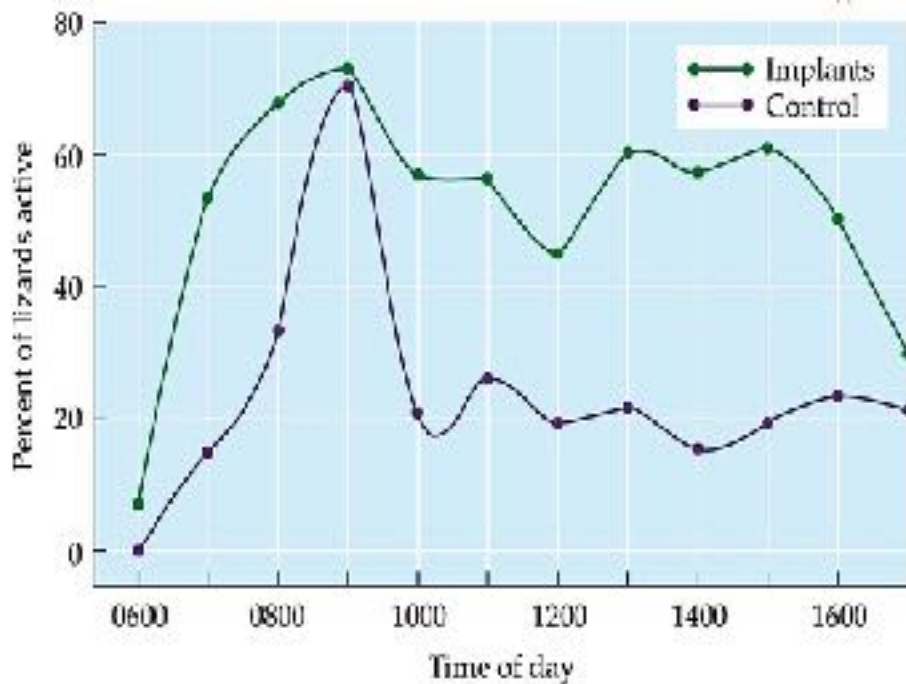


American redstart (male)



