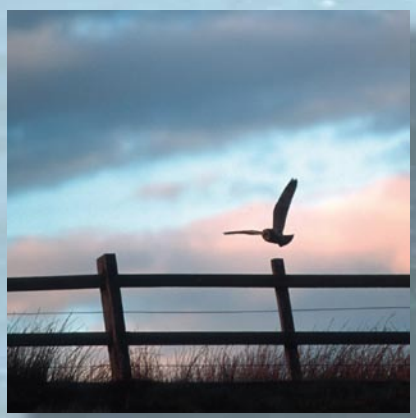
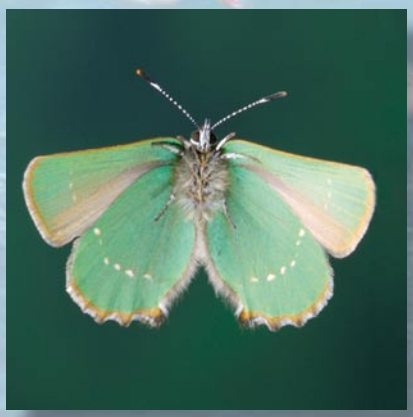
# Animals on the Move


Michael Dockery





Association for the Study of Animal Behaviour

# Animals on the Move

Investigations and worksheets on animal behaviour for pupils at Key Stage 2

***Michael Dockery***

*The Association for the Study of Animal Behaviour*

2008

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*Investigations and worksheets on animal behaviour for pupils at Key Stage 2*


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Linking animal behaviour to the National Curriculum for Science at Key Stage 2
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**References and acknowledgements**

**Investigations**

1. Crawling caterpillars — Years 3 & 4
2. How do seed beetles move in response to light? — Years 5 & 6
3. Are brine shrimps top, middle or bottom dwellers? — Years 5 & 6

**`Suggested` answers**

**Worksheets**

A. Feet and legs - 1 — Years 3 & 4
B. Feet and legs - 2 — Years 3 & 4
C. Feet — Years 3 & 4
D. Wings of insects — Years 3 & 4
E. Wings of birds - 1 — Years 3 & 4
F. Wings of birds - 2 — Years 3 & 4

A. Aquatic animals - 1 — Years 5 & 6
B. Aquatic animals - 2 — Years 5 & 6
C. Insects - 1 — Years 5 & 6
D. Insects - 2 — Years 5 & 6
E. Birds - 1 — Years 5 & 6
F. Birds - 2 — Years 5 & 6
G. Mammals - 1 — Years 5 & 6
H. Mammals - 2 — Years 5 & 6
I. Mammals - 3 — Years 5 & 6
J. Mammals - 4 — Years 5 & 6

Miscellaneous

K. Speedy movers — Years 5 & 6
L. Long distance movers — Years 5 & 6
M. Medium distance movers — Years 5 & 6
N. Fairly short distance movers — Years 5 & 6
O. Short distance movers — Years 5 & 6
P. Animals that rarely move — Years 5 & 6
Q. Animals that never move — Years 5 & 6
R. Human body and movement — Years 5 & 6

**Puzzle sheets**

A – D — Years 3 & 4
E – K — Years 5 & 6

# Animal Behaviour in Primary Schools

## *Introduction*

Like its companion volume, *Finding Food*, the purpose of *Animals On The Move* is to show teachers how the study of animal behaviour will enable them to cover some areas of the *Life processes and living things* (Sc2) section of the National Curriculum for Science at Key Stage 2. The emphasis recently given in the end of stage testing to the methods of science, i.e. Scientific Enquiry (Sc1), is also addressed in the series of differentiated investigations/practicals and worksheets. Some puzzle sheets are included for teachers to use as they see fit.

For Sc2 *Life processes and living things*, the material in the book should be useful for teaching pupils:

- that movement is a key life process common to both human and non-human animals (1a);
- that humans have skeletons and muscles to support their bodies and to help them to move (2f);
- to recognise a number of British and non-British animals (4a);
- about the variation and classification of living things (4a);
- that different animals are found in different habitats (5a);
- how animals are adapted to their environment (5b);
- to use correct vocabulary, such as *habitat, food chain, predator, prey, producer, consumer, key*, *skeleton, muscles*, etc..

The practical ideas will help in teaching pupils about scientific enquiry (Sc1), and specifically in:

- planning experimental work - for example, making predictions and testing them, designing fair tests and selecting relevant equipment (2a, 2b, 2c, 2d);
- obtaining evidence - for example, taking measurements in a careful and considered manner, doing so safely and aiming for reliable data (2e, 2f, 2g, 2h);
- considering evidence - for example, using appropriate graphical means to present results, assessing their findings, drawing conclusions and explaining their findings by relating them to current knowledge (2i, 2j, 2k, 2l, 2m).

The investigations will teach the children about the behaviour of some familiar animals and some unfamiliar ones. All three investigations can be safely undertaken in the classroom. They can also be carried out within a `normal` length lesson (45 - 60 minutes) and the apparatus required should be readily found in a primary school. With each investigation there are three follow-up questions which can be used to reinforce aspects of the study. Each practical activity also offers a teacher the opportunity to assess the children on the extent to which:

- an idea suggested by the teacher was turned into a scientific investigation;
- their prediction was suitable to test;
- their choice of measures was appropriate;
- they tried to keep as many factors as possible constant in a fair test investigation;
- they selected suitable apparatus and used it correctly;
- they made careful observations and recordings;
- they replicated their observations and recordings;
- they used appropriate tables, graphs and diagrams to illustrate their findings;
- they used their graphs, tables and diagrams to tease out patterns and trends;
- they used their results wisely to draw conclusions;
- they used appropriate scientific terms to explain their results.

The book has a number of worksheets concerned with animals on the move and by tackling them pupils will consolidate their learning experiences. The worksheets will also introduce them to secondary-source information which will help the children to make careful, relevant observations from data and help them draw conclusions. They will also aid the development and use of appropriate vocabulary for science in general and life processes in particular. The worksheets, which can be used in the classroom or for homework assignments, are differentiated so that they can be used for Years 3 & 4 or Years 5 & 6. The puzzle sheets are additional exercises that could be used as end-of-lesson activities or as homework assignments.

The investigations and worksheets will also offer opportunities for teachers to see links with other areas of the curriculum. For example:

## *Numeracy*

| | |
|---|---|
| numbers | fractions, percentages; |
| calculations | both mental and paper & pencil calculations;<br>use of a calculator; |
| measuring | use of appropriate measures and vocabulary;<br>selection of suitable measuring equipment;<br>measurement and calculation of area;<br>measurement of time; |
| handling data | collecting, organising, representing and interpreting data in tables, graphs and charts;<br>practising the appropriate skills for drawing graphs and charts;<br>using ICT. |

## *Literacy*

(non-fictional elements)

| | |
|---|---|
| vocabulary extension | especially of scientific terminology; |
| reading comprehension | reading and evaluating information;<br>using sources such as videos, CD-Roms and internet information that is available;<br>reading and following directions/instructions; |
| writing composition | accounts of experiments and observations;<br>providing appropriate phrases/sentences to answer questions;<br>assembling and sequencing pictures and points;<br>producing a table to contain data;<br>developing notemaking skills;<br>using ICT. |

As they carry out the investigations and try some of the worksheets the children will hopefully develop an understanding of how animals move, what triggers the movement, when they move, where they move to and if they return, etc.. ASAB also believes that the material here will enable pupils to develop a respect for living creatures too. Finally, we hope that the activities will encourage the busy teacher to find time to try one or more of the investigations or worksheets with their class and enjoy discovering something about the fascinating world of animal behaviour.



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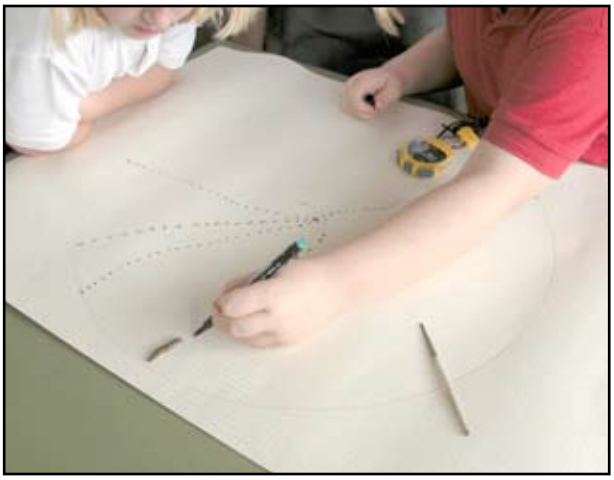
## *Children and animals*

Primary school children are fascinated by the behaviour of animals, see Figure 1, whether through personal observations at school or home, in the wild, on television or in books and magazines.

*Figure 1 Children in Year 4 and Year 6 carrying out studies of the behaviour of a) the caterpillars of butterflies/moths and b) animals caught in a pond study*

a)





b)



None of the activities in this book should give rise to any moral/ethical problems or any health or safety issues for the teacher or for the children. Nevertheless, all practical activities must be risk-assessed and any precautions that are to be taken should be recorded. Since some of these activities require children to handle live animals they should, as a matter of course, wash their hands thoroughly with soap and water after contact with the animals. The same principle should be followed if the pupils handle their food, bedding or housing/shelter.

Almost all primary school children find animals interesting so it is not difficult to get them involved in such work. As a consequence, the practical activities here should be valuable to both teachers and pupils because:

- the investigations require very simple and easily available equipment;
- they are non-invasive and the animals will come to no harm;
- the investigations can operate at a number of levels, can provide opportunities for differentiation and allow the teacher to assess pupil performance;
- the studies provide opportunities for gathering a large amount of quantitative data;
- follow-up work can often be done just as easily at home;
- the investigations encourage the active involvement of the children in their work;
- the context in which the studies are set is clear, i.e. each investigation is purposeful to the children;
- the children develop a respect for animals;
- the children develop a respect for the scientific method.

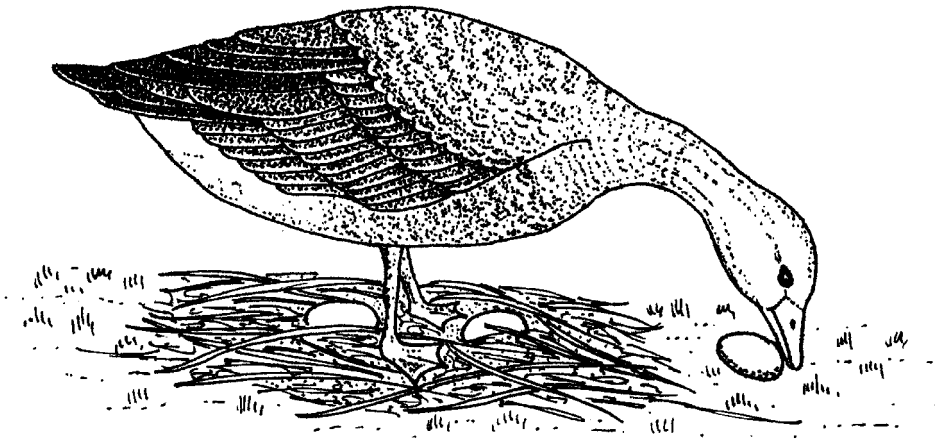
## *The science of animal behaviour*

Behaviour is what humans and animals `**do**`, the actions they engage in. This book deals mainly with the behaviour of non-human animals but involves some human behaviour too. When studies of animals are carried out, humans invariably consider how their own behaviour compares with that of the animals under investigation. In many respects the behaviour of humans and animals is often similar, though there are obvious and important differences too. Teachers can use the materials and suggestions in the book to highlight similarities and differences in behaviour between the two.

The science of animal behaviour attempts to answer questions that researchers are interested in. When scientists try to answer the question "*Why is that animal doing that?",* (for example, "*Why is that goose rolling the egg with its beak*?" - see Figure 2), Niko Tinbergen, a 1972 Nobel Prize winner and one of the founders of the science of animal behaviour, recognised that they are really trying to provide answers to four separate questions. These four questions are:
1. what **mechanism** allows the behaviour to take place?
2. what is the **function**, or value, of the behaviour to the animal?
3. does the behaviour change during the lifetime of the individual animal? (i.e. how does the behaviour **develop**?)
4. how did the behaviour **evolve**?

At Key Stage 2, children tend to ask questions chiefly about the functions of behaviour.

*Figure 2 Egg rolling behaviour in a greylag goose*



## *Linking animal behaviour to the National Curriculum for Science at Key Stage 2*

Life processes illustrate particularly well some of the functions of behaviour. Animals need to find food to sustain their energy levels, to move around their environment, to grow and for their current and/or future reproduction. In these respects, the needs of animals and humans are the same.

