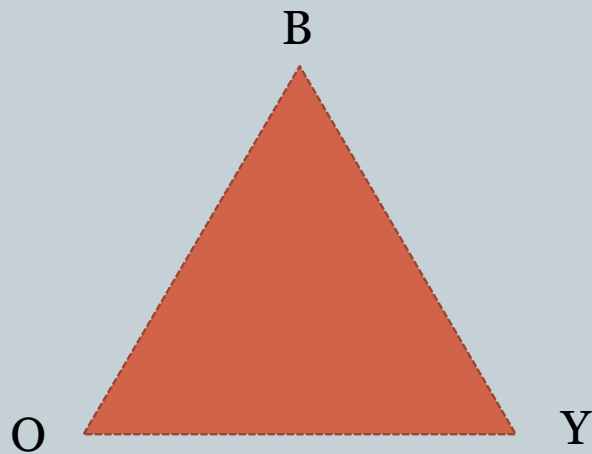


Frequency-dependent strategies

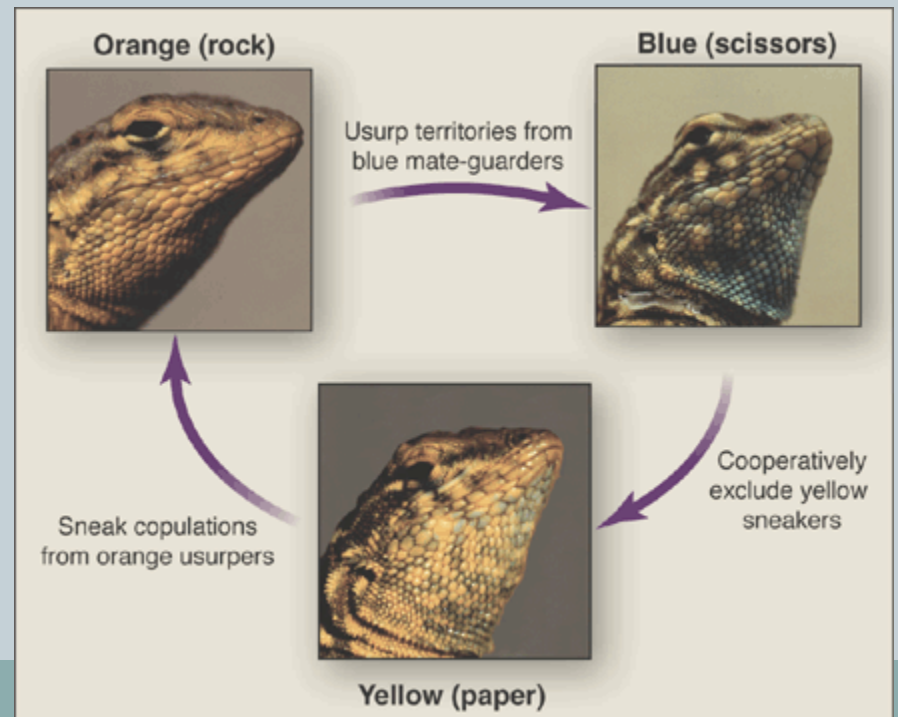


- Frequency-dependent - Fitness is affected by what others in the population are doing (e.g. cooperative behavior, aggressive behavior, mating behavior)



- Orange males are large, hold big territory
- Blue males smaller, cooperate to hold territories
- Yellow males are smallest, sneak matings

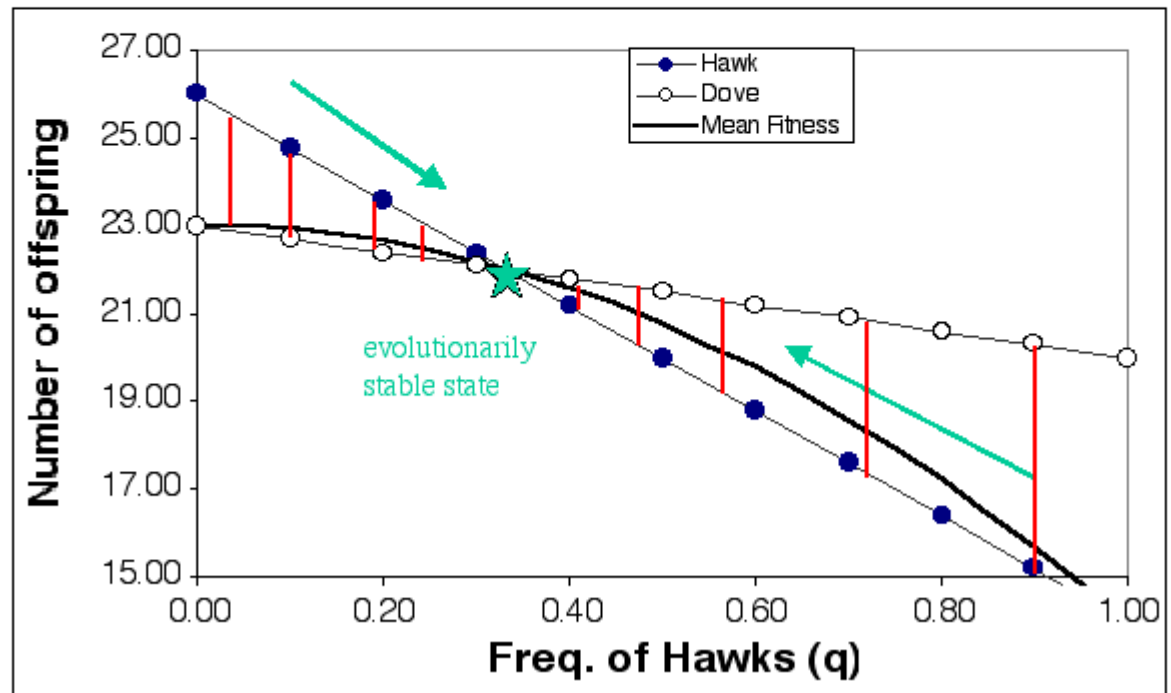
(Sinervo & Liveley 1993)