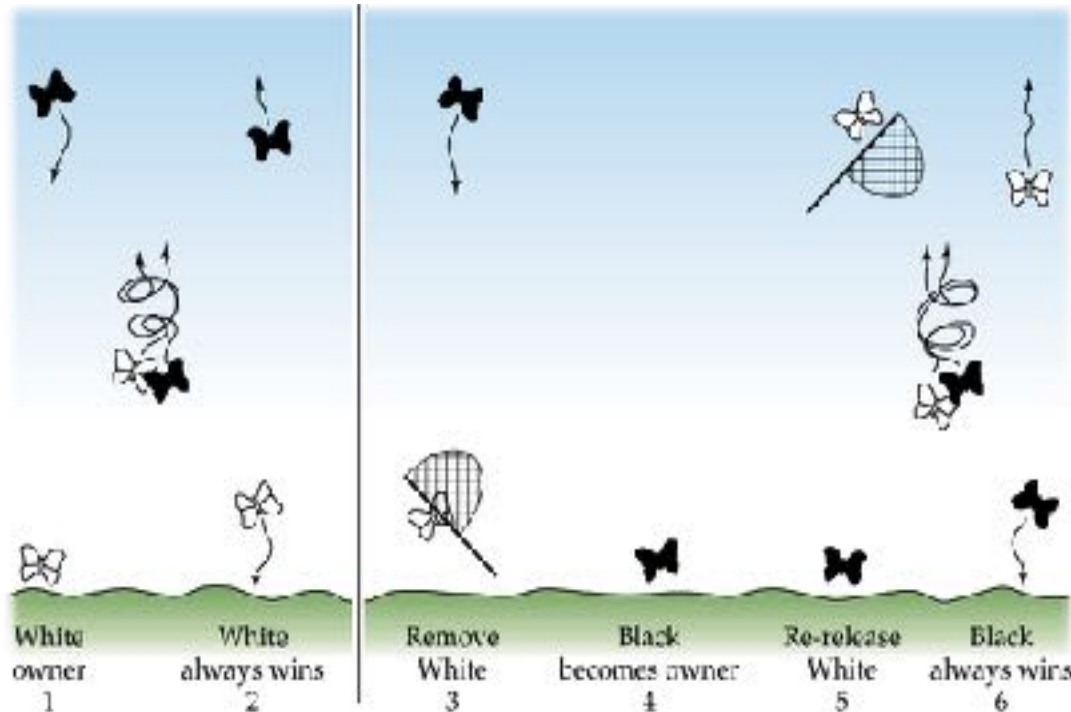
Territoriality: costs

- Costs of activity, defense, predation
- Cost of testosterone
 - ex. T implants in lizards
 - increase patrolling
 - lower survival (but not in food supplemented group)



Conflict resolution: ESS

- Speckled wood butterfly
 - Observation: Resident always wins

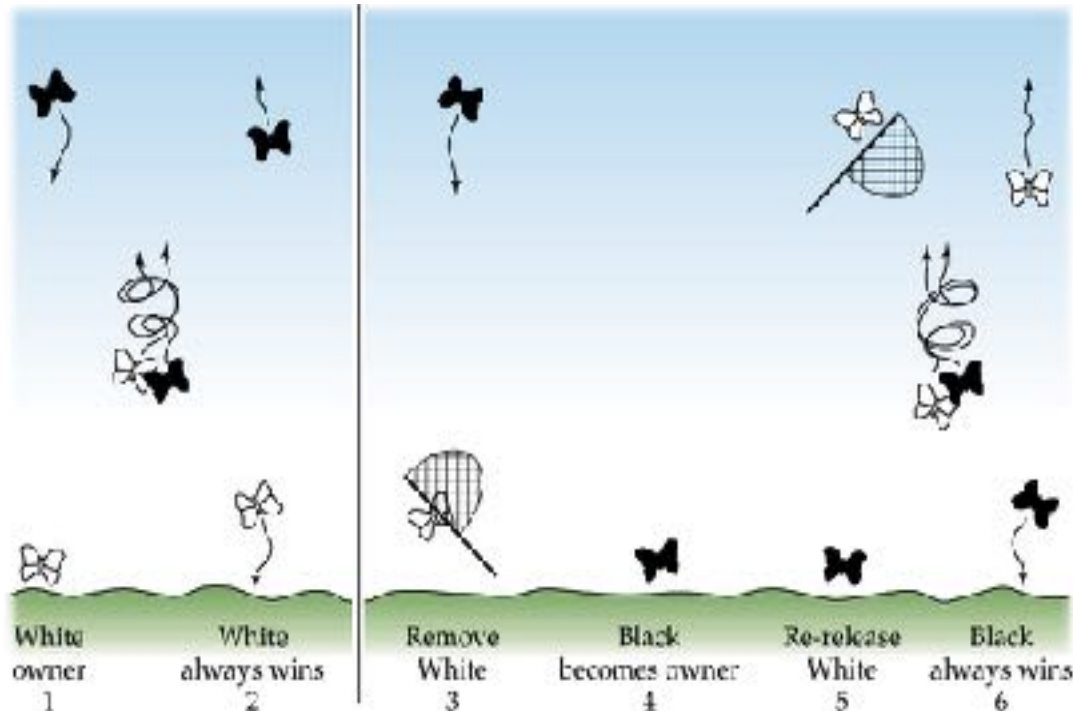


New owner wins 100% fights
Why?