The developmental changes in the behaviour of certain animals can also be used to illustrate how living things are adapted to their environment. For example, at the caterpillar stage of development, a moth or a butterfly larva may consume leaves but this behaviour changes when it emerges from its pupal case as an adult and begins to search for nectar. Feeding relationships can also be used to help in categorising animals; thus the feeding behaviour of buzzards and rabbits is clearly different and so studying feeding behaviour allows children to recognise both predators and prey and their relationships in food chains and food webs.

All scientists carry out activities that generate *numbers*. In the activities in this book the children can carry out investigations that will generate numbers. In trying the practicals in this book pupils will learn about observational and experimental methods. Pupils can therefore be taught:

- what question, or questions, their research will address;
- to predict what might happen;
- to put forward a hypothesis;
- to question whether there are other hypotheses that could also be put forward;
- to ensure that the investigation is valid;
- to decide what to measure and how to undertake the measurements;
- how to plan experiments and carry out observations in response to their own, or teacher-generated, ideas;
- to suggest what equipment will be needed;
- how to deal with the data they collect.

They will also be guided through the processes necessary to obtain scientific evidence:

- to use the selected equipment appropriately and carefully;
- to take measurements carefully;
- to engage in replication in order to produce reliable results.

The children will also learn how to represent, analyse and consider the evidence from their experiments and observations by:

- using appropriate diagrams and graphs;
- looking for trends and patterns in the tables, graphs and diagrams;
- drawing conclusions based on their findings;
- deciding whether their evidence answers the questions they set at the start;
- explaining how their results tie in with previous knowledge about the behaviour of the animals under investigation.

## *Behavioural studies of animals on the move*

Some animals, such as sea anemones, move very little during their lifetime: most remain attached to the same piece of rock, though some do actually move if they find a home on the shell of a hermit crab! Most animals move frequently, many on a daily basis and some make significant seasonal moves. Some movements are local, the animal not moving very far from its home, such as a wood mouse. For others, like the migrational movements of Monarch butterflies and wildebeest, the moves may cover hundreds of kilometres, with probably the greatest traveller being the Arctic tern which goes from pole to pole twice a year!

Scientists sometimes study animal movement by observation (by following chimpanzees during the hours of daylight for example), some carry out their studies in a laboratory (studying the tethered flights of locusts and moths for example) and some use radio tracking, ringing, etc.. However far animals move and whatever mechanism they use to achieve travel, whether feet, fins or feathers, the advantages of moving are presumably greater than being sedentary. The practical activities and exercises in this book will hopefully throw some light on the reasons and advantages of moving and give primary school pupils some insight into the functions, development and mechanisms for the locomotory behaviour of animals.

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## Acknowledgements

ASAB is very grateful to Judy Evans, Linda Gray, Jo Wright, Stephen Tomkins, Mick Hoult and the British Ecological Society for providing the illustrations and Mick Hoult, Roy Leverton, The Wetlands and Wildfowl Trust, Paul Hobson and the author for the photographs. The text benefitted greatly from the very helpful comments of Dr Nicola Marples (Secretary of the ASAB Education Committee), Dr Victoria Braithwaite (University of Edinburgh), Anne Woodfield (Moss Park Infant School, Stretford) and Judith Willis (Tameside Education Authority). Many of the exercises were improved by the comments of other primary teachers at ASAB workshop and other INSET sessions around the UK. Particular thanks are also due to Louise Davies, Polly Lee and Joan Boswell at St Monica`s R C Primary School, Flixton and Rowena Owen and Pam Bann at Withington School for Girls` and their Year 3 – Year 6 pupils. The author would also like to acknowledge the support of Professor Terry Looker and Professor Bill Gilmore (Manchester Metropolitan University) and record very special thanks to Mick Hoult (Manchester Metropolitan University) for designing the book.

# Investigations

1. Crawling caterpillars — Years 3 & 4
   *(Do caterpillars crawl in straight lines?)*

2. How do seed beetles move in response to light? — Years 5 & 6
   *(Do seed beetles move towards or away from light?)*

3. Are brine shrimps top, middle or bottom dwellers? — Years 5 & 6
   *(Where do brine shrimps spend their time in a column of water?)*

*[The investigations and the 'suggested` answers are written solely for teachers. The answers provided are not exhaustive, teachers should use their judgement in marking a pupil's response. The follow-up material, check sheets, worksheets and the puzzle sheets are written for use by pupils.]*

# 1. Crawling caterpillars - Years 3 and 4

Most moth and butterfly caterpillars move very little during daylight in order to reduce the chance of being seen by predators. If they are out in the open, most caterpillars quickly seek a refuge and keep still until dark. This investigation asks the question - **`do moth/butterfly caterpillars move in a straight line when seeking a refuge?`**

[Note: in this study caterpillars have freedom of movement in an open area as there are no other objects in their path. So in this respect, the situation is rather unlike that in the wild.]

It is not known precisely what specific stimuli a larva responds to when seeking a refuge, or at least which ones it selects to respond to, since it will be subject to many different stimuli. What is clear, however, is that they move to seek a refuge if they find themselves in an open area during daylight. What will be apparent to the children is that as a larva moves it stops occasionally, re-samples stimuli, makes a decision and then moves on, sometimes in a slightly different direction. This suggests that a larva has an ability to change its behaviour in the light of information from its environment.

## *Previous knowledge*

It would be helpful for the children to:

- be aware that butterflies and moths go through specific stages in their development;
- know that there are 4 of these stages and the second is the caterpillar (or larval) stage;
- be aware that although a larva might appear to have more than 6 legs they only have 6 real legs, the additional `prolegs` near their tail help them to move when they are at the larval stage;
- know that most moth and butterfly caterpillars hide or keep still in their chosen resting site in order to reduce the chances of being seen and eaten by predators. If caterpillars are exposed in an open area during daylight they either keep still or move away to a suitable refuge until it is dark.

## *Background information*

A female butterfly or moth has only one parental task, this is to find a suitable place to lay her eggs that will maximise the chances of each one hatching successfully. The emergent caterpillars will then find a nutritious food source, which allows them to grow, pupate successfully and go on as adults to feed, mate and produce offspring of their own.

Some caterpillars will eat during the day but many do so at night, when the number of active predators is fewer. However, predators, such as birds, are still active during the day. For example, blue tits are peeling back bark and looking under leaves for caterpillars to feed to their chicks, whose diet is chiefly caterpillars. Some moth and butterfly caterpillars are inevitably disturbed by bird, insect and mammal predators during the day and if they are not taken, perhaps because they fall to the woodland floor or to the bottom of a hedge, they typically crawl away to find a place of safety. But in which direction do they move?

They could perhaps follow a spiral path, with increasing radii away from their start point. Eventually they would strike cover of some description. [Given a big enough area in which to walk, research has shown that when humans are blindfolded they tend to follow a spiral route, even when asked to move in a straight line!] The caterpillar might move in a chosen direction for say a number of body pulses and then either continue in that direction or change to another direction. [Most caterpillars move in these pulse-like ways: after a few pulses they usually stop, raise their heads, sample their environment again, and perhaps re-orientate, before continuing their movement.] Alternatively, the caterpillars may move at random. Caterpillars could also move in a straight line until they reach a refuge. This is usually what Year 3/4 pupils suggest. This study will test the prediction that `*the caterpillars will move in a straight line*`.

## Apparatus

The following items, per group, are required:

- a length of string, 100 cm is sufficient;
- a large sheet of kitchen/sugar paper (A2 is best but A3 is fine - if this is not available then 2 or 4 sheets of A4 paper sellotaped together or a 50 cm length of wallpaper will be OK);
- a couple of soft lead pencils (felt pens or crayons could also be used, but the pencils do allow the same paper to be used on several occasions);
- a soft artist`s brush;
- a small plastic spoon; [This is helpful when pupils are manipulating caterpillars - the brush can be used to gently coax a larva onto the spoon.]
- a pair of compasses;
- a 30 cm ruler (a metre rule would be helpful if A2 paper is used);
- 10 - 20 caterpillars would be a reasonable number: caterpillars are available from a number of reputable sources, see page 18.

## What to do

A large level surface is required so it is best if the sheet of paper is laid out onto 1 or 2 tables in the classroom. [A small piece of Blu-Tack under each corner might be helpful to stop the paper moving and perhaps cascading a larva onto the floor.] A cross needs to be marked in the centre of the paper as this will be the starting point for the caterpillars. Then, using this point as its centre, draw a large circle on the sheet of paper, one with a 20 - 25 cm radius is suitable. A circle means that a straight line route for all caterpillars would be equal to a radius.

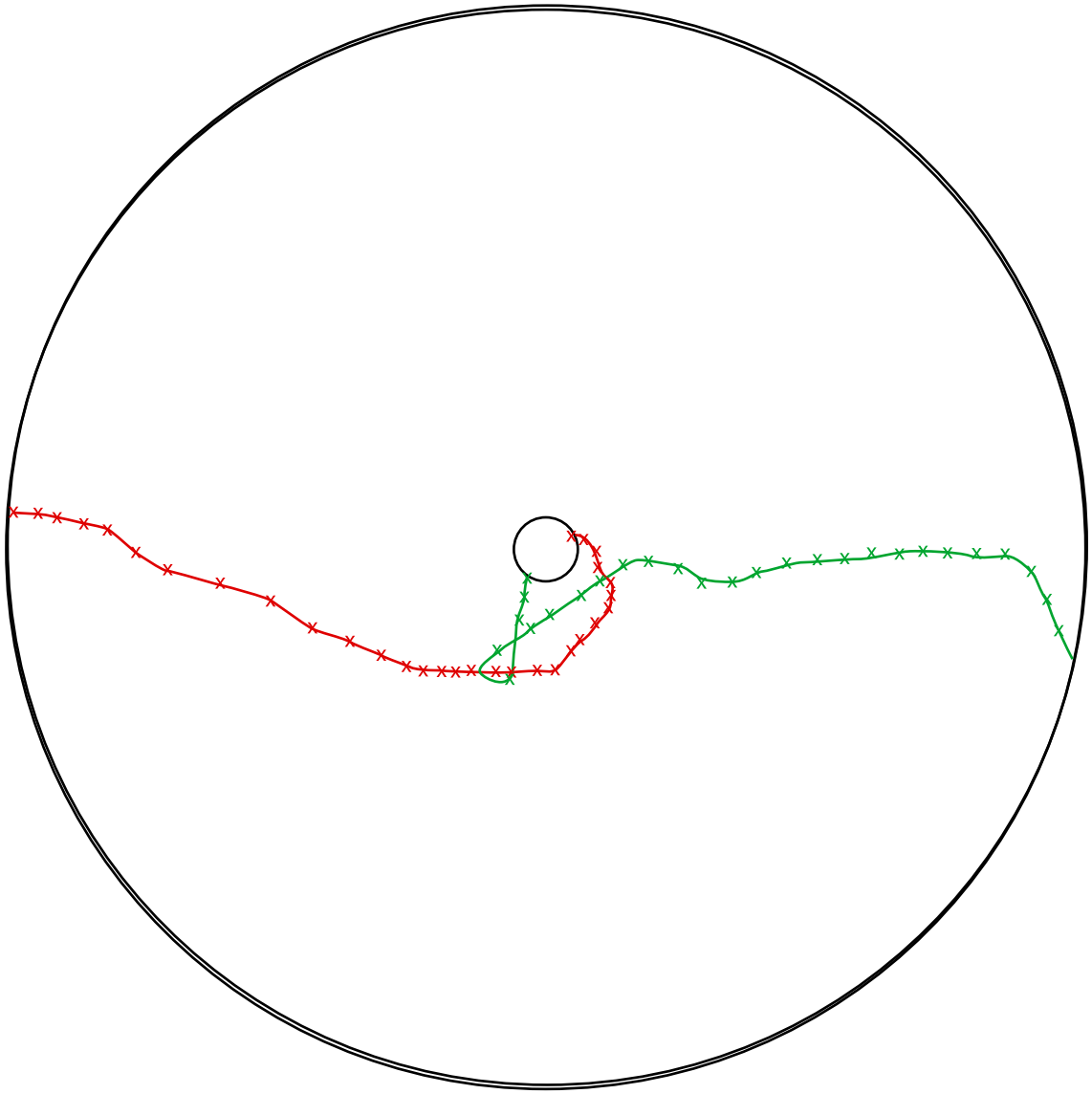
The first larva can then be introduced from the container housing them. To pick up a caterpillar an artist`s brush and the spoon should be used as their bodies might be squashed if the children try to pick them up by hand, especially if a larva is an early instar and thus small. [An instar is an insect larva that is between moults. By moulting its old skin the larva can grow bigger. There are several instars during the development of a larva, typically five or six for butterfly or moth larvae.]

Using a brush requires a degree of care and manual dexterity so it is often a good idea to cut up some small pieces of string to give the pupils the opportunity to pick up and move these before they try to move live caterpillars. However, a larva often wraps its legs and prolegs around the bristles and shaft of the brush which makes a pick up easier. A cupped hand under the spoon also acts as insurance when a pupil moves a larva.