Evolutionary Stable Strategies



Evolutionary Stable Strategy - a behavioral strategy (or phenotype) if adopted by all individuals in a population that cannot be replaced or invaded by a different strategy through natural selection.



Game theory



- A mathematical approach to understanding the outcomes of interactions between two or more individuals when benefits and costs of the interactions depend on the strategies of each individual.
- Prisoner's Dilemma

		Prisoner A Choices	
		<i>Stay Silent</i>	<i>Confess and Betray</i>
Prisoner B Choices	<i>Stay Silent</i>	Each serves one month in jail	Prisoner A goes free Prisoner B serves full year in jail
	<i>Confess and Betray</i>	Prisoner A serves full year in jail Prisoner B goes free	Each serves three months in jail

The Scenario



Food source



Do you alarm call?

PAY-OFF	Alert	Flee
Alert	3, 3	0, 5
Flee	5, 0	1, 1

Remember: organisms are reproductively selfish

How to Play



- Break up into groups of three
 - Decide who will be the “fitness keeper” and who will play (chickadee and titmouse)
 - Players cannot communicate
 - Score keeper will go back and forth between players
 - 5 full rounds
 - Report average of the two fitness scores

PAY-OFF	Alert	Flee
Alert	3, 3	0, 5
Flee	5, 0	1, 1

Round 2: Memory



- This time, the score keeper will tell the player the previous outcome before beginning the next round
- Again, report the average of the two scores

PAY-OFF	Alert	Flee
Alert	3, 3	0, 5
Flee	5, 0	1, 1

Remember: organisms are reproductively selfish

Why cooperate?



- How did the two rounds differ?
 - If we played again, what would you do differently?
- What do you think would happen if we introduced communication? Enforcement?

Food source



Types of Cooperation



1. By-product
2. Reciprocity
3. Delayed benefit
4. Kin Selection

Types of Cooperation



- **By-product**
- **Unrelated groups**
 - Decreases chance of dying
- **Mutualism***

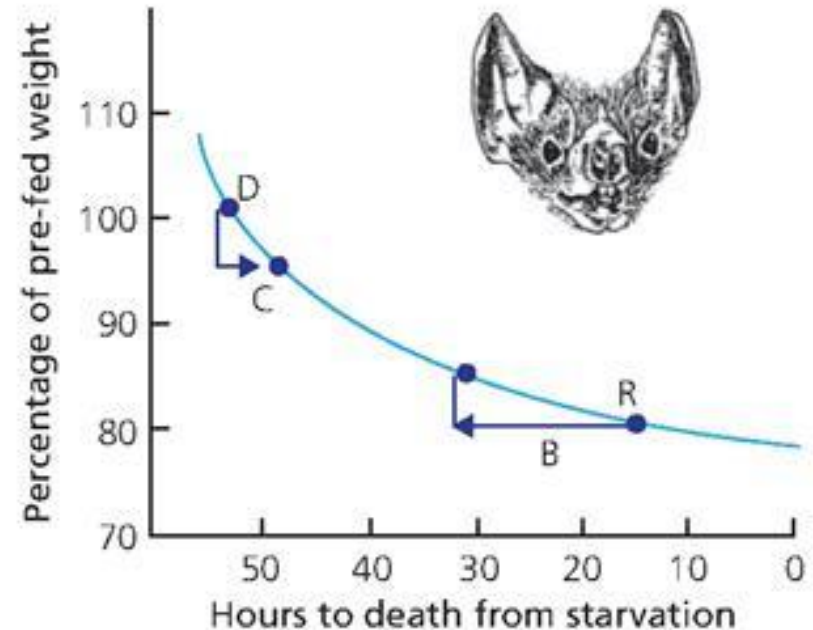


*organism is reproductively selfish

Types of Cooperation

- **Reciprocity**
- Repeated interactions (memory)
- Benefit to recipient > Cost to donor
- More willing to help those who've helped you

Is this a strategy or a tactic?



Types of Cooperation

- **Delayed benefit**
- Payoff down the road
 - “Setting yourself up for success”



Types of Cooperation



- **Kin selection**

- Sherman (1977): Populations in Alpine meadows
- Males disperse far from burrow, females stay around
- Constructed pedigrees of individuals in populations