Conflict resolution: ESS



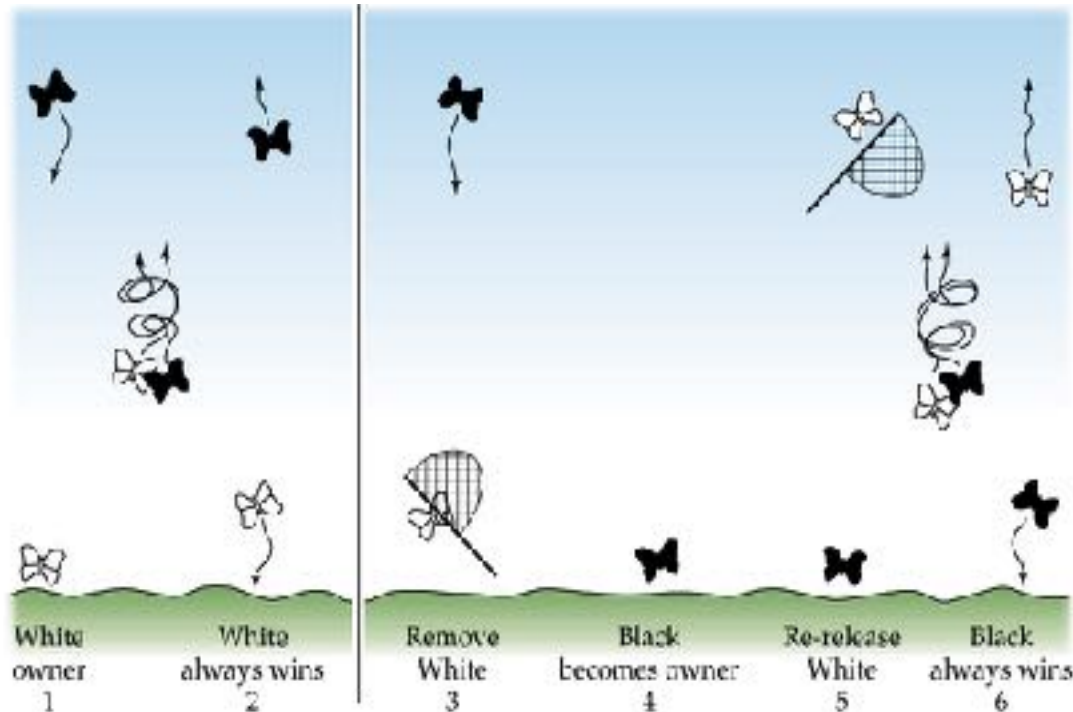
- Speckled wood butterfly
 - Observation: Resident always wins
 - Is there an Evolutionary Stable Strategy (ESS) that can explain this phenomenon?
 - **ESS: behavioral rule that everyone plays by, that once in place, cannot be replaced by an alternative strategy (i.e., other strategies have lower RS).**



Conflict resolution: ESS



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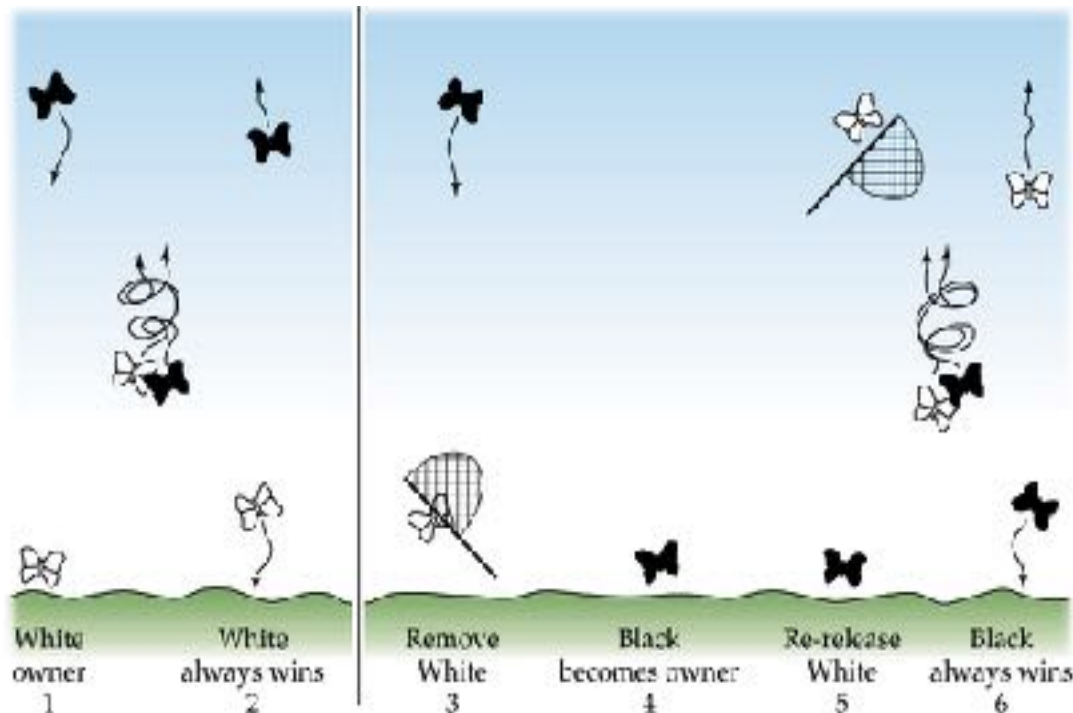