When a larva is close to the paper it can be carefully placed on the sheet at the centre. The children then need to be ready to act because some caterpillars move immediately, whilst others may take a while to move. As the larva moves away one child, armed with a pencil, can follow the tail of the caterpillar and place a small cross or dot on the paper, about every 2 - 3 cm, to show where the caterpillar was. By the time the caterpillar gets to the circumference of the circle a trail of crosses will record the route. The crosses can then be joined together by a pupil or teacher, see Figure 1, page 7.

[The child with the pencil will need to be warned not to have the pencil point too near the caterpillar as an over-enthusiastic lunge with a pencil might puncture its body and the animal would die.]

*Figure 1 Two trails of crosses have been joined to show the routes taken by two large yellow underwing caterpillars. [See appendix for photographs of a late instar larva and an adult large yellow underwing.]*



A convenient way to record the actual distance each caterpillar moved is for the pupils to place a piece of string on the track the larva followed. If they then place the string on a metre rule they can determine the length of its route from the centre until it crossed the perimeter of the circle. The straight line route is a radius of the circle and a second piece of string can be cut to represent this length. The two pieces of string will thus be a physical record of the two distances. The strings will need to be marked in some way to identify them. [An easy way is to wrap a piece of Scotch tape round one end and write a `1` on the tape to identify that this was the first larva.] This process can be repeated for each of the other caterpillars in the sample.

## Analysis

The pieces of string can be placed on a large sheet (A3 if available) of graph paper as a physical record of the distances. Alternatively, coloured paper, pencils or pens can be used. It will be clear to the children that the greater the difference between the straight line route and the actual route, the more circuitous was the caterpillar's journey. This difference in route lengths will vary between the caterpillars, which introduces children to the concept that it is important to use a large sample size in any study.

If the same piece of paper is used for all the caterpillars, then it may be evident from their tracks that they have moved in a preferred direction. If the classroom has windows along just one side of the room then there would be a difference in light intensity in the room and the caterpillars may show a response to this. Many species will move to less intensely lit areas so there may be a preference seen with caterpillars moving to the side of the room opposite to where the windows are located.

[This may not be the case for all moth caterpillars. Thus the caterpillars of the cinnabar moth (*Tyria jacobaeae*) are brightly coloured with alternating orange and black stripes and can be seen on ragwort plants during the day, often in large groups to emphasise their visibility. These caterpillars are toxic to birds, which are usually sick after eating them.]

The same sheet of paper may also reveal if there are any general patterns of movement. For example, do the caterpillars take a spiralling path as they move away from the centre of the large circle?

## Conclusions

The children should be able to draw some conclusions and place these alongside any tables, graphs or diagrams they may have drawn. These might include statements relating to whether:

- the caterpillars do/do not move in straight lines;
- caterpillars stop after covering a short distance and re-sample the environment, and then re-orientate, before carrying on moving;
- when the caterpillars re-sample the environment, they raise the front half of their bodies off the paper or not.

## *Follow-up work*

If it was possible to get samples of a different species then that would be very helpful, in order to see if similar behaviour was found in other butterfly or moth species. It might be useful to compare a diurnally active species and a nocturnally active one.

If other animals were available, such as seed beetles (see Practical 2), then the same set-up could be used to assess if there are differences in the strategies used by caterpillars and adult seed beetles. Adult seed beetles are known to be attracted to light so there would probably be a fairly strong preference shown in direction, though not necessarily in the discrepancy between the straight line route and the actual route followed. [Seed beetles adults move quickly so children would need to be ready to follow a beetle as it moves!]

A nice cross-curricular link to Geography could be made by comparing the actual route each member of the class takes when walking to school (not, of course, that too many children actually engage in this behaviour in 2008!). Instead, their car route could be compared with the straight line route. If a copy of the relevant 1:12 500 Ordnance Survey map showing the school catchment area is available (or a large scale version of the relevant A-Z map) then each individual child could obtain this information directly from the map.

## *Additional notes for teachers*

Similar work can be undertaken with other animals which might be available. Thus, woodlice can usually be found beneath a pile of stones, logs, etc. which may be found in a corner of a sports field or perhaps a purpose-built wildlife area. Similarly, pet shops or angling suppliers offer mealworms quite cheaply, these being frequently used by anglers as live bait.

Moth and butterfly caterpillars are available from several biological suppliers. Two reputable sources are:

**Blades Biological**, Cowden, Edenbridge, Kent TN8 7DX Tel: 01342 850242
Fax: 01342 850924 E-mail: info@blades-bio.co.uk Website: www.blades-bio.co.uk/

**Worldwide Butterflies**, Sherborne, Dorset DT9 4QN Tel: 01935 474608
Fax: 01935 429937 E-mail: sales@wwb.co.uk Website: www.wwb.co.uk

There are a large number of amateur lepidopterists who supply caterpillars. Teachers may also know of local people who will have several species available for sale. These animals are usually sold in the summer months so some forward planning may be needed as to the timing of such an investigation. There are also a number of local and national groups who provide livestock, such as the **Entomological Livestock Group**. The contact address for the ELG regarding livestock is: Paul Batty, 50 Burns Road, Dinnington, Sheffield S25 2LN Tel/Fax: 01909 565564 E-mail: pwbelg@clara.co.uk Website: www.pwbelg.clara.net/index.html

[Michael Dockery can provide a photocopy of an ELG newsletter containing a number of such suppliers so contact him at the Manchester address if you wish to see a list.]

## *Appendix*

*Sample data*

Measurements made by Year 3 pupils at St Monica`s R C Primary School, Flixton, Manchester using large yellow underwing (*Noctua pronuba*) caterpillars.

*Table 1 Path taken by the caterpillars and the equivalent straight line route*

| Caterpillar number | Actual distance (cm) | Straight line distance (cm) | Difference (cm) |
|---|---|---|---|
| 1 | 38.3 | 22.7 | 15.6 |
| 2 | 72.4 | 22.7 | 49.7 |
| 3 | 28.9 | 22.7 | 6.2 |
| 4 | 34.0 | 22.7 | 11.3 |
| 5 | 25.4 | 22.7 | 2.7 |
| 6 | 33.2 | 22.7 | 10.5 |

*Figure 2 Adult and late instar larva of large yellow underwing moths*

© Roy Leverton

© Michael Dockery

## *Investigation 1: - follow-up exercise*

1. An insect goes through 4 stages in its life. The stages include pupa, larva, adult and egg. Put the stages in the correct order.

..... ..... ..... .....

2. Here is a photograph of a moth caterpillar, it is called a canary-shouldered thorn. During the day the caterpillar keeps very still.



a) Can you spot the caterpillar?
Draw a circle around it.

b) Why do you think the caterpillar spends the day keeping very still?

.....

c) Why do you think the caterpillar looks like a twig?

.....

3. Here is a photo of another moth caterpillar - a garden tiger.



Children try to explain why its body is covered with hairs.

Underline which explanation you think is best.

i) Hairs make it look bigger and better for birds to eat.

ii) Birds use the caterpillar to brush their feathers.

iii) The caterpillar wants to look like a hedgehog.

iv) The caterpillar is going to a fancy dress party.

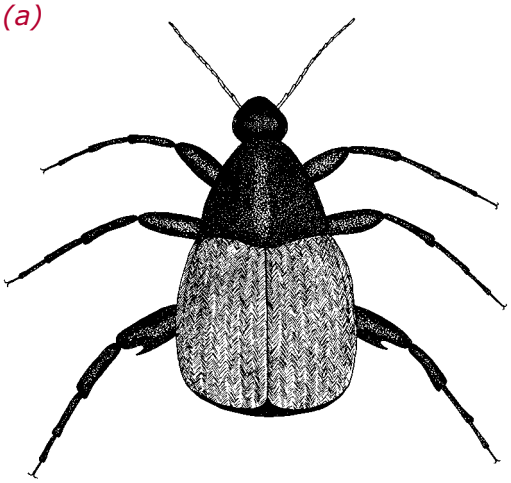
v) Hairs warn birds that it would not be easy or nice to eat.

# 2. How do seed beetles move in response to light? - Years 5 and 6

In this investigation, the key question is **`do adult seed beetles move towards or away from the main source of light in a room?`** See Figure 1 for illustrations of the animals. [The species that are provided by myself, or by any other supplier, are *Callosobruchus maculatus*.] Just as in investigation 1, these animals will have freedom of movement in an open area. The children will be observing where the animals move in a `normal` classroom in which the light intensity varies, the light sources being the windows and strip lighting in the ceiling. In the wild, the insects are found in a field of beans or peas, or perhaps as `pests` in a seed store.

*Figure 1 Male (a) and Female (b) seed beetles*

*(a)*



*(b)*

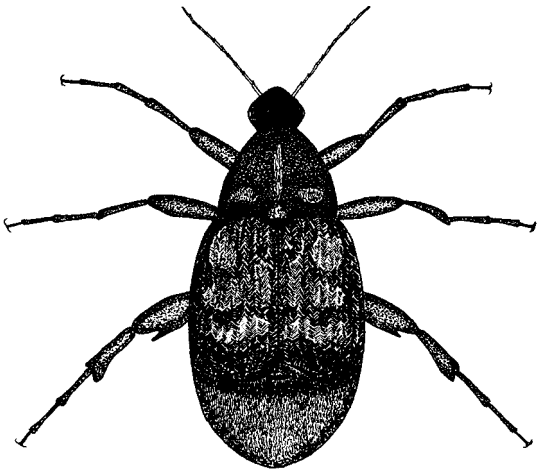


*Figure 2 Jar with beetles, beans and muslin cover*



Seed beetles are not native to Britain, they are found in tropical and sub-tropical areas: see the fact sheet in the Appendix. When adults, the male and female seed beetles spend their lives seeking mating opportunities and, for females only, looking for suitable sites where they can lay their eggs. The natural egg-laying sites in a field crop are the seeds and since these are found at the top of the plant it might be expected that the beetles would seek out the upper parts of the plants, since this is where the light intensity (sunlight) will be highest. Beetles, therefore tend to show a movement to well-lit rather than shaded areas. This investigation is likely to confirm this.

## Previous knowledge

It would be helpful for the children to:

- be able to distinguish female and male beetles (see Figure 1);
- be aware that although the beetles can fly (their wings may sometimes be evident just beneath their wing cases) they rarely do, they invariably walk; [That being said, one or two beetles from a large jar may well take to flight but can quite easily be re-captured.]
- be aware that the beetles often walk quite quickly across a sheet of paper;
- be aware that the beetles may not move intitially when they are placed on a sheet of paper: this is an anti-predator strategy - a beetle sometimes lies `doggo` to suggest to a predator that it is dead;
- be familiar with the eight points of the compass.

## Background information

For teacher colleagues, details about the beetle can be found on the information sheet in the Appendix. For this investigation the children could be reminded, that animals they may be familiar with, such as woodlice, are often found under stones, a log pile, etc. as the animals seek out dark, damp places. This practical will check whether seed beetles do the same and move towards darker areas of the room.

Since female seed beetles must lay their eggs on the surface of a bean in order for their offspring to hatch, they must go towards the top of the plant to find the seeds. Both males and females mate several times and so it must also be in the interest of males to move towards the tops of the bean plants to seek females and mate with them. After all, males are only seeking mating opportunities during their brief lives, since both sexes neither eat nor drink as adults! So beetles of both sexes need to know where the top of a plant is. The best indicators of where the `top` of a plant is are likely to be gravity and/or light intensity. Both stimuli are reliable in the wild and both could be used. This investigation considers just light intensity.

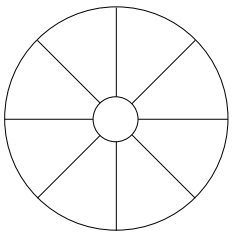
In a typical primary school classroom there will be windows on at least one side of the room and this is assumed to be the case here. However, it is likely that the room may have more than one set of windows. With just one set of windows in the room it is likely that a preference will be seen but this will probably be less clear if there are more than one set of windows. So if we give beetles the opportunity to move across a horizontal surface we can test to see if they show a preference and move towards areas of higher light intensity (i.e. towards the side of the room with the windows). This practical tests this possibility: **`do adult seed beetles move towards or away from the main source of light in a room?`** In this case the main source of light is likely to be the sunlight through the windows, depending on the time of the year when the study is carried out.

## Apparatus

The following items, per group, are needed:

- a sheet of A4 paper with the two concentric circles marked (see Figure 3);
- a small artist`s brush;
- two Petri dishes, or similar clear plastic containers;
- a number of seed beetles* (around 12 - 20 will be fine, so for a list of suppliers see page 25);
- a recording sheet - the one provided at the end of this investigation can be used.

*Figure 3 Two concentric circles, with lines indicating the 8 compass points.*



* It is likely that the seed beetles and beans will be kept in a glass jar, or a similar container, see Figure 2. Undoubtedly the easiest way to get a number of beetles out of the jar is to use the cardboard core of a roll of kitchen tissue. The beetles show a marked propensity to climb and so if the roll is placed on the surface of the beans at the bottom of the jar several beetles will quickly walk onto the tube. After a few seconds the roll can be withdrawn and the beetles gently brushed off the cardboard roll into one of the two Petri dishes. Put the lid on quickly as the beetles are highly mobile!

