

a) Describe two research studies into animal navigation.

Keeton conducted a study regarding the ability of pigeons to navigate. It was suggested that pigeons are able to detect the earth's magnetic field, and therefore navigate with this aid. An experiment carried out to explore this possibility. Small magnets were attached to the heads of pigeons which were then released in unfamiliar surroundings. The magnets were designed to disrupt any detection of the earth's magnetic field. The pigeon's ability to find its way back to its home loft was then observed. It was found that the pigeons had difficulty returning home on overcast days, but had very little difficulty doing so on clear, sunny days. This suggested that there are two main compass systems that pigeons utilise; the sun, and the earth's magnetic field. On sunny days pigeons were able to find their way home using the sun as a compass, whereas on overcast days where they would normally use the earth's magnetic field, they were unable to do so and hence had difficulty. It was also found that young pigeons had difficulties in both sunny and overcast environments, suggesting that using the earth's magnetic field to navigate is innate, whereas using the sun comes with experience.

Mouritsen and Frost looked at Monarch butterflies and the way in which they navigate. They conducted an experiment whereby butterflies were tethered in a specially built flight simulator that simulated flying with the use of airflow from below the butterflies. This, however, did not affect the direction in which the butterflies headed. It was found that the butterflies headed in a south-westerly direction. However, some of the butterflies had their day-night cycle shifted by six hours; some in one direction, others in the other direction. These butterflies were found to be headed in a different direction to the original butterflies. Their paths were at a 90 degree angle from the paths of the normal butterflies. This suggested that the butterflies headed in a certain direction according to where they believe the sun should be for the time of day they believed it to be. It was also found that the butterflies did not respond to changes in magnetic fields suggesting that their primary compass system is based on the sun.

b) Assess what these studies can tell us about homing and/or migration.

Both studies suggest that animals do not necessarily use just one method to navigate. Keeton's studies shows pigeons to use both magnetic field and the sun depending on the weather condition. This demonstrates that animals are able to adapt their navigational strategy accordingly as it is essential for survival. However, in Mouritsen and Frost's experiment, it was suggested that butterflies only utilise one strategy of navigation; the sun. Even in cloudy conditions butterflies are said to use patterns of polarised light visible through the clouds. In this case, the idea that animals adapt to different weather conditions cannot be put forward. The butterflies were able to navigate their direction even when the sun was not actually present. This puts forward the idea that animals do not

necessarily need the sun to be visible to use it to navigate. However, the flights of the butterflies were simulated and therefore may have produced different results if this had not been the case.

Both experiments show that different animals used different navigational systems as the butterflies did not respond to the magnetic field whereas the pigeons did. They also suggests that navigational strategies can be learnt by animals, but this is not the case for all animals. In Keeton's study it was seen that the mature pigeons were able to use magnetic fields and the sun to navigate, whereas younger pigeons were only able to use magnetic fields. In this case the mature pigeons were more experience at navigating, also suggesting that it doesn't appear to be totally innate. In Mouristen and Frost's study the maturity of the butterflies appeared to be irrelevant to the direction in which the butterflies headed, showing that some animals may be unable to learn new strategies, or that it just isn't necessary. It is difficult to say whether it is in fact the maturity of the pigeons that lead to better navigational skills, or whether it is the amount of experience the pigeon possess. However, these two factors would overlap in a natural environment.

Keeton's experiment offers more ecologically valid results than Mouristen and Frost's study as the pigeons were observed in natural situations, whereas the flights of the butterflies were simulated. This suggests that results may differ for butterflies in real life. Both studies suggest that animals have certain techniques to navigate, but it's difficult to say how exactly these techniques are used.