» **ESS Hyp #1:** resident plays hawk; intruder play dove

Conflict resolution: ESS



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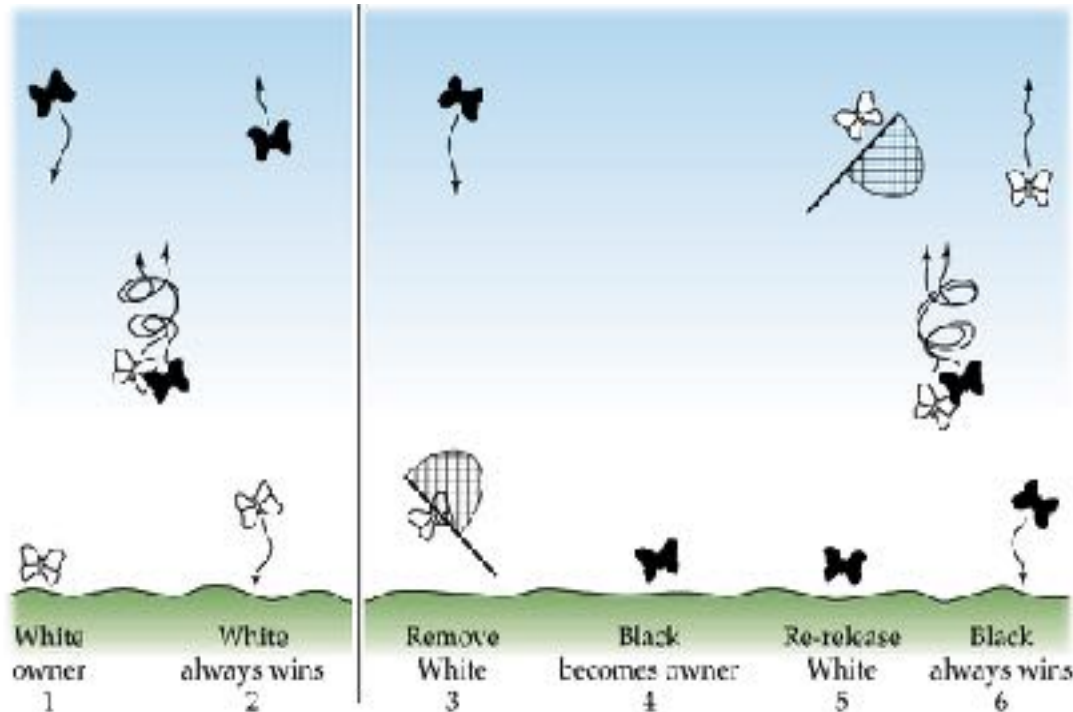