## What to do

The sheet of A4 paper, with the two concentric circles marked on it, needs to be placed on a level surface, such as a table. [A small piece of Blu-Tack under each corner may be helpful in anchoring the paper to the table.] The 8 radiating lines on the paper can then be labelled N, NE, E, SE, S, SW, W and NW. It is important that the piece of paper that each group is using is placed on the tables so that they all face in the same direction. [This is only crucial if there are a number of groups doing this investigation concurrently and you want to compare the results from each group.] This is easiest to organise if each group place one of the lengths of the A4 sheet so that it is parallel to one wall in the room. This can be identified as North (N) and then the other lines as NE, E, SE, S, SW, W and NW. [It is not necessary to have N actually pointing to geographic north, though you may wish to do so. The eight compass points are simply used for convenience when the children describe their findings.]

Then 10 or 12 seed beetles need to be collected from the population of beetles in the jar and put into one of the Petri dishes. The beetles should then be given 2 or 3 minutes to settle into their new environment. Then one child in the group needs to collect the first beetle from the Petri dish using the brush and transfer it carefully to the small concentric circle in the centre of the paper. (A cupped hand under the brush would be helpful when transporting the insect in case it falls off as it is being moved). After a few seconds, the beetle will start to walk away and the children then record between which two compass points the beetle crosses the circumference of the outer circle, say N - NW. [Sometimes, the children will find that a beetle appears to walk along one of the radiating lines as it leaves the second circle and they will be unsure of how to record this. In fact, this is an important point and it is worth making a decision about this before the study begins. What is needed is an operational definition of how to record this event. This could be as follows: record where the beetle`s left antenna crossed the circumference; or its right hindleg, or whatever. Such a decision allows all data to be recorded unequivocally.] After this first beetle has completed its walk, place it in the second Petri dish so that it is not used again.

Then the second seed beetle can be introduced and the process repeated. If this is a one-off activity then 12 - 20 will be enough but if several groups, say 6, are doing this at the same time then each group could use 4 beetles and the results could be pooled. The children will be able to identify the two sexes and so it might be useful for each group to use 2 females and 2 males so it would also be possible to see if the two sexes behave differently.

## *Analysis*

To collate the results, the check sheet in the Appendix can be used. The results should suggest that a bar chart would be an appropriate way to represent the findings. This invariably indicates that the majority of seed beetles do indeed move towards the strongest light source. The strength of the preference depends on the amount of competing light so if there are windows along two sides of the room the direction of choice is usually less clear.

## *Conclusions*

The children should be able to draw some conclusion (s) about their work, using their own bar chart or that derived from the group data.

## *Follow-up work*

This movement to well-lit areas is quite strong in seed beetles and it might be possible to create a situation to test this response further. The children could place the paper on a board, say a piece of hardboard, and place a wooden block (or an equivalent) under one side of the board which will now become an inclined plane. If the block is placed so that the beetles have to walk downhill to move towards the strongest light source in the room you can compare the influence of light and gravity.

If wood lice are available then a comparable study could be undertaken. Since woodlice seek out dark places they would be expected to move away from the main light source.

It is possible that the direction the seed beetles are facing when they are placed on the sheet of paper might influence the direction of their movement. This would be fairly easy to investigate by putting half the beetles facing the main light source and half facing away from the main light source. The numbers of seed beetles moving in each direction could then be compared.

## *Additional notes for teachers*

The movement to the strongest light source is a fairly predictable behaviour but it works best if the contrast is as great as possible. So carrying out this study on a bright sunny day might be useful.

It is noticeable that the insects respond to vibration so it is important to tell the pupils not to bang the table when the study is being carried out. This may knock the animals onto the floor and it may not be easy to spot them.

There is a chemical (called Fluon, and available from suppliers such as Blades Biological) which can be safely used in schools. It can be painted on the glass jar and provides a smooth surface which the beetles cannot easily cross. Apply the Fluon, with a brush or piece of sponge, **before the animals and beans are put in the jar**. The chemical will prevent the beetles reaching the top of the jar so they won't escape when the cover is removed.

## *Suppliers*

**Blades Biological**, Cowden, Edenbridge, Kent TN8 7DX  Tel: 01342 850242
Fax: 01342 850924  E-mail: info@blades-bio.co.uk  Website: www.blades-bio.co.uk/

**Michael Dockery**, the ASAB Education Officer, can also provide egg-laden beans to teachers. When the adult beetles emerge, teachers will be able to establish their own populations quite easily by putting adults onto new beans in a clean jar. (See page 6 for contact details.)

## *Appendix*

## *1. Background information on the seed beetle* Callosobruchus maculatus.

a) The seed beetle is a pest of stored legumes i.e. peas, beans, etc., as it causes weight loss, a reduction in the quality of the seed and also affects its germination. The legumes that have been most extensively used in research are mung beans (*Vigna radiata*), black-eyed beans (*V. unguiculata*) and azuki beans (*V. angularis*) and colonies in schools can be established using any of these.

b) The seed beetles colonise beans both in the field and in storage, in silos.

c) The females stick eggs singly to the surface of the host bean. The eggs hatch 5-6 days later (at 28º-30°C) and the first instar larva burrows into the bean directly below the egg and begins to feed. One study gives the following developmental data:

| | |
|---|---|
| oviposition (egg–laying) | egg |
| 6 days after the start of oviposition | first instar |
| 9 days after the start of oviposition | second instar |
| 12 days after the start of oviposition | third instar |
| 16 days after the start of oviposition | fourth instar |
| 18 days after the start of oviposition | pupa |
| 25 days (approx) after the start of oviposition | the adult beetle emerges |
| 10-12 days after emergence | death of the adult. |

So the beetles have a generation time of 4-5 weeks.

d) The larva passes through four instars within the bean. During the fourth instar the cell containing the larva is enlarged so that it is next to the outer skin of the bean (testa). The larva may then be seen through a translucent window. To emerge, the adult chews a hole through the testa. Occasionally the cell is not adjacent to the testa and the adult then can`t emerge and dies.

e) When the adult beetles emerge, they are extremely well-adapted to the storage conditions since they require neither food nor water to reproduce. The adults will copulate very soon after emergence and copulation may recur during an adult`s life.

f) The females will usually begin egg-laying, after mating, on the day of emergence. Females lay fewer eggs if too few beans are offered and fecundity also drops if there is adult crowding.

g) Before laying eggs females `inspect` a bean. They prefer to lay on egg-free beans rather than egg-laden beans and have been shown to be able to distinguish beans bearing different numbers of eggs. This does not imply that they can count but that females can detect, by touch, that eggs have already been laid on the surface of the bean and perhaps detect a marker pheromone (chemical) left by a previous female.

h) Seed beetles have the status of pests in tropical and sub-tropical countries but this is not a problem in UK as the beetles would not survive a winter if they escaped! However, it behoves a responsible teacher to ensure that they are contained within the classroom. Dead beetles and used beans should be disposed of in appropriate ways.

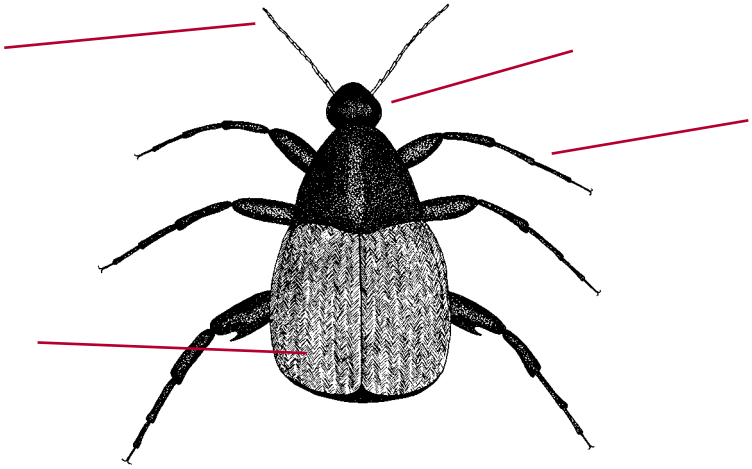
## *2. Check sheet for recording data*

| Trial | N - NE | NE - E | E - SE | SE - S | S - SW | SW - W | W - NW | NW - N |
|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |
| 10 | | | | | | | | |
| 11 | | | | | | | | |
| 12 | | | | | | | | |
| 13 | | | | | | | | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |
| 16 | | | | | | | | |
| 17 | | | | | | | | |
| 18 | | | | | | | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |
| 21 | | | | | | | | |
| 22 | | | | | | | | |
| 23 | | | | | | | | |
| 24 | | | | | | | | |
| 25 | | | | | | | | |
| 26 | | | | | | | | |
| 27 | | | | | | | | |
| 28 | | | | | | | | |
| 29 | | | | | | | | |
| 30 | | | | | | | | |
| Total | | | | | | | | |

## *Investigation 2: - follow-up exercise*

1. Here is a drawing of a male seed beetle. Using the four body parts below, identify which parts of the insect are shown in the drawing. Write the correct word by each line.

**antenna, leg, head, wing case.**



2. The wings of a seed beetle are underneath the wing cases. Children give five reasons why the wings are kept hidden. Underline which reason you think is best in explaining why their wings are hidden.

a) The beetles might be embarrassed by showing their wings;
b) the beetle may be blown away if it is windy;
c) they don`t use their wings at night;
d) their wings are delicate and might be damaged if they are not protected;
e) they only show their wings when the sun shines.

3. i ) Suppose scientists wanted to find out how quickly seed beetles can walk. Describe how they might do this. In your description write down what equipment the scientists would use, how many beetles they would need and how they would measure how fast the insects move.

.....

.....

.....

ii) Write down **one** reason why seed beetles might walk quickly.

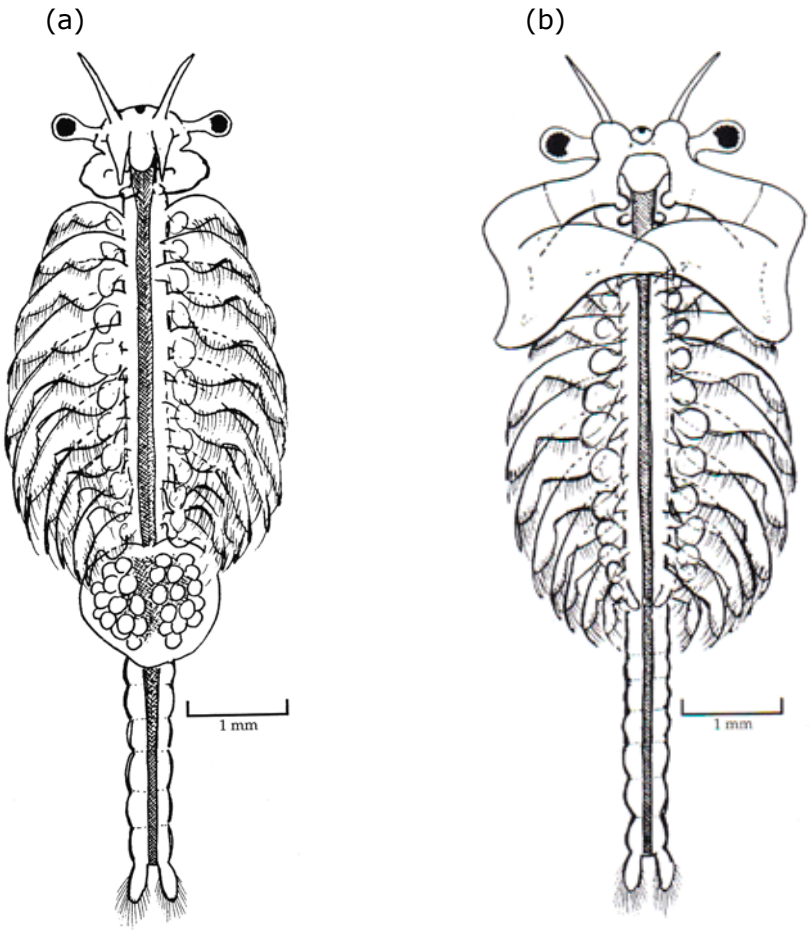
.....

# 3. Are brine shrimps top, middle or bottom dwellers? - Years 5 and 6

In the sea, some fish spend most of their time near the bottom (such as plaice and skate), others in the middle (such as cod and mackerel) and some close to the surface (such as flying fish and coral reef fishes like wrasse). If we offer brine shrimps the chance to swim in a vertical column of saltwater where do they spend most time? In this investigation the children can answer the question **`do brine shrimps spend more time in the top, middle or bottom part of a column of saltwater?`**

Brine shrimps (see Figure 1) are very suitable organisms for this investigation since they are easy to rear and maintain in a tank in a primary school classroom (a south-facing window sill is best) and there will be plenty of animals available, especially in the summer months. Since they are always on the move (in order to maintain key life processes) they will always be providing the opportunity for children to observe them and record their behaviour. In addition, they can be easily moved from their tank to a container of pure saltwater (i.e. without their algal food) and will swim around, with no obvious signs of stress, for the course of a typical 45 - 60 minute lesson.

