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**Discuss how climate change could act as an agent of natural selection to:**

**(a) Increase extinctions**

Climate change can increase extinctions as they place evolutionary pressures on the animals to adapt to the new climate and environment in which they live in

For example, with rising sea temperature, aquatic animals are forced to adapt to their new environment or risk dying and going extinct. This is already happening with coral reefs, where large parts of the Great Barrier Reef are dying due to rising temperatures. This, in turn, causes coral reef fish (fishes which are dependent on corals for their habitat) to no longer have a home.

Another area where climate change can influence the success of an animal is in endotherms and exotherms. As we know, endotherms are typically more common in cooler and wetter climates because there are sufficient resources to maintain an internal body temperature to maintain optimal physiological performance. However, this comes at a great cost of higher metabolism and greater food needs. Therefore, as the climate changes or warms in some regions of the planet, we can expect endotherms to be placed at a significant disadvantage compared to exotherms, which require less food resources since their body temperature is close to the warm environment.

Another example would be the Pied Flycatcher. This bird migrates to Europe annually when the weather turns warm. However, climate change has caused the weather to warm unusually early, which means when the bird returns to Europe, there is no food. This can cause the birds to die or go extinct.

**(b) Create new species**

Climate change can create new species as they place evolutionary pressures on the animals to adapt to the new climate and environment in which they live. The ones that fail to adapt will decrease in numbers and/or die out while the ones that manage to adapt change to the point they can be considered a different species.

For example, let’s say there is an existing population with an existing distribution of genotypes for rabbits. There is a rabbit population and they have genes for really long fur (homozygous dominant L) and short fur (homozygous recessive l). When climate change increases the temperature of their habitat, one phenotype (the short fur) will be fitter than the other phenotype. The rabbits with the fitter phenotype will survive, be more successful, reproduce, and pass their genes off to their offsprings. Over time, the prevalence of different genes - the phenotype distribution - is going to shift. The percentage of rabbits with the recessive gene (l) will increase. This would be a case of directional selection.

Climate change can also cause indirect selection. Let’s say climate change causes a certain plant species to die out. In this case the food landscape changes for the rabbits. The natural selection in the rabbits will be due to the difference in the available food in their environment. Rabbits that have genes for teeth better suited for the available plant will survive in this case. Over time, their offsprings will make up a good percentage, if not all, of the population.

Like in the cases above, as favorable traits are being passed down from generation to generation, the organism eventually has too different genes to be considered the same species, and are considered different species. This is called speciation. A real life example would be the Galápagos finch (although not caused by climate change). These finches (located in different islands) were isolated from one group to another by the sea, preventing them from having any contact or reproducing. Each group developed different kinds of beaks for the food that was available to them. Some had long and thin beaks, for eating cactus flowers while others had large and blunt beaks, for cracking open nuts.