- » **ESS Hyp #1:** resident plays hawk; intruder play dove
- » **ESS Hyp #2:** resident plays as hard as its energy reserves allow

Conflict resolution: ESS



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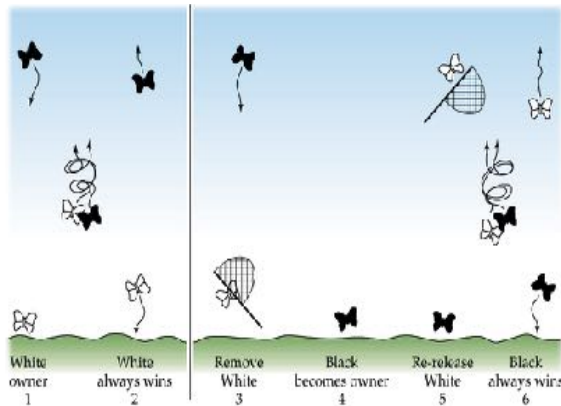
» **ESS Hyp #1:** resident plays hawk; intruder play dove

» **ESS Hyp #2:** resident plays as hard as its energy reserves allow

If chill prior resident (less energy expended while captured), and then release, the prior resident wins 50%

Conflict resolution: ESS

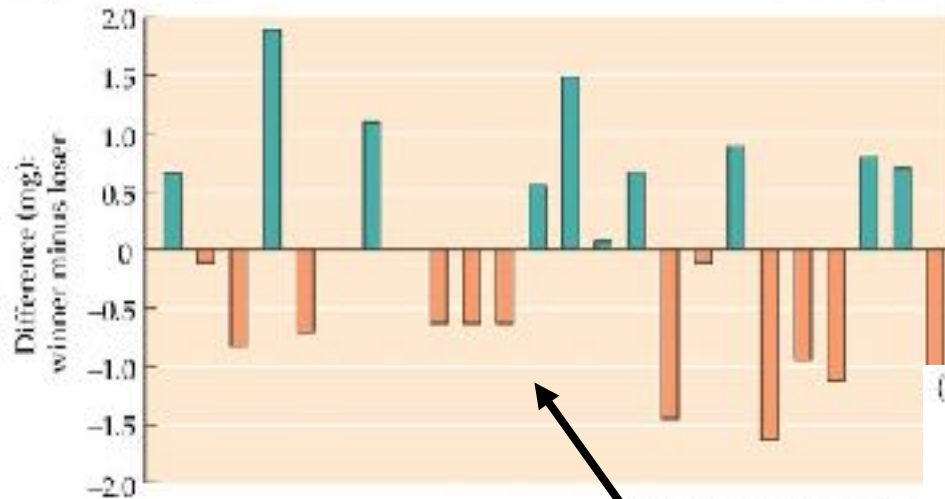
- **ESS: play as hard as energy resources allow**
- Resource-holding power/potential (RHP): Capacity of an individual to defeat others when competing for resources
 - Can be a function of energy availability, energy reserves, body size, muscles, health, injuries, etc.
 - ex. Why do owners speckled wood butterfly win? Answer: resident has more energy (from sitting in warm spot in sunlight) and so 'decides' to play hawk