*Figure 1 Female (a) and male (b) brine shrimps*



## *Previous knowledge*

It would be helpful for the children to:

- be able to distinguish between female and male brine shrimps (see Figure 1);
- be aware that brine shrimps are always moving in order to maintain vital life processes;
- be aware that, in a tank, algae are found both in suspension in the water and also on the substrate of the tank and on the sides; (It is quite clear when they are feeding on the substrate as the shrimps flip over and graze directly on the algae on the tank substrate.)
- be aware that brine shrimps do not swim around in groups but swim independently around the tank.
  [However, the children will often see a male and a female clasped together and swimming around. These two animals are not actually mating. This is called mate guarding and is an important part of their courtship behaviour.]

## *Background information*

There is a basic set of background notes on the animal in the Appendix (see page 34). Hopefully, the children will have seen the shrimps swimming in the tank in the classroom and feeding on the bottom or sides of the tank. These observations can provide the focus for this observational study, which will offer the shrimps the chance to swim in a narrow, vertical container, a different shape to the usual aquarium tank.

The children will give the shrimps the opportunity to swim in pure saltwater with no algal food and will record where the shrimps swim. The shrimps will be confined to a graduated cylinder (measuring cylinder) and their position in the vertical column of water will be tracked. This investigation will answer this question: **`Do brine shrimps spend more time in the top, middle or bottom part of a column of saltwater?`**

## Apparatus

The following items, per group, are needed:

- a 100 ml graduated cylinder;
- three small elastic bands;
- a number of brine shrimps, 2 or 3 are fine; [It is best if the same sex are used. This will prevent female-male couplings and so the 2 or 3 shrimps will swim more or less independently in the column of water - they will occasionally bump into each other but they come to no apparent harm.]
- a stop watch/clock;
- 90 ml of saltwater;

  [Saltwater can be made up quite easily and is 30-35g of salt per litre of water, see the information sheet on page 34.]
- a plastic pipette, with the end cut off to allow a shrimp to be safely sucked up into the pipette without harming it;
- a 50 (or 100) ml beaker;
- a recording sheet - the one provided in the Appendix (page 35) can be used.

## What to do

The graduated cylinder should be filled with saltwater to the 90 ml mark. This allows the children to see that the vertical column of saltwater can be divided into three equal parts: 0 - 30 ml (the `bottom` third), 30 - 60 ml (the `middle` third) and 60 - 90 ml (the `top` third). The three elastic bands can be placed around the outside of the graduated cylinder (at the 30 ml, 60 ml and 90 ml marks – the band at 90 ml is optional) to give the children an easily observable means of separating the three parts of the column of water. [Sometimes a sheet of paper placed behind the cylinder helps pupils to see the shrimps more easily.]

Two or three brine shrimps then need to be sucked up, one at a time, into the plastic pipette from the host tank and transferred to the 50 ml beaker. The shrimps can then be introduced into the graduated cylinder, using the pipette. Just where the shrimps are placed in the graduated cylinder is a key point as it could influence the position of the animals in the column of water. It might be thought that they should be introduced into the column at the 45 ml level but the children will find that their pipette is too short to allow this to be achieved. When the fingers of a 9 - 11 year old child are around the bulb of a pipette they effectively limit the depth of introduction to about 10 cm below the lip of the cylinder, which should introduce the shrimps into the `middle` third: this will be fine. The shrimps are highly mobile and they soon move around the column. Once in the cylinder, the animals should be given 2 - 3 minutes to settle in to their new environment before recording begins.

When the settling-in period is over, the children can begin to record where the shrimps are. The most straightforward type of sample is one in which the children record how many shrimps are in each third of the column every 15 or 30 seconds. If the children record for 10 or 15 minutes this will provide sufficient data if 2 or 3 shrimps have been used. The children might again need an operational definition (see page 23) for recording the position of a shrimp in the column: the location of an individual`s head perhaps. After the study is completed the brine shrimps should be returned to their home tank, as they may have been without food for up to 30 minutes.

## *Analysis*

The results the children collect should enable them to suggest that a bar chart would be a suitable way to represent their findings. Alternatively, a pie chart might be thought to be an appropriate way to do this. The usual finding is for shrimps to show a preference for the `bottom` third of a graduated cylinder.

## *Conclusions*

The pupils should be able to make statements based on their findings, or those of a number of groups if the study has been replicated.

## *Follow-up work*

One of the most obvious follow-up studies is to compare the behaviour of the two sexes. If groups have used same-sex animals then differences in behaviour may be readily apparent. A mixed group may be tried, with 2 females and 2 males in the graduated cylinder.

Most children will recognise that a column of saltwater will not have any food for the shrimps and so they may not be behaving as they would if substrate was in the column of water. So a cylinder with substrate from the host tank could be used to collect further data. [Half a level teaspoon of substrate from the tank will provide enough food for the animals: of course, if two cylinders are available the two groups could be compared side by side.]

In the classroom aquarium tank there will be many immature shrimps and so a sample of 2 or 3 immature shrimps could be used and compared with the adult shrimps. Sexing the brine shrimps is not easy before they have reached maturity but mate seeking behaviour is not evident before maturity and would probably not influence where the immature shrimps swim.

## *Additional notes for teachers*

It would be possible for the children to collect water fleas (*Daphnia pulex*) from a local pond and these might be used for comparison. *Daphnia* show diurnal movement in a pond, moving upwards to the surface early in the day and returning to lower depths in the evening. This daily movement is not evident in brine shrimps.

Brine shrimps eggs can be sprinkled onto saltwater and will hatch 24 - 48 hours later in warmish water, (viz. 20 - 25°C). The eggs are readily available in pet shops. Adult shrimps can be bought too, as they are fed to fish as live bait!

Reputable suppliers of brine shrimp eggs are:

**Blades Biological**
Cowden
Edenbridge
Kent
TN8 7DX
Tel: 01342 850242
E-mail: info@blades-bio.co.uk
Website: www.blades-bio.co.uk/

**Timstar Laboratory Suppliers Ltd.**
Timstar House
Marshfield Bank
Crewe
Cheshire
CW2 8UY
Tel: 01270 250459
Sales@timstar.co.uk
www.timstar.co.uk

## *Support service*

The Science laboratory of the Faculty of Education, Cambridge University may be able to offer advice on rearing and maintaining brine shrimp cultures. The contact person is: The Science Technician, Faculty of Education, Homerton College, Hills Road, Cambridge CB2 2PQ. Tel: 01223 507172.

The British Ecological Society maintains brine shrimp details on their website, which is – HTTP://www.BritishEcologicalSociety.org

The ASAB Education Officer, Dr. Michael Dockery, will happily try to provide advice on rearing and maintaining brine shrimp cultures. His contact details are on page 6.

## *Appendix*

1. Background information on brine shrimps *Artemia franciscana.*

Brine shrimps are invertebrates with jointed legs, so are Crustacea. Their name tells us their natural habitats are salt lakes and brine ponds around the world, in tropical and sub-tropical areas. These habitats are very harsh as temperatures are often high and the salt content of the water can be over 30-35 g per litre. This means that only a few algae and bacteria can survive in these lakes, which can even dry up completely in the hottest months. As a consequence, fish predators are often absent so concentrations of algae and shrimps are very high. The brine shrimps do have predators, however, chiefly large birds such as flamingos.

A study of the water in a salt lake (and your classroom tank if you have established a brine shrimp culture), will reveal small brown particles, about the size of pepper grains. These are the inactive dry egg cysts of *Artemia franciscana* which accumulate in millions in a salt lake. These egg cysts are collected and sold to pet shops and aquarists as fish food. [See the list of suppliers to buy brine shrimp egg cysts on page 33.]

As long as they stay dry the egg cysts can remain viable for years. When placed in saltwater, or after a period of steady rainfall in the wild, they hatch and a small shrimp embryo (called a nauplius) emerges and starts swimming around. Over the coming days, the nauplius grows and goes through several moults. Over the time to reach maturity, about 2.5 to 3 weeks, it will be apparent that the shrimps swim on their backs using their legs, which also serve as gills and food filters, their food being algal particles. By the time they have reached sexual maturity the male and female shrimps are fairly easy to tell apart, see page 29. Males are translucent and have two large claspers by their head. The claspers are used during courtship when a male grabs a female and the pair swim around together for several hours before mating. Females are reddish-brown in colour and have an obvious egg-sac just over halfway down their body. Both adult male and female brine shrimps are 8 - 10 mm long and can live for several weeks in the absence of predators.

Usually, the first generation of eggs develop quickly into nauplii when they are released by the female but the second generation do not hatch immediately. These form the brown egg masses that accumulate at the sides of a lake, or a tank, and remain in a dormant state until stimulated to grow, by rainfall for example. For the best growth rates, the water should be around 25° C with the salinity around 3.0 - 3.5 % salt.

## 2. Check sheet for recording data

| Time (min and sec) | Upper third | Middle third | Lower third |
|---|---|---|---|
| 0 15 | | | |
| 0 30 | | | |
| 0 45 | | | |
| 1 00 | | | |
| 1 15 | | | |
| 1 30 | | | |
| 1 45 | | | |
| 2 00 | | | |
| 2 15 | | | |
| 2 30 | | | |
| 2 45 | | | |
| 3 00 | | | |
| 3 15 | | | |
| 3 30 | | | |
| 3 45 | | | |
| 4 00 | | | |
| 4 15 | | | |
| 4 30 | | | |
| 4 45 | | | |
| 5 00 | | | |

| Pupil group | Total - upper third | Total - middle third | Total - lower third |
|---|---|---|---|
| A | | | |
| B | | | |
| C | | | |
| D | | | |
| E | | | |
| F | | | |
| G | | | |
| H | | | |
| I | | | |
| J | | | |
| K | | | |
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| M | | | |
| N | | | |
| O | | | |
| P | | | |
| Q | | | |
| R | | | |
| S | | | |
| T | | | |
| | | | |

# Investigation 3: - follow-up exercise

1. Eagles will sometimes catch and eat flamingos. Algae are plants and are eaten by brine shrimps. Flamingos eat brine shrimps. Put these four living things into a food chain.

..... → ..... → ..... → .....

2. Five children answer the question, "Where do brine shrimps get their energy from?". Which child do you think has given the best answer?

David - "They get energy from eating flamingos".

Emma - "They get energy from eating the feathers of eagles".

Danielle - "They get energy from eating algae".

Salim - "They get energy from eating very small brine shrimps".

Paul - "They get energy from drinking saltwater".

..... has given the best answer.

3. Children notice that when brine shrimps are swimming in the tank in their classroom they always swim around on their backs. (Sometimes they turn over if they are feeding.) The children notice that the light falling on the tank comes from lights in the ceiling and they wonder if the shrimps might turn over and swim on their fronts if they could make the light come from under the tank. Describe an investigation they could carry out in their classroom to check this.

.....

.....

.....

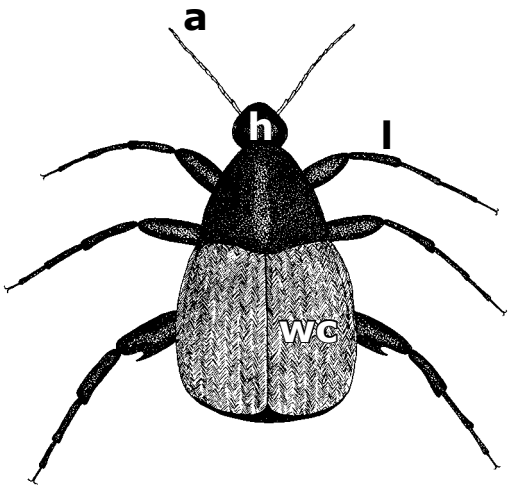
.....

.....

# `Suggested` answers

*(All `suggested` answers are written for teachers)*

## Follow-up work




### *Moth or butterfly larvae*

1. egg, larva, pupa, adult
2. a) see pupil response

b) to reduce the chance of a bird, or other predator, noticing it

c) to be more likely to deceive a predator by the accuracy of its camouflage – the caterpillar`s appearance matches extremely closely the twigs on the tree it is resting on and since birds don't eat twigs they leave them alone.

