5.5 NATURAL SELECTION

Selective pressures affecting which individuals survive, and which individuals will not

The term **natural selection** goes hand-in-hand with *adaptation*. In fact, variation, adaptation, natural selection and speciation are all a long chain of events which connect and are the building foundations of *evolution*.

It was **Charles Darwin** who proposed the mechanism of natural selection. During his time aboard the HMS Beagle on a five year world voyage, he visited the Galapagos Islands, where he discovered a large number of unusual **species**. Many of those species, though, were similar to those found back in South American mainland – but this made Darwin curious as to how there could be such variation between the populations of the same species living on different islands.
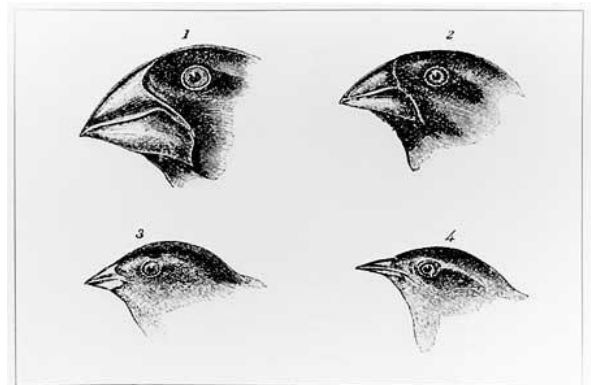
Species -
a group of organisms sharing biological, anatomical and physiological characteristics, and who can successfully interbreed to produce fertile offspring

Darwin made *four* **observations** which you need to know:
i   offspring generally appear similar to their parents
ii   no two individuals are identical
iii organisms have the ability to produce large numbers of offspring
iv   populations in nature tend to remain fairly stable in size

Darwin had noticed what he thought to be several different species of bird, but what they were in fact were closely-related finches. These all became known as **Darwin's finches**. The diagrams show four of these finches. The variation is found in their beaks. For example, number 1 has a beak for eating buds and fruit, number 2 leaves, number 3 insects and number 4 grubs.

Darwin noted that variation was the key to a changing species. If a large number of offspring are produced at any one particular stage, there will be too many organisms and not sufficient resources for food and shelter, etc. According to Darwin's observations, there will be differences between the new generation, and so some will be better *adapted* to survive, and will do so long enough to reproduce. Those who are not "fit" enough to make it will not survive.

The term 'natural selection' is used to describe the process of **environmental factors** determining which individuals will survive. Those individuals who do survive have been *selected* from the entire population, this is called undergoing **selection pressure**. Those individuals with a beneficial characteristic will be at an advantage, and will be selected. Those without that useful characteristic won't have what it takes to survive.

Take the example of finches. If there are two closely-related finch species living in one habitat, say finch number 1 and finch number 2. Finch number 1 has adapted to be able to manageably eat nuts, buts and fruits, and finch number 2 has adapted to be able to eat leaves. But say that in that habitat, an **environmental pressure** is that suddenly all of the nuts and buds increase in size. Finch number 1 won't be able to eat as heavily anymore, and so those individuals will be more likely to not survive. However, there has been no change in the size of leaves, and finch number 2 has the perfect beak to feed on leaves, so they are likely to remain happy. Species number 1 will not be selected, unlike number 2.

Some of the most common environmental pressures which encourage natural selection are:
➢ *availability of suitable food* – those individuals who are adapted to eat the food available are more likely to survive
➢ *diseases* – if an organism is able to survive a disease, it is more likely to be "selected"
➢ *predators* – those adapted to avoid detection of predators, or who can escape easily, are more likely to survive
➢ *physical, biological and physiological determinants* – those organisms which are able to survive in extremely harsh conditions, are already at a selective advantage

Darwin's observations on the Galapagos Islands with the finches, regarding the same species being so varied in different areas, led to the discovery of *speciation*, which is covered in the next topic (see 5.6 Speciation).