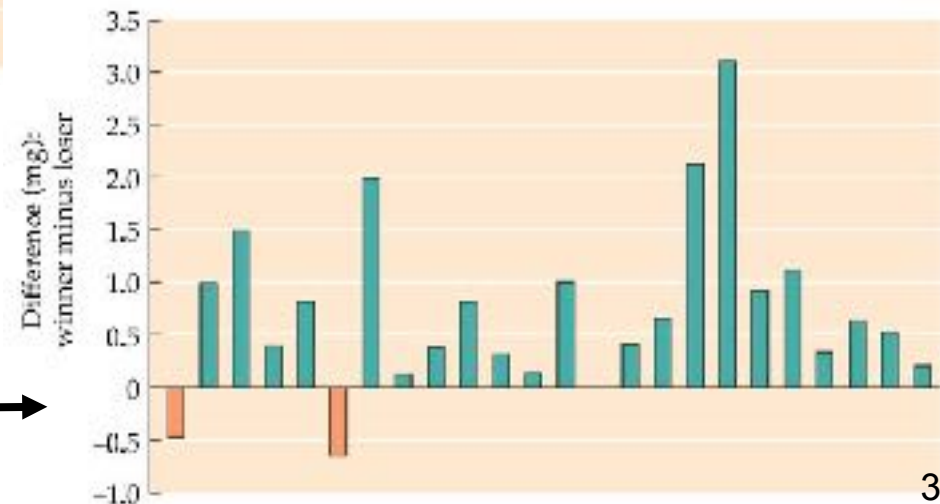
Conflict resolution: ESS

- ESS: play as hard as energy resources allow
 - ex. Damselflies: territory owners are in better condition

(A) Thorax weight Black-winged damselfly



(B) Fat content



Body weight is not a good predictor of victory

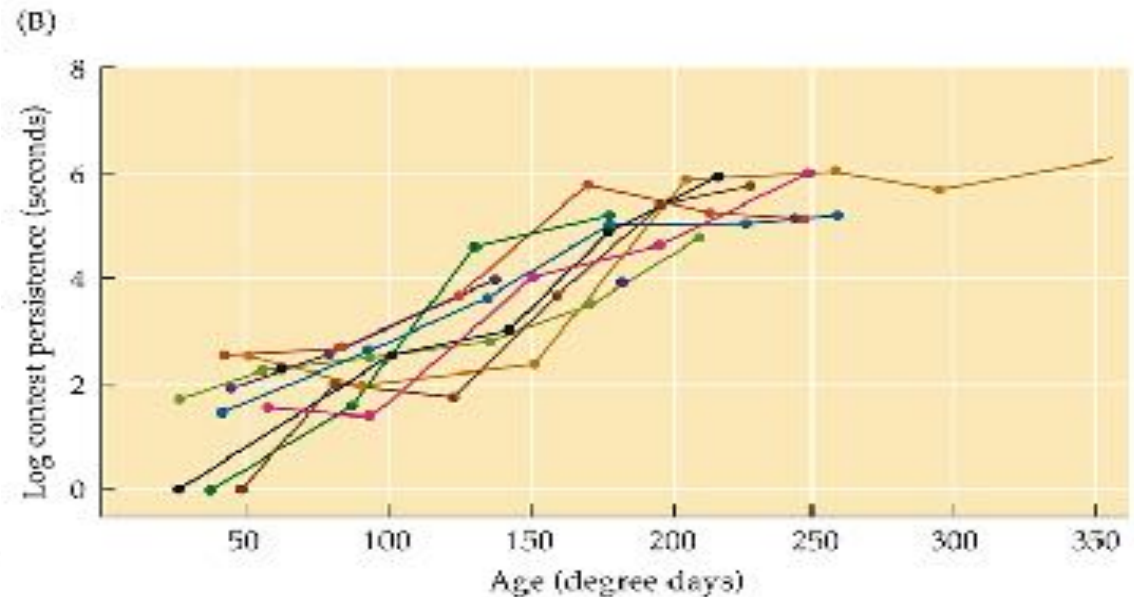
...but fat content is

Conflict resolution: ESS

And.... in other systems, another ESS applies:

ESS: fight as hard as territory is worth

- Contested resource is more valuable to current owner (asymmetrical value), so owner generally plays 'hawk'
 - ESS: play as hard as territory is worth
 - ex. eggfly butterfly
 - » Older owner is familiar with territory and his neighbors



Conflict resolution: ESS

And.... in other systems, another ESS applies:
ESS: fight as hard as territory is worth

- Contested resource is more valuable to current owner (asymmetrical value), so owner generally plays 'hawk'
 - ESS: play as hard as territory is worth
 - ex. tarantula hawk wasps
 - Fighting by new resident increases with time spent on territory