3. v)

### *Seed beetles*

1. [see drawing – a is an antenna, wc is a wing case, h is the head and l is a leg]
2. d)
3. i) put a beetle in a plastic tube, place the tube over a piece of graph paper (with 1 cm or 1 mm squares) and determine how long it takes for a beetle to walk, say, 10 cm – repeat with n beetles and find the mean speed (or simply time) for a number of beetles (or male and female beetles separately) to move 10 cm

ii) if the beetle is a male, it could be going up a stem to search for females to mate with – if it is a female it could be going up a stem to look for a site to lay her eggs – for male or female beetles they could be moving up the stem to escape predatory attack

### *Brine shrimps*

1. algae > brine shrimps > flamingo > eagle
2. Danielle
3. put the tank on a table and record how many free swimming shrimps (i.e. shrimps not feeding on the substrate or sides of the tank) are swimming on their backs – this should be all of them. Then put the tank on an OHP and record the same behaviour – this should be none of them: brine shrimps have an eye in the centre of their head which orients them to face the strongest light source - in the wild this is sunlight and so they are always swimming on their backs, except when feeding. [If you put a piece of black card underneath and halfway across the tank when it is on the OHP, the shrimps will be seen to flip over as they cross from one side of the tank to the other!]

# `Suggested` answers

## Worksheets

### *Worksheet A. Feet and Legs - 1 (Years 3 & 4)*

1. A - mallard; B - eagle; C - wagtail
2. i) the eagle`s foot enables it to: kill prey, grip branches if it lands on a branch, pick up prey or carrion and take it to a safe area to eat, scratch or groom itself
ii) the duck`s foot enables it to: propel its body through the water efficiently as the foot has a large area, spread its mass over a large area which prevents it from sinking into soft mud, groom its feathers or scratch itself
3. its claws lock on to the branch - the claws can find small crevices on the branch to get a good grip even if the bird can`t get its foot around the whole branch
4. c)
5. A - hippopotamus; B - gazelle
6. the hippo needs short stout legs to carry its great bulk - its muscular legs give it sufficient drive off the bottom of a lake or river to help it move underwater
7. its legs
8. leap - spring - hop

CHALLENGE
They could capture a number of frogs, release them one at a time from a known position and then measure the length of the first hop they make - could gently stimulate `wild` frogs into leaping and measure how far they jump and find the mean

### *Worksheet B. Feet and Legs - 2 (Years 3 & 4)*

1. i) bird (accept predator and carnivore)
ii) it has a beak - it has feathers - (accept - it has two legs)
iii) would be useful to wade out further into water to catch more fish – they allow the heron to catch prey from water as well as the land
iv) fly - walk - stalk (accept, slowly, gracefully)
v) if it moved it would produce a moving `shadow` which would alert the fish to the presence of a predator - so that fish don`t notice that they are the `legs` of a predator which normally move through the water and should therefore be avoided
2. i) they need to run to gain enough speed to allow them to take off and fly - they cannot provide enough thrust from their feet to raise their mass from the water
ii) the swan - it has greater mass and needs to run further to reach its take-off speed
3. i) walk - they slide down ice covered, or grassy, surfaces if they are on a slope
ii) they swim, powered by their wings

# `Suggested` answers

## *Worksheet C. Feet (Years 3 & 4)*

1. i) it has two large hindlegs and small forelegs, like a kangaroo - it looks like a kangaroo - it jumps (moves) like a kangaroo
ii) d) leaps
iii) they will help it to dig a burrow efficiently as they are powerful tools with a big surface area - they could dig the burrow quickly so the kangaroo rat is soon able to shelter
iv) they thrust sand at the snake to deter it from attacking them - the feet and claws could strike a snake and injure it
2. Big Foot - mythical creature - larger than a large man - generally described as hairy and living in cold, or mountain, areas of N America
3. i) a chimp has a digit (toe) that is opposable ii) a chimp has a broader heel iii) the chimp foot is hairier iv) the chimp foot is longer with longer toes
4. i) - v) [see pupil`s answers]

## *Worksheet D. Wings of insects (Years 3 & 4)*

1. i) because its tail allows it to move in a series of jumps or springs
ii) ground predators would probably be unable to jump up and catch it - it makes its return to the ground unpredictable for predators and reduces the chance of being caught and eaten
iii) kangeroo - kangeroo rat - wallaby - frog - gerboa - indris - sandhopper - grasshopper - cricket - flea - birds
2. i) four wings
ii) six legs
iii) females have spots on all four wings, males a small spot on each hind wing
iv) to drink nectar - to look for a mate - to rest – to warm up in the sun
3. i) [see pupil`s response]
ii) because the yellow colour of their wings is similar to the colour of butter
4. i) it has 6 legs – it looks like other insects, such as wasps and hoverflies – its body is in 3 parts
ii) 4 wings
iii) veins
5. i) to fly and remain more or less in the same place
ii) it gets its energy from the nectar - nectar is essentially sugar which provides the energy the hoverfly needs for hovering flight

## *Worksheet E: Wings of birds - 1 (Years 3 & 4)*

1. i) it is streamlined - it has scythe-like wings which both cut through the air and allow the bird to glide, long tail gives it lift
ii) to rest - to feed and drink water - to shelter from storms and heavy rain – to prevent strong winds from carrying them to areas away from their normal routes - they don't migrate at night
iii) [see pupil`s response]
iv) 11 100 km (± 500 km)
v) to avoid flying over the sea in case bad weather forces them down
vi) Sahara Desert - it is so vast - there are few natural stopping points, like oases, where the birds can feed and drink - sand storms may force the birds down - the weather makes the journey physiologically demanding for the birds

CHALLENGE – vii) 300 km per hour (some books give lower speeds, some higher)
viii) stoop

# `Suggested` answers

## *Worksheet F: Wings of birds - 2 (Years 3 & 4)*

1. i) they have powerful muscles for flying - they have a large surface area for gliding and soaring
ii) c) gliding saves energy
iii) hollow bones means the mass of a bird is reduced which makes flying easier – though hollow, the bones are still rigid to give support to muscles, organs, etc.
iv) a) white wings: most swans – egrets – some doves
b) black wings: rook - raven - crow - blackbird - coot - moorhen - swift - chough
c) black and white wings: gannet - oystercatcher - avocet - eider - goldeneye - some gulls
2. i) winters are less harsh - food is more readily available - they find an assured food supply in some locations (Wildlife and Wetlands Trust sites or RSPB reserves) –
ii) to feed in order to supply fuel for the second leg of the journey - to rest or take shelter if the weather is poor
iii) 20 hours
iv) to get information on a large sample of birds – so the birds will be representative of the population of barnacle geese
v) to allow the scientists to identify and monitor each individual bird - to allow the age and sex of birds to be determined
v) they can find out where birds spend their winters and summers - they can check on the survival rates of birds in each year group - they can determine from these data how long the geese live

## *Worksheet A: Aquatic animals - 1 (Years 5 & 6)*

1. i) they use their pair of enlarged antennae for movement
ii) e)
iii) algae > water fleas > mallard ducks
2. i) their many pairs of legs
ii) eleven pairs
iii) a) 21 seconds b) mean = 9 seconds c) they could use more shrimps - they could use male shrimps as well as female shrimps
3. i) tadpoles
ii) tail
iii) to escape from predators - to search for food - to move to a warmer/cooler part of the pond
iv) it would be a handicap to movement on land - it would be a physiological drain on the frog and it would no longer be a vital organ - it could be grabbed by predators and increase a frog`s risk of predation
v) they leap/jump/hop
vi) their hindlegs

## *Worksheet B: Aquatic animals - 2 (Years 5 & 6)*

1. i) [see pupil`s response]
ii) its tail
iii) its fins
iv) it is torpedo-like and cuts through the water easily
2. i) it has a muscular and powerful tail - it has a streamlined shape
ii) they swim fast as they approach the falls and then rely on a powerful push from their tail to give them the impetus to leap out of the water and clear the falls
iii) fishermen try to net/catch them - the river may be dammed - the river may be polluted – predators might catch them
iv) the salmon leaps out of the water and can be caught - the salmon may try several times to clear the falls and so may get fatigued and be easier to catch - the salmon will leap only at certain points in the river and bears know where to concentrate their effort

# `Suggested` answers

## *Worksheet C: Insects - 1 (Years 5 & 6)*

1. i) have veins - shape is similar - made of the same material
ii) flies only have one pair, butterflies two - butterflies have wings covered in scales - flies have transparent wings
2. i) it has seven spots on its wing cases
ii) they protect the wings from damage as the insect moves around a plant - they protect the soft body of the ladybird
iii) easier for their larvae to find food quickly - the larvae would have to find suitable plants, i.e. ones with aphids, if the eggs were laid on the ground – the larvae could be eaten by ground predators
3.
i) cockchafer
ii) tiger
iii) rove
iv) stag
v) 7-spot ladybird
vi) burying beetle
vii) they bury the body by digging a hole under the mouse and letting the body fall into it, hence their common name of a sexton beetle:

**some facts about the beetles:**
they feed and reproduce on dead bodies of animals – burying beetle parents provide care for their young, feeding them bits of carrion like birds feed their young – the larvae beg for food from their parents by tickling their mouthparts with their legs – the larvae can increase their mass 1000 fold in just 6 days after hatching!

## *Worksheet D: Insects - 2 (Years 5 & 6)*

1. the hooks on its feet let the fly exploit cracks or irregularities in the ceiling and support its body
2. similarities – 6 legs, body in 3 parts, capable of flight
differences – fly has 2 wings, the moth 4 wings; moth bodies and wings are covered in scales flies have no scales; flies have plain and transparent wings, moths have coloured wings
3. i) 7 moths
ii) 45 %
iii) F should be in the smallest sector and W and C in the other two sectors
iv) the area of the walls must be greater than that of the ceiling and so the moths have preferentially chosen the ceiling as a landing site, in terms of the potential landing area
4. i) the female is on the left
ii) so that a predator would not eat all her eggs if it found them – to avoid the chance that damage to an area of bark would destroy all her eggs
iii) they move up the trunk into the branches and eat oak leaves

## *Worksheet E: Birds - 1 (Years 5 & 6)*

1. i) near to the edge because the water is shallower and more plants and seeds will be available to them there - away from the edge to reduce possible attack by predators, especially when feeding
ii) around half its body length - from its beak to the middle of its body
iii) it can find food over a much greater area/volume - it can select prey which might be found in different depths/levels in a pond/lake
iv) if one type of food becomes scarce it can feed on others - it can fly to another pond and find food relatively easily
v) *adv* - can spot prey from some distance away - can plunge deeper to exploit fish swimming at greater depth below the surface
*disadv* - might lose out to other birds since it plunges into the water from several metres in the air - in fog/mist its ability to detect fish is restricted
vi) *adv* - can spot prey from some distance away - it doesn`t attack until it sees a fish so energy is saved
*disadv* - can only exploit fish that are at, or just beneath, the surface - its attack success rate may not be too high as it can`t pursue the fish that take avoidance action
2. i) to give them sufficient thrust to power a dive several metres below the water surface - the feet at the rear help the birds to steer their body underwater
ii) it would be a major handicap when swimming underwater, as it would act like a brake and make them less manouvreable - it would slow them down under the water

# `Suggested` answers

iii) to upend themselves in the water - so that their feet stay on/ at the surface and prevent them from going under - to enable them to take-off vertically from the water surface
iv) it would not get submerged when the bird upends as it would stay above the water surface

## *Worksheet F: Birds – 2 (Years 5 & 6)*

1. i) wren, great tit, carrion crow
ii) chaffinch, raven, oystercatcher, all swans, geese, ducks and wading birds
iii) see pupil`s response (the tracks of the bird should be parallel with the right foot opposite to the left)
iv) it helps the bird to grasp the branch well and keep it stable
v) it can get a better grip on the trunk - the arrangement of the toes helps it to move both up and down the trunk
vi) it was moving to the right - the toes of the foot point forwards so the bird was moving from left to right
vii) it is webbed - ducks, geese and swans have webbed feet
viii) it gives them good thrust when they move (swim, dive or take off) - it does not let the birds sink into wet mud too far as it spreads the mass of the bird over a greater area
2. i) 60 steps
ii) 6 steps
iii) three times
iv) the prey may have dug down too deeply for the bird - the bird may not have assessed the correct position of the prey - the number of prey vary across the beach
3. i) pink/red/orange
ii) it puts its beak under the water surface and filters out small animals (such as brine shrimps) by pushing the lower mandible against the upper and squeezing out the water
iii) they can search for animals in deeper water as well as at the edge of a lake
CHALLENGE – i) see pupil`s response
ii) see pupil`s response

## *Worksheet G – Mammals - 1 (Years 5 & 6)*

1. i) C ii) C iii) L iv) L v) C
vi) to reduce the chance of predators spotting it - so its mother can find it when she returns
vii) calling for its mother might put the mother in danger if a predator was close – calling would alert predators to the presence of the young gazelle
viii) the patterns and colours on the hide of the gazelle (fawn) blend in well with its surroundings so it is difficult for a predator to see it, especially from a distance
2. i) has long legs - has powerful muscles - has streamlined shape
ii) so that the wind does not carry the scent/smell of the cheetah to the gazelle - the gazelle might hear the cheetah tread on a stick and break it if the wind is blowing towards the gazelle
iii) to maximise the chance of catching the gazelle - to make the chase as short as possible and thus save energy
iv) gazelles are fast and jink quickly to make the cheetah swerve, lose speed and momentum and hopefully exhaust it - the gazelle sees/hears the cheetah, or the warning of another gazelle, and runs off before the cheetah is close enough to start a chase
3. i) cow is bulkier, more muscled - cow has shorter, stocky legs - cow has no horns - the cow has very prominent udders
ii) herbivores
iii) it has long legs - it is less heavy so it will achieve faster speed and have greater stamina
iv) cows don`t have natural predators in Britain

# `Suggested` answers

CHALLENGE - v) observe the cow at regular intervals and plot its location on a map of the field, where it is every, say, ten minutes [alternatively, could place a video camera where the whole field could be viewed and let it record events during the hours of daylight] - can then use the map to plot the cow`s position every ten minutes and then the distance the cow moves can be determined [would repeat the procedure for several cows of course!]

