

1. **Single, optimum strategy** – everyone in group uses same strategy



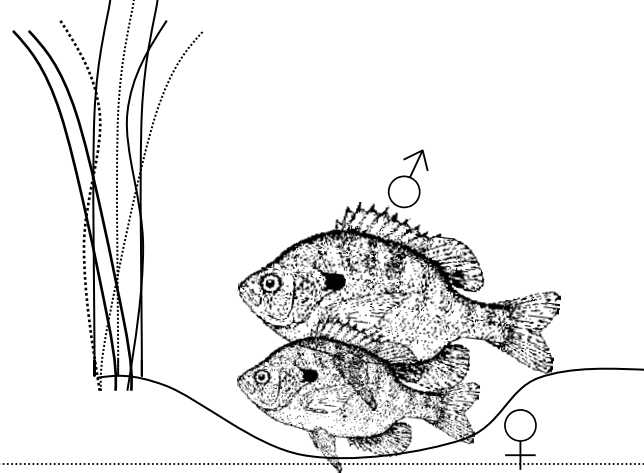
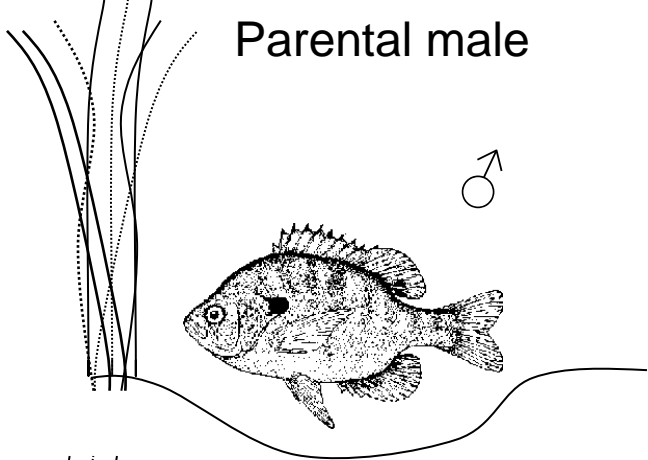
e.g. “Winter Survival” in British Red Squirrels

2. **Alternative, competing strategies** – multiple strategies found within a single group

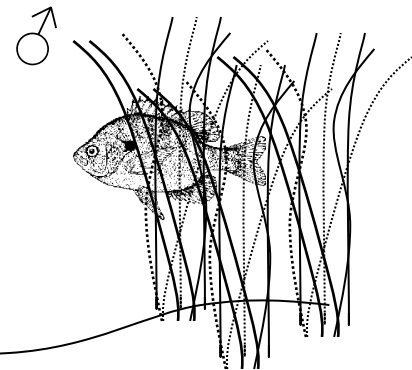
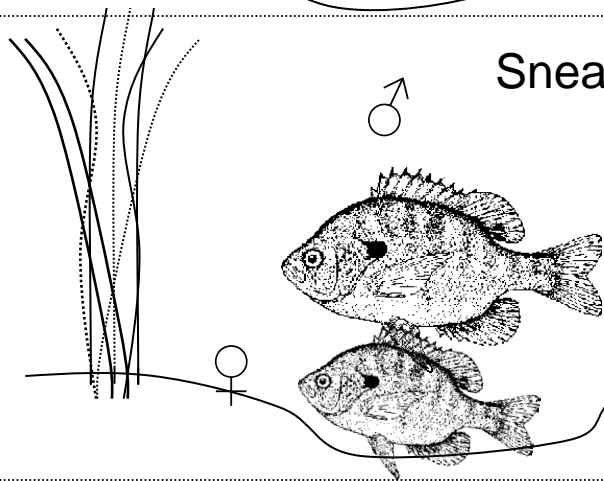


E.g. Mate Mating in Blue-gill Sunfish

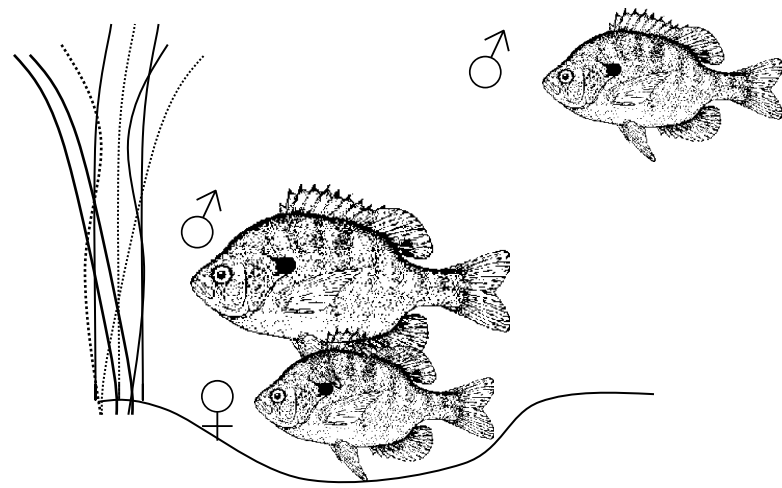
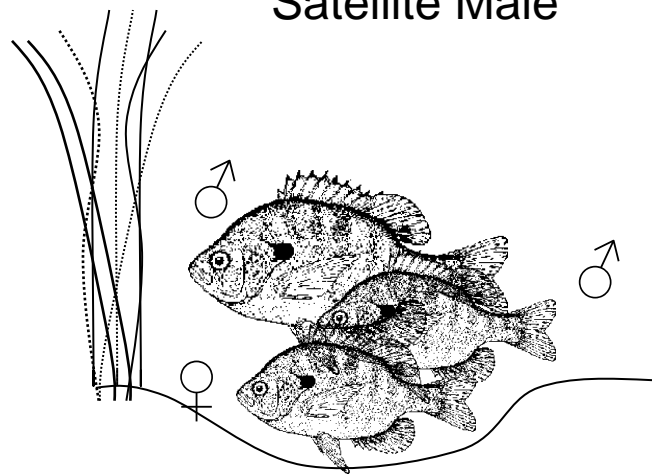
Parental male



Sneaker Male

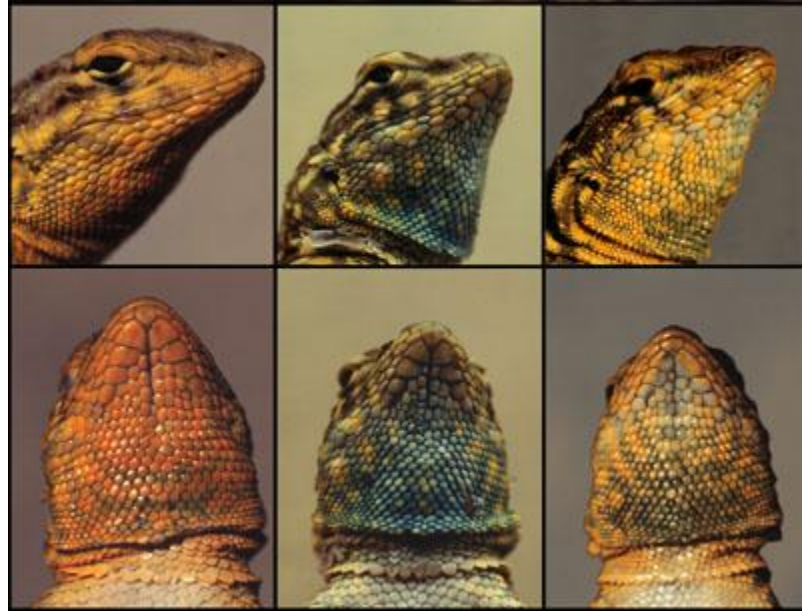


Satellite Male



1. Fixed strategy = “no choice”

e.g. Side-blotched lizards



Orange – biggest, most aggressive, steals mates from blue males

Blue – medium, forms pair bonds, wins fights with yellow to attract females

Yellow – smallest, looks like female, sneak in and mate with orange males
stolen females

Orange beats blue: blue beats yellow: yellow beats orange

2. Plastic strategy = “choice”



E.g. Hamadryas baboons

“Fight” or “don’t fight”

Decision based on prior ownership



Male "A" with Female "Z"

Dang! I guess she's taken.



Male "B"

Adopts "don't fight" strategy.

Darn, missed
my chance
with that one!



Male "A"

Also adopts "don't fight" strategy.



Male "B" with Female "X"



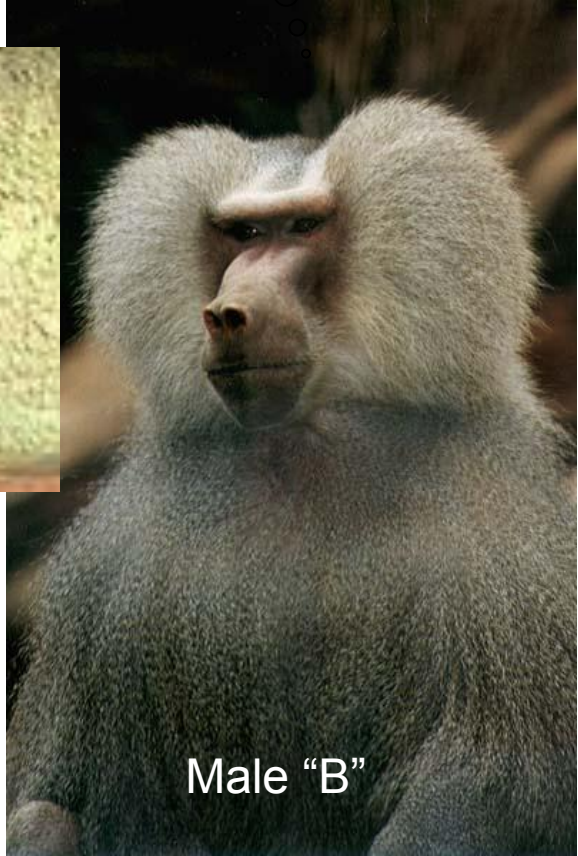
Male "A"

She's mine!



Female "Y"

She's mine!



Male "B"

Both adopt “fight” strategy.



Evolutionary Game Theory

Hawks and Doves

Hawks:

- Always fight
- first one to get injured and quits fighting loses
- winner gets sole possession of the resource

Assumption:

- all hawks have equal fighting ability – they each have a 50% chance of winning a Hawk-Hawk contest

Doves:

- never fight, only display
- If attacked, immediately withdraw
- Never gets hurt, but never wins against a Hawk

Assumption:

- all doves are equally good at displaying – they each have a 50% chance of winning a Dove-Dove contest

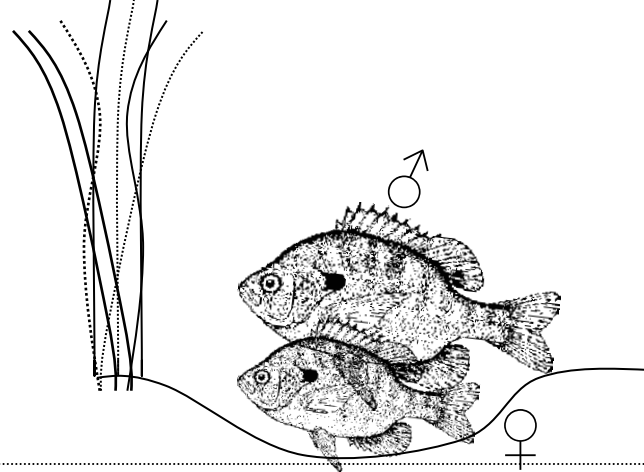
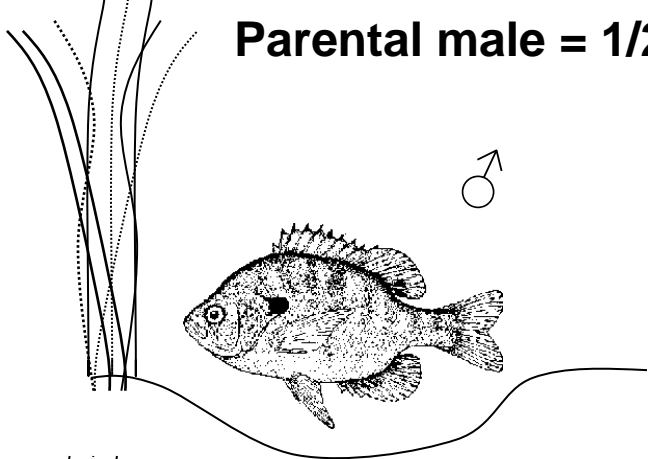
Hawks and Doves

Evolutionary Stable State (ESS) = consistent frequency of each strategy in a population.

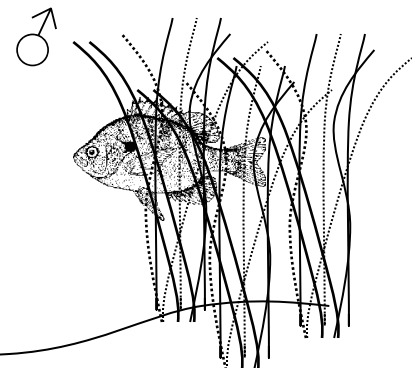
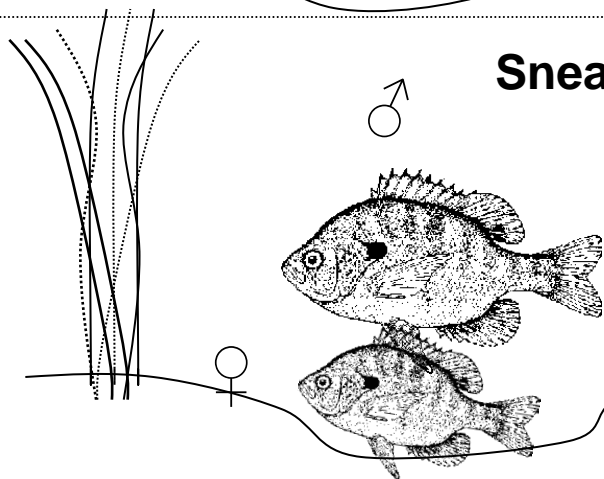
Hawks = $2/3$

Doves = $1/3$

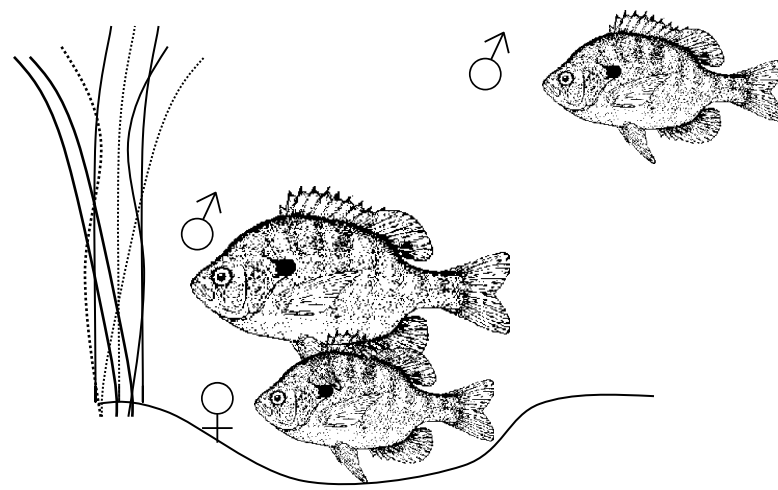
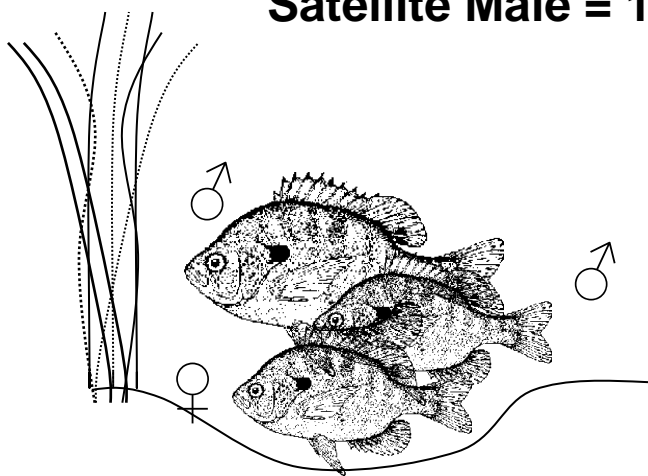
Parental male = 1/2

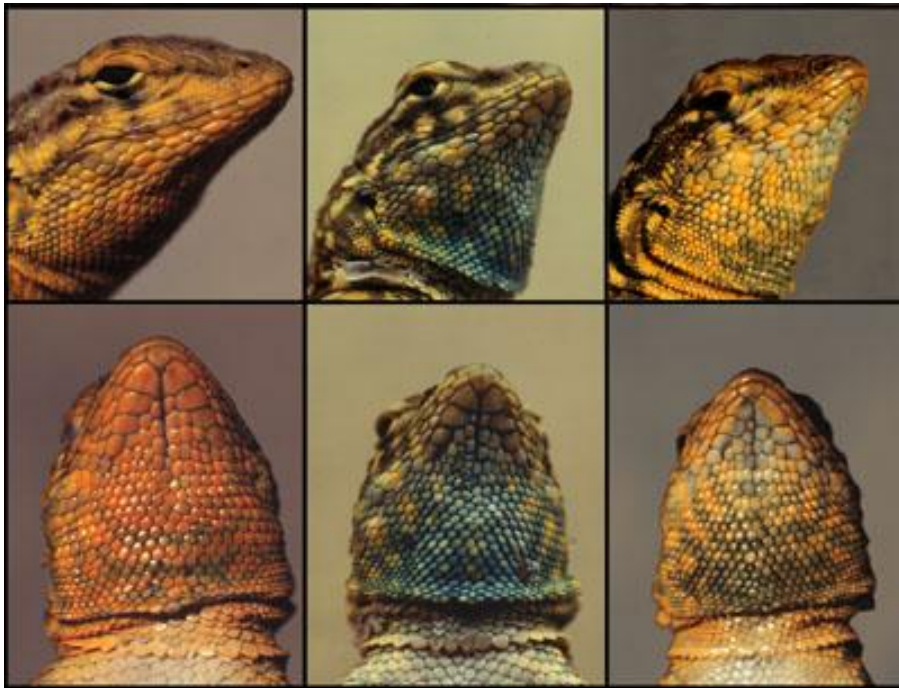


Sneaker Male = 1/4



Satellite Male = 1/4





ESS = 1/3 for each type

Bourgeois Strategy of Hawk-Dove Game

Play Hawk if you are the owner, Dove if you are intruder



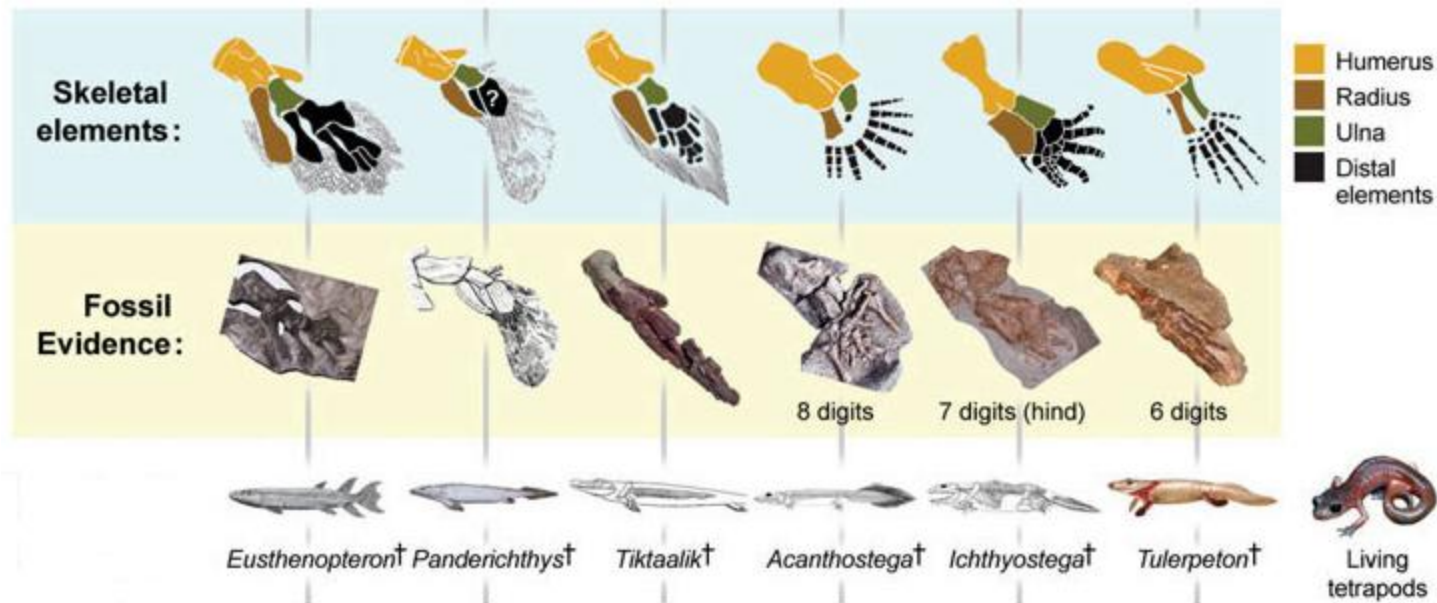
Hamadryas baboons

Biological evolution = A change in the genetic make-up of a population over time.

Evidence for evolution:

1. **Fossil record** – physical evidence of organisms that lived in the past

E.g. Origin of Tetrapods based on Fossil Record



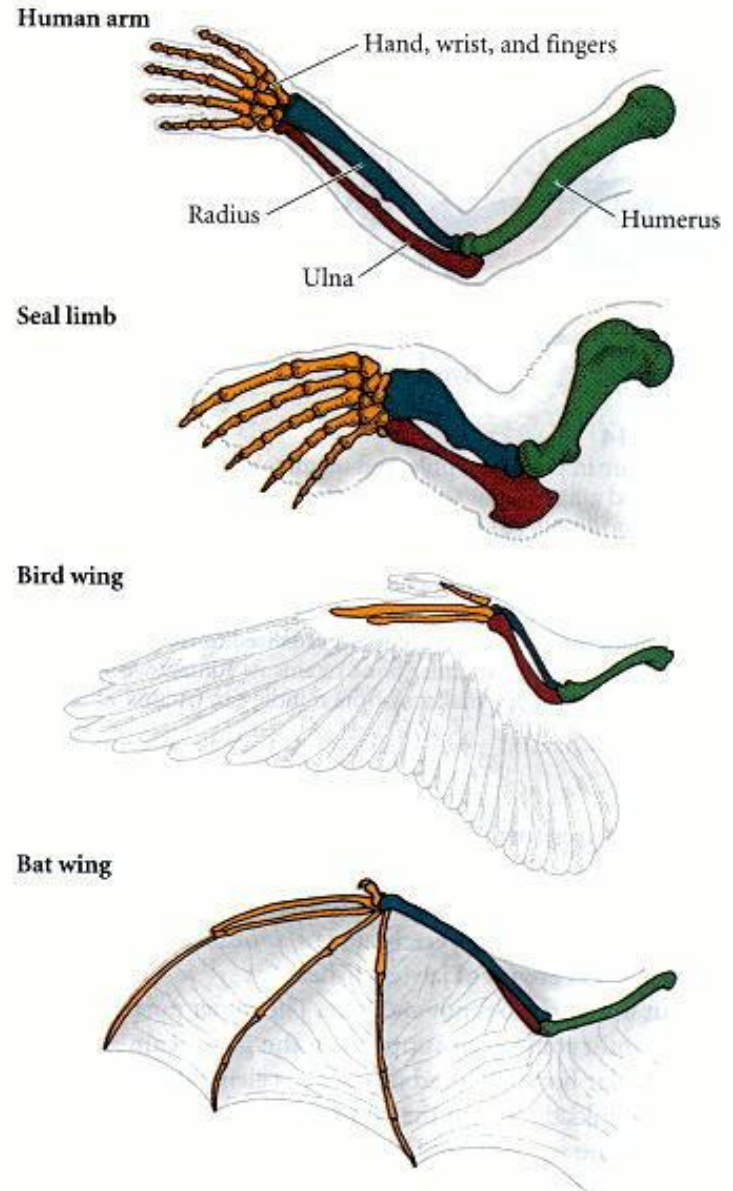
Evidence for evolution:

1. **Fossil record** – physical evidence of organisms that lived in the past
2. **Homologies** – similarity of structures of different organisms as a result of their evolution from a common ancestor

Ancestor

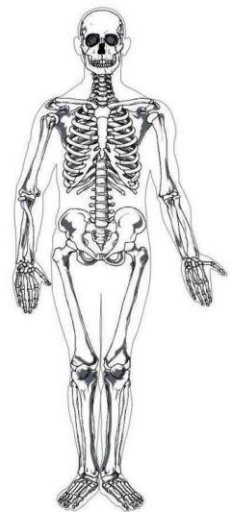
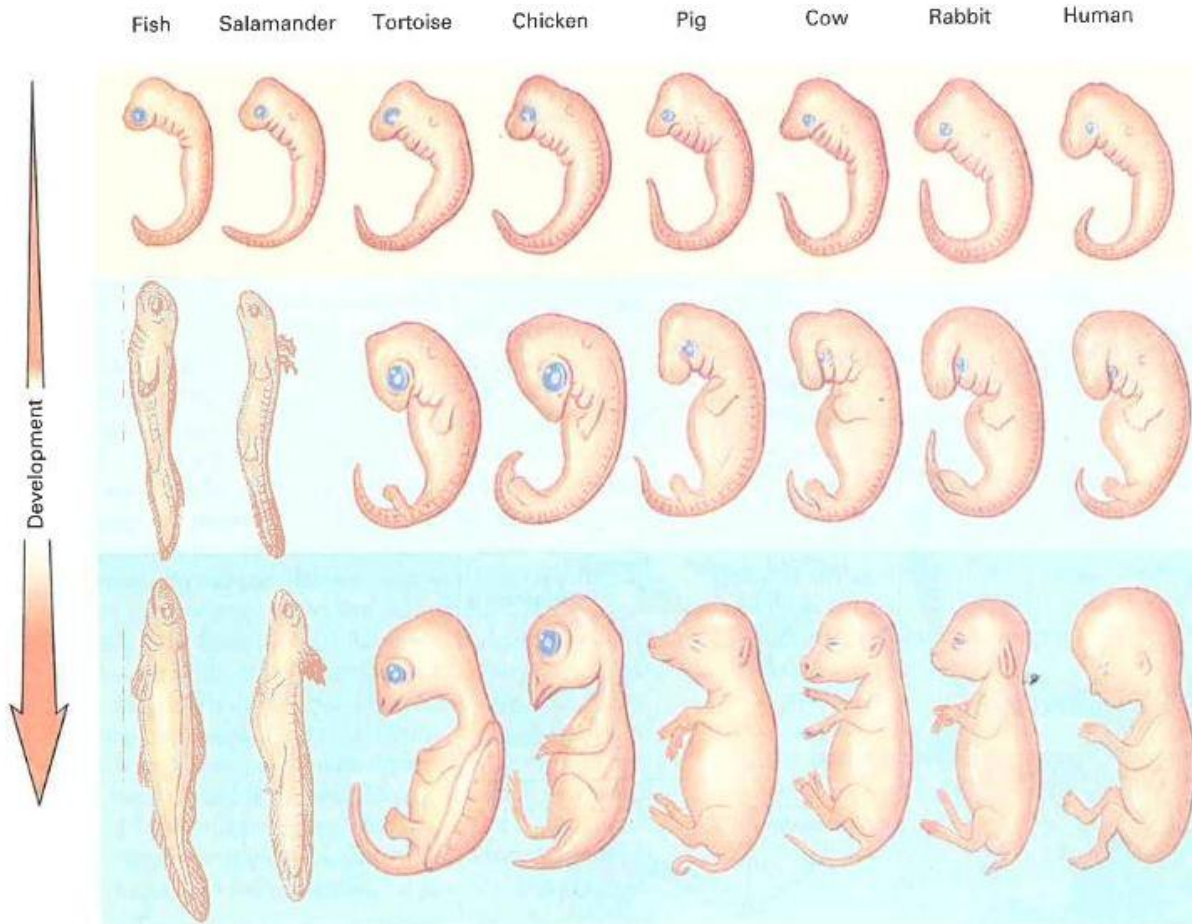


Descendent



2 “types” of homologies:

1. Anatomical & embryological

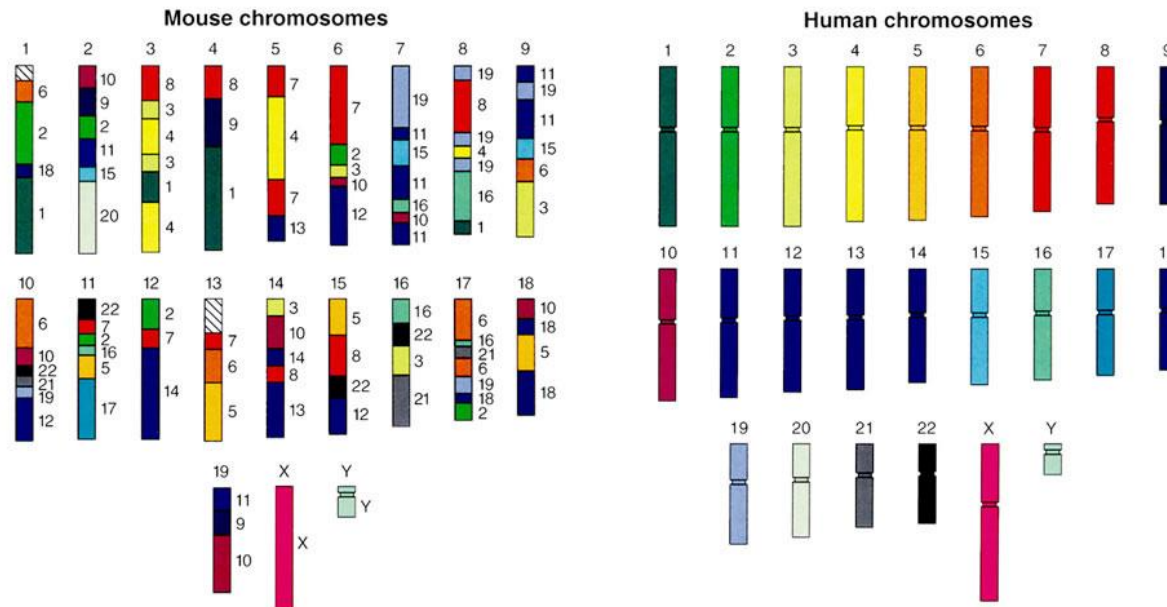


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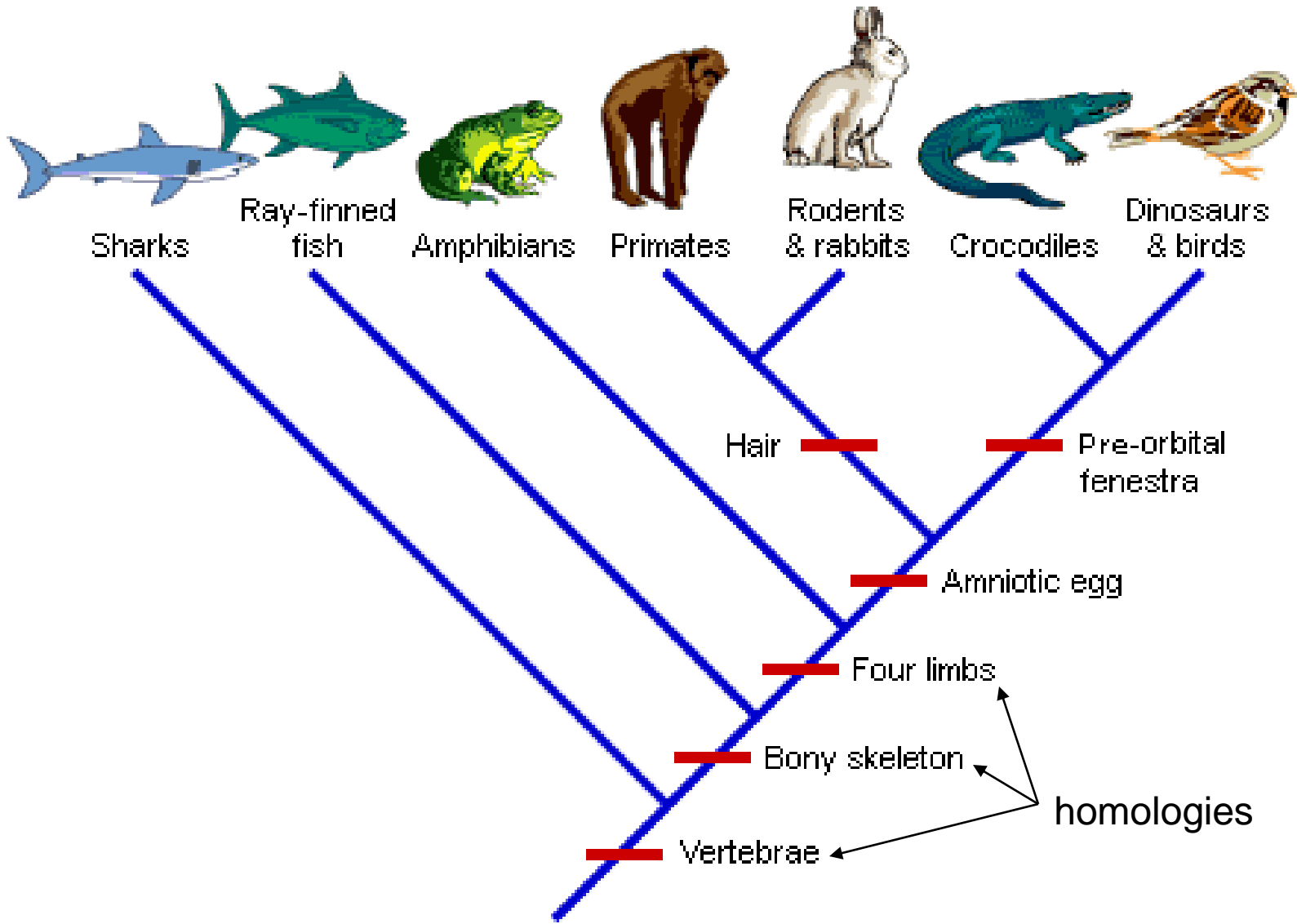
B. Molecular genetics

Mouse and Human Genetic Similarities



Evidence for evolution:

1. **Fossil record** – physical evidence of organisms that lived in the past
2. **Homologies** – similarity of structures of different organisms as a result of their evolution from a common ancestor
 - **phylogeny** = evolutionary history of a lineage



Evidence for evolution:

1. Fossil record

2. Homologies

3. Empirical data – experiments and observations

E.g. antibiotic resistance in bacteria

