

Biology Notes

Evolution

Speciation- TWO types

- The formation of a new species from an old one
- A species: a group of individuals that actually or potentially interbreed in nature
- The biggest gene pool under natural conditions

Type one: ALLOPATRIC SPECIATION- the great divide

- Species being formed by geographical isolation
- Something environmental halts the interbreeding between two pops in a species- a lineage form two separate species
- Isolation can be due to a distance/ barrier- desert river mountain/ wind blows pop away (finches)
- Look at diagrams

Type two: SYMPATRIC SPECIATION

- Doesn't require large geographical barrier to reduce gene flow
- The individuals in a pop are no longer attracted to interbreed, due to manner factors

What Factors affect Speciation?

1. Genotype variation (& isolation caused by type one) leading to phenotype variation
 - Eg. Galapagos island finches
2. **Inbreeding**
 - The mating of closely related individuals
 - Can happen due to geographic isolation (type 1) or a genetic bottleneck
 - Religious and sociocultural reasons for this in humans
 - Closely related individuals have same allele- therefore a reduced gene pool
 - Less variation and lack of evolution
 - Can result in defects- smaller/ weak immunity/ high mortality rate/ physical abnormalities/ recessive genetic disease/ decrease in heterozygous genes/ fail to reproduce- line dies out
 - Against the law in most countries
 - Inbreeding examples: white lions of Timbavati/ the royal family= haemophiliac/ Jewish group- Tay Sachs disease/ Amish communities

The Cheetah

- Climate change caused only one species to be left, close relative had to interbreed
- This resulted in: low survivorship/ poor sperm/ susceptibility to disease

Why is inbreeding disadvantageous for survival?

- Lack of genetic diversity- less variation that helps species adapt to environments
- A virus infecting one can likely affect all- extinction
- Eg- feline infectious peritonitis in cats, 50- 60% in cheetahs

3. Outbreeding

- Mating of unrelated individuals
- Increase gene pool- genetic variation- heterozygous/ hybrid vigour
- Therefore- more productive/ fertile/ greater survival
- Case study- hip dysplasia in German Shepherds- few in SA so more were brought in internationally to increase gene pool

4. Founder Effect

- Event when a small no of individuals carrying a fraction of pops genetic variation become founders of a new society elsewhere
- Result- new pop has different genes from parent pop- may lead to speciation and development of new species
- Eg- migrations in human history- reduced genetic variation from original pop and non-random sample of genes in original pop
- Eg – Afrikaner pop has frequency of Huntington’s disease because original Dutch had it
- The Jansz emigrated from Holland in 1600’s with porphyria- 30 000 SA have the disease now
 - Family hypercholesterolemia- 1/ 72 in Afrikaners

5. Population Bottleneck

- Caused by catastrophic event that kills large portions of pop (can cause founder effect)
- Reduces genetic variation- causes inbreeding. Chimps and gorillas
 - Eg the Toba catastrophe- volcanic eruption limiting human pop to 15 000

6. Reproductive Isolation

- What does speciation require? Two individuals cannot produce offspring together/ they avoid mating with certain groups in their species

6. 1 Breeding/ Flowering At Different Times In The Year

- Mist belt of KZN, 3 types of yellowwood remain separate species because they form cones/ pollen at different times

6. 2 Species Specific Courtship

- Genetically based changes= different mating location/ mating time/ mating rituals
- The mate recognition system- signs that allow an individual to recognise potential mate

- This depends on anatomical features (kudu horns) performance of behaviours(dancing cranes)
- These features can evolve over time- because if 2 pops lose genetic contact they wont evolve in the same way- they won't recognise others as mates even if they come from a common ancestor

6.3 Adaption To Different Pollinators

- Flowers coevolve with pollinators, pollinators therefore drive speciation for them
- Reproduction isolation will happen with pre- pollination barriers that limit transfer of pollen from one group in a species to another= speciation
- Eg- Proteas have many different pollinators- causes the variety of types of Protea- read Protea example
- Can also happen in flower morphology- only certain pollinators can access rewards (nectar)

6.4 Timing of Flowering

- If flowers open at different times of the day, they are only pollinated at these times and therefore rarely cross- pollinate- little hybridization
- Eg *O breviceps* and *O clavaeformis*

6.5 Different Shaped Sex Organ

- Damsel flies penis is differently shaped so that no mating happens between species