## *Worksheet H: Mammals - 2 (Years 5 & 6)*

1. i) it is well muscled - it has large front feet which can move soil easily - it has claws on its feet to break up compacted soil
ii) on the surface above/around an exit point
iii) an animal that eats other live animals - a meat-eating animal: they eat earthworms, some beetles, grubs
iv) they rely on smell to detect prey and any intruders - they can also use their sense of touch to recognise prey
2. i) they have very short legs - they freeze if predators attack them, rather than running away
ii) they often curl up into a compact shape with just their spines exposed
iii) spines do not protect them from vehicles - predators such as foxes and badgers could spot them more easily on a road
iv) earthworms, slugs, beetles, bread, peanuts
v) they are fewer predators around - they do not have as many competitors for food - some of their prey animals are active at night
vi) bats - most species of moths - most species of owls - snails
3. i) herbivores
ii) to avoid predators such as foxes and dogs which can run quickly - to take avoidance action when farm machinery is being used in the fields
iii) having spotted a hare in a field, the scientists could drive a suitable vehicle towards them to trigger flight and then try to keep the same distance from the hare as it runs away, whilst recording the speed being achieved by the vehicle

## *Worksheet I: Mammals – 3 (Years 5 & 6)*

1. i) similarities: both have five toes - both have similar overall shape
differences: chimp has an opposable toe - chimp has a broader foot
ii) it can grasp a limb of a tree to help it climb - it is capable of some manipulation of objects in its environment
iii) it is safer from night-hunting predators than sleeping on the ground – the chimpanzees can find comfortable bedding (leaves and branches) in the trees more easily than on the ground
2. i) a young baboon cannot balance very well when it is very young so it is safer to hang on underneath its mother - it would be possible to feed as the mother walks - a mother knows the position of the young baboon as it hangs underneath but if it was on her back she would be unaware of what it was doing and its safety could be compromised
ii) they are able to balance well - the young baboon can see what is going on around it if it is on its mother`s back
iii) to carry out activities that may be helpful later, such as jumping, wrestling, etc. - play helps the baboons to build up their bodies - play helps them to develop relationships with others that will be helpful to them when they are older
iv) it might break a limb or injure itself - it might not see a predator stalking it and be caught - it might get detached from its mother
v) to return to to its mother for security and tactile support - to be grabbed up by its mother if danger threatens

# `Suggested` answers

## *Worksheet J: Mammals – 4 (Years 5 & 6)*

1. i) they have long arms which suggest they move around in the trees which would be a handicap if moving on the ground - their feet are curved which suggests they move around in trees not on the ground
ii) they can easily grab branches as they move - they can hold on really tightly with curved fingers so are unlikely to fall off as they move around in the canopy
2. i) their tails have alternate black and white bands or rings
ii) they will grip well which enables them to climb easily and quickly - the leathery pads help them in rainy conditions as their hands and feet don`t slip in the wet – the leathery pads absorb some of the shock as the lemurs land on hard surfaces after leaping
3. i) 45 minutes
ii) 40 minutes
iii) 7/20
iv) [15% – see pupil`s response]
v) may have recently been fed by the keepers – may have been sleeping – may have been sitting in the sun to warm up (this behaviour is common in lemurs)
vi) *adv* – the lemurs generally stay within sight of the scientists so recording is much easier – it is possible to control/change elements in the environment to see if behaviour changes – the age of the lemurs would be known
*disadv* – the behaviour they show might not be the same as `wild` lemurs – the lemurs may interact with the public which they would not do in the wild - the zoo environment would not be the same as their natural environment

## *Worksheets K – Q: Miscellaneous (Years 5 & 6)*

## *Worksheet K: Speedy movers!*

1. i) it might injure the prey animal making catching it easier - the trip enables the cheetah to grab it and kill it - tripping results in a shorter chase - tripping the prey is unlikely to injure the cheetah so it is an effective low risk strategy
ii) it could slip over and lose the prey it was chasing - it could put its foot in a hole and break a leg
2. i) they stalk the animal and then chase it quickly over a short distance - they can surprise or ambush the antelope – they often hunt as a group and numbers give them an advantage
ii) elephants are too large for a lion or a cheetah to tackle, even in a group - elephants could easily injure a cat if it did attack
iii) if it is injured – if it had recently been chased by a predator – how fast its parents ran – how healthy it was
iv) 50 m
v) 20 hours
vi) Challenge - 0758 hours on Wednesday (2 minutes to eight o`clock on Wednesday morning)

## *Worksheet L: Long distance movers*

1. i) 18 000 km
ii) they are narrow but swept back to reduce drag (friction)
iii) fish and other marine animals which they take at, or just beneath, the water surface
iv) to rest - to re-fuel for the next leg of the journey - they might fly into bad weather
v) there is too little food in the Arctic waters in winter - bad weather could prevent them from fishing and they would starve

## *Worksheet M: Medium distance movers*

1. i) 5150 km (accept ± 250 km)
ii) to ensure that there are no other chicks to compete with it for food
iii) d)
iv) reed warbler - hedge sparrow - pied wagtail – meadow pipit
v) b) (foster parents)

# `Suggested` answers

## *Worksheet N: Fairly short distance movers*

1. i) 4 hours
ii) c) (sun and stars)
iii) mist or fog - very heavy rain or snow – very strong winds (cross-winds or head-winds)
iv) it gets protection since other birds can keep an eye open for predators - other birds might find food and so a pigeon can benefit by being with them - it is easier to find a mate if an individual bird is in a flock
2. i) the prey animals move very quickly too – the prey might quickly go down a hole to escape so the roadrunner needs to be fast over short distances
ii) it will increase its chance of catching them if it is equally agile - the roadrunner can take evasive action and not injure itself if the prey suddenly darted into a crack in the rock or hole in the ground or a thorny bush
iii) sight

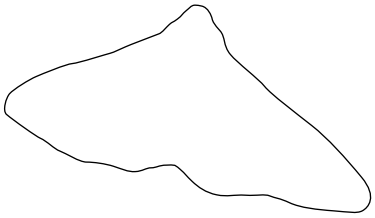
## *Worksheet O: Short distance movers*

1. i) the young will stay close to their mother who can protect them - they will follow their mother who will lead them to food or their nest
ii) because the mother and the young shrews are linked together when they move, like a car and a caravan
iii) smell
iv) they have then learnt that their mother has a characteristic odour and this is what they use to `recognise` her - since the odour of the mother is transferred to the coats of her youngsters each shrew can follow any of its sibs as well as its mother
2. i) the young will stay close to their mother who can protect them - they will follow their mother who will lead them to food
ii) could avoid the attentions of aquatic predators (such as pike) if they are on the back of their mother - the chicks can save energy by not swimming
iii) imprinting

3. CHALLENGE - i) they measure the distance between the child and its mother before and after the stranger enters the room and compare the distances - they observe if the child continues to play with the toys when the stranger enters the room or if the child stops playing and returns to its mother
ii) if the baby cries – if it moves towards its mother – if it approaches the stranger

## *Worksheet P: Animals that rarely move*

1. i) [see the pupil`s response - the outline is provided below]



ii) the colours and patterns on its wings blend in with the bark and plants growing on a tree making it difficult to spot the moth
iii) to reduce the chance of a predator spotting them
iv) they may be disturbed by a predator - they may be disturbed by a twig or leaf bending in the breeze and touching them
2. i) they look very like a stick or twig - they generally keep very still, as a stick would do, just moving gently in a breeze
ii) it would fall to the forest floor and so be well away from the predator - it would land on the forest floor and move to find a safe place to hide before the predator could find it

# `Suggested` answers

## *Worksheet Q: Animals that never move!*

1. i) the waves constantly bring food, in suspension in the water, to them
ii) the tides and currents could sweep them off the rocks - there is only a limited amount of space on the rocks between the tides so sticking down well prevents others prising them away from the space
iii) *adv* - they could exploit feeding opportunities better as the crab might move to good feeding areas - the crab might be always underwater and so they could find food over a longer period
*disadv* - the crab might move up the beach beyond the tidal zone - the crab might be taken by a predator, and eaten well above the tidal zone, so the barnacle would die even if the shell of the crab was discarded
iv) b)

## *Worksheet R: Human body and movement*

1. i) they allow the body and skeleton to move
ii) ankle - knee - hip - shoulder - elbow
iii) they need to support the whole body and so need to be larger - they provide the power for movement so must be bigger than other muscles
iv) difference - the leg bones are thicker - the leg bones are longer
similarity - they have the same number of large bones - the pattern of bones is the same, one large one above two thinner ones
2. i) a) and b) - see pupil`s response (the foot usually has a greater area in most primary school children)
c) the foot is greater in area as it has to support the weight of the body - a large foot spreads out the mass so that pressure on joints is reduced
3. i) a) heart beats faster b) breathe faster
ii) The fitter we are the slower our heart beats and the faster our heart beat returns to normal when we stop exercising.
4. i) might train harder/longer - they might have a genetic predisposition to run fast - their mass (stature) may allow them to run quicker
5. gather a large group of pupils and ask them to jump as far as they can, when on their own (to nullify audience effects) - they then measure the distance jumped and then determine the height of the pupils - they could draw a graph (scatter graph) to see if the height of the pupils and the distance they jumped are correlated [or they could divide the pupils into two groups (`tall` and `short`) based on their height and then determine the mean distance jumped by the pupils in each group]

# `Suggested` answers

## Puzzle sheets

### *A. How do these animals move?*

1. these could include the following:

**worm** - slither, wriggle, slide, crawl, glide
**elephant** - amble, charge, run, walk, swim
**shark** - glide, race, swim, cruise
**robin** - hop, run, fly, walk, bob
**cheetah** - charge, run, stalk, race, chase, pounce

### *Track down the animal*

2. cow - A; badger - B; rat - C; duck - D

### *B. Be an insect detector!*

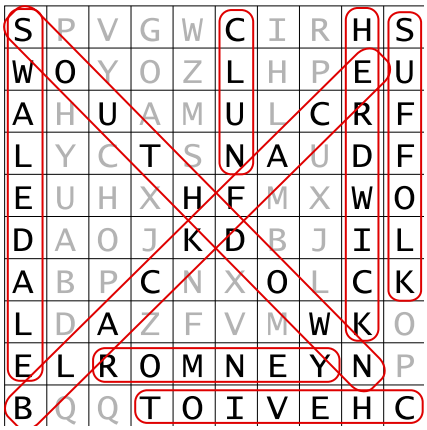
1. wasp
2. bee
3. ant (s)
4. hornet
5. moth
6. bluebottle
7. bug
8. flea
9. gnat
10. earwig

### *C. Design a fly!*

1. [See pupil response - a drawing of an idealised fly is provided which could be used as a template for any pupil needing help!]
2. Flies have hooks on the ends of their legs and the hooks find surface irregularities in the ceiling for the flies to grip on

### *D. Have a go at being a sheepdog!*

(see grid)




1. sheepdogs are well muscled - have stout legs - have a compact shape
2. dogs can negotiate the terrain in hills and mountains much more easily and safely than a tractor - dogs can also work effectively in pairs/threes and thus double/ treble the farmer`s work force - dogs have impressive stamina and are much cheaper to fuel than a tractor - dogs can be trained to operate out of sight of the farmer - dogs can be trained fairly easily as their herding behaviour is based on their `natural` tendency to group other creatures, such as sheep - dogs are more cost effective than farmworkers
3. [see survey names - some widely used sheepdog names are Fly, Tweed, Moss, Meg, Nan, Corrie, Dot, Bess, etc. Sheepdogs are working dogs and are usually kept outside the house so don't have names like Spot or Rover]

# `Suggested` answers

## *E. Watch the birdie!*

1. 3 facts: example - pied wagtail
a) black, white and grey bird
b) around 18 cm long
c) nests in open country, often near to streams and rivers
d) females lay 4 - 7 pale blue/grey eggs
e) the nest is often in a cavity in a wall, between rocks, in a river bank, etc.
f) finds food (e.g. insect larvae, adult insects, spiders) along river banks
g) often seen in towns, feeding in places like supermarket car parks, and at places such as motorway service stations, etc.
h) has a characteristic wagging/bobbing of the tail as it moves, hence its name

2. [see pupil`s drawing]
3. [see pupil`s explanation]

## *F. Snakes alive!*

1. In order: anaconda, mamba, grass, python, rattlesnake, krait, sidewinder, asp, corn, adder, cobra

2. slither, slide, crawl, glide

3. example: some fascinating facts about rattlesnakes - could include the following:
a) found in the warmer, drier areas of North America
b) have heavy bodies with distinctive zigzag markings
c) avoid human contact and only strike if surprised or provoked
d) hundreds are killed each year by humans who catch, kill, skin and even eat them
e) they catch their prey (mice, rabbits, lizards, hares, etc.) by striking with their fangs which release poison into the body of the prey
f) they swallow their prey whole, and so take days to digest a meal
g) can survive for a long time between eating one meal and the next
h) grow by getting rid of their old skin (sloughing)
i) the rattle at the end of the tail is formed from scales - the scales increase by one each time the skin is shed (though the scales do break off)
j) the rattle is vibrated if the snake is alarmed and this warns another animal (perhaps a predator) of its presence and that it is dangerous

## *G. All very fishy!*

1. Outline of a typical fish
A - dorsal fin
B - tail fin
C - eye
D - gills
E - mouth
F - pectoral fin

2. The Mako shark is a fast swimmer because:
it has a very powerful tail to give it thrust - it has a long, thin, streamlined, torpedo-like shape which reduces drag

3. for big fish (in the seas/oceans) - if the fish swims near the surface scientists could follow the fish in a boat and estimate the speed of the fish from the speed of the boat - sometimes fish are fitted with devices to allow their position in the sea to be noted and so their speed of movement could be estimated
for small fish - they can be put in an aquarium tank and their speed of movement can be found by watching them swim over a known distance

# `Suggested` answers

## *H. A speedy bird!*

1. carnivore
2. rattlesnake
3. if danger threatens - to fly to their nest in a tree/bush
4. it has strong/muscled legs - it has two toes pointing forward and two backward to give it a good grip on the ground - when running it points its head forward to give it a streamlined shape
5. for example

a) Emperor penguin - around 80 - 100 cm tall and weigh up to 40 kg - eat fish, crustaceans and squid - have one egg which the male broods during the long, cold Antarctic winter months (often below - 20ºC and with wind speeds of 50 - 75 km per hour) - egg hatches at the end of winter so that the chick, which is fed by both parents, is fed throughout spring and summer so that it is independent before the winter - the adult males group together on the ice during the winter to minimise activity and heat loss - the chicks also gather in creches

b) ostrich - largest bird, being up to 250 cm tall and weighing 100 - 120 kg - males black and white, females largely brown/grey - found in drier areas in Africa - have very long necks and legs, large eyes and can run up to 50 km per hour - eat grasses, seeds and flowers - a male has a territory in which his mate lays her eggs, but often other females, which mate with the male, leave some of their eggs in the same nest to be reared by the dominant pair - after hatching the chicks are soon mobile and able to feed themselves - eggs are very large (weigh 1 - 2 kg) - eggs and chicks are preyed on by jackals, vultures, eagles, etc.

## *I. Birds of a feather*

a) robin
b) blue tit
c) magpie
d) hobby
e) avocet
f) blackbird
g) turnstone
h) peregrine falcon
i) swallow
j) lapwing
k) wren

nightingale
some facts
around 16 cm in length - largely brown and dull cream in colour - the male has a beautiful song which it uses to attract females - females lay 4 - 5 eggs, which are blue/grey with reddish speckles - spends the winter in tropical Africa

## *J. QUIZ 1 - How many legs?*

1. slow worm (it is actually a lizard, even though it is called a worm)
2. flamingo (there are 6 species - greater, lesser, Chilean, Andean, Caribbean, James`)
3. bee-eater
4. chicken
5. red deer
6. water boatman
7. wood louse
8. spider
9. brine shrimp
10. a) centipede b) millipede
11. a) pink-footed b) redshank c) red-legged d) greenshank

## *K. QUIZ 2 - Miscellaneous*

1. cheetah
2. peregrine falcon (in a `stoop`, when it dives on its prey)
3. they hope that the predator will end the attack, or interest in the prey, if it seems dead
4. their names suggests they have 100 feet/legs, but they do not
5. for example: cuckoo, swallow, house martin, sand martin, bee-eater, nightingale, all species of terns
6. for example: barnacle geese, pink-footed geese, Whooper swan, Bewick`s swan
7. hummingbird
8. Crawley
9. bob, bob, bobbing
10. kestrel
11. otter
12. dipper
13. crab, sidewinder snake, indris (lemur)

# Worksheets

## Years 3 & 4

A. Feet and Legs – 1
B. Feet and Legs – 2
C. Feet
D. Wings of Insects
E. Wings of Birds - 1
F. Wings of Birds - 2

## Years 5 & 6

A. Aquatic animals - 1
B. Aquatic animals - 2
C. Insects - 1
D. Insects - 2
E. Birds - 1
F. Birds - 2
G. Mammals – 1
H. Mammals – 2
I. Mammals – 3
J. Mammals – 4

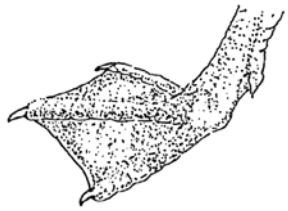
**Miscellaneous Worksheets**

K. Speedy movers
L. Long distance movers
M. Medium distance movers
N. Fairly short distance movers
O. Short distance movers
P. Animals that rarely move
Q. Animals that never move
R. Human body and movement

# Years 3 & 4 Worksheet A: FEET AND LEGS - 1

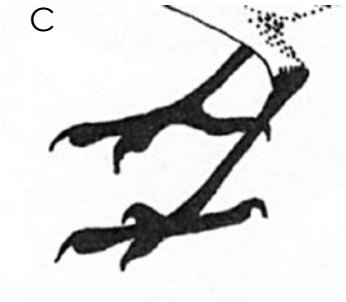
1. Here are drawings of the foot of an eagle, a mallard duck and a wagtail. Identify which foot belongs to each bird.

A



B

C



A is the .....

B is the .....

C is the .....

2.

i) Suggest **one** reason why the eagle has the type of foot it has.

.....

.....

ii) Suggest **one** reason why the mallard duck has the type of foot it has.

.....

.....

.....

3. Eagles sometimes land on the branch of a tree: mallard ducks rarely ever do. Write down **one** reason why an eagle`s foot helps it to land on a branch.

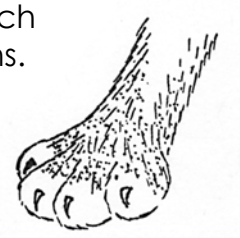
.....

.....

.....

.....

4. Here is a cat`s foot. Its claws can be pulled in so they do not touch the ground when it walks or runs. Underline which of these reasons best explains why the claws are pulled in:



a) they might scratch a carpet;
b) they might scratch a child;
c) they keep the claws sharp for when the cat needs to hunt;
d) it is easier for the cat to walk on tiptoes if the claws are pulled in;
e) the claws might harm a kitten if the cat trod on it.

5. Here are drawings of the legs of a hippopotamus and a gazelle. Which is which?

A

B

A is the .....

B is the .....

6. Suggest **one** reason why the hippo has the sort of legs it does have.

.....

.....

.....

.....

7. Here is a frog jumping.
Which part of its body lets the frog jump quite long distances?

.....

8. Write down **two** other words that could be used instead of *jump* to describe how a frog moves.

i) .....

ii) .....

**CHALLENGE** – *Hop to it!*

Suppose scientists wanted to know how far a frog jumps. Describe how they would find out?

.....

.....

# Worksheet B: FEET AND LEGS - 2

1. Here is a heron. Herons eat fish, frogs, lizards, insects, mice and young birds.

i) What animal group does the heron belong to?

.....

ii) Give **two** reasons why you think that it is this type of animal.

a) .....

b) .....

iii) Write down **one** reason why a heron has long legs.

.....

.....

iv) Write down **two** words that would describe how a heron moves.

a) .....

b) .....

v) A heron often waits by the edge of a lake to catch fish. It keeps very still until it sees a fish. Then it grabs it quickly with its beak. Why do you think a heron keeps very still when it waits to catch fish?

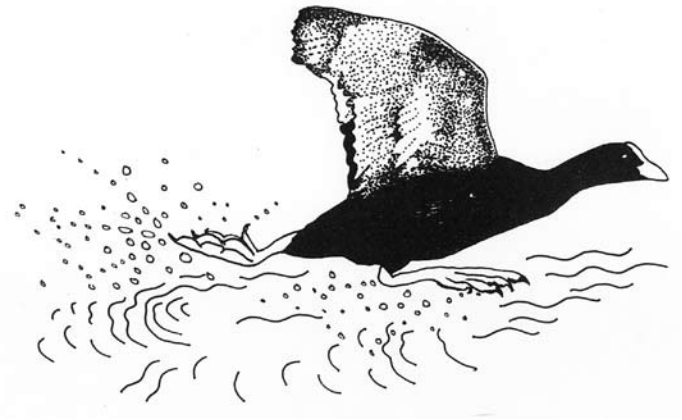
.....

.....

.....

.....

2. Here are drawings of a coot (which is about 35 cm long) and a swan (which is about 150 cm long). Both birds swim on rivers and lakes. When they want to fly, both birds run on the water to take off.



i) Why do you think both birds need to run on the water to take off?

.....

.....

ii) Which of the two birds would need to run further before it takes off and why?

The ..... has to run further because

.....

.....

.....

.....

.....

.....

3. Penguins are birds that have wings but they do not fly.

i) How do penguins move around on land?

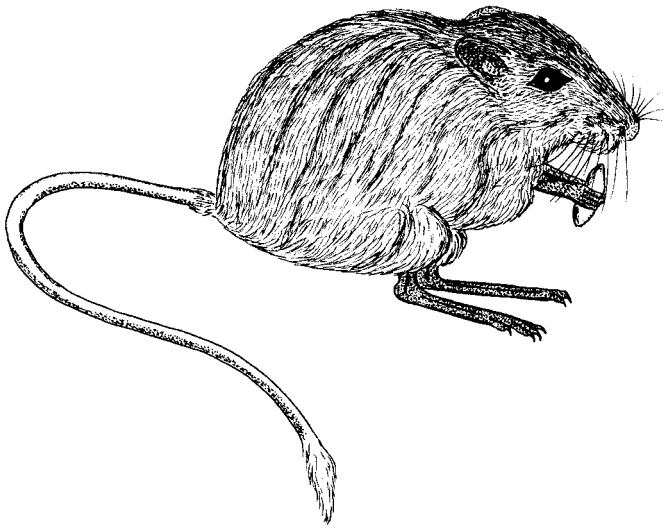
.....

ii) Penguins eat fish. How do penguins move under the water when hunting fish in the sea?

.....

# Worksheet C: FEET

1. Here is a drawing of a kangeroo rat. It lives and sleeps in a burrow in the desert during the day and finds seeds to eat at night.



2. There is an American story or legend about an unusual creature called Big Foot! Try to find this story in a book or on the Internet and write down **two** things about this creature.

i) .....

.....

ii) .....

.....

i) Why do you think it is called a kangeroo rat?

.....

.....

.....

ii) The kangeroo rat generally moves in a special way - underline which it is:

a) swims b) walks
c) climbs d) leaps
e) slithers

iii) The kangeroo rat has big feet. Write down how the big feet might help it to make a burrow in the desert sand.

.....

.....

.....

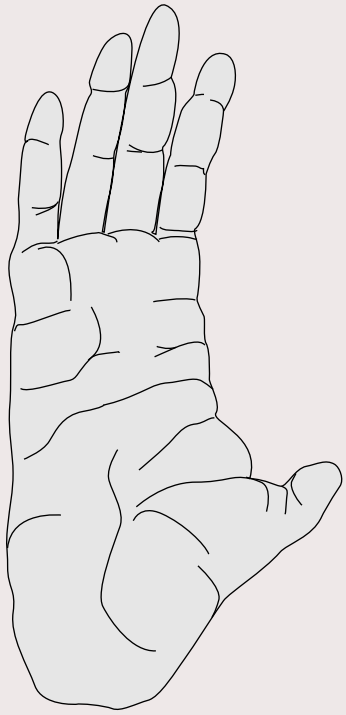
iv) Snakes will eat kangeroo rats. Kangeroo rats use sand and their big feet to make a snake less likely to attack them. How might they do this?

.....

.....

.....

3. Here is an outline of a chimpanzee`s foot.



On a sheet of paper with 1 cm squares, draw around one of your feet. [You can keep your sock on to do this!] Write down **two** differences between your foot and the chimp`s foot.

i) .....

.....

ii) .....

.....

4. Using the drawing of your foot:

i) Count how many squares your foot covers. It covers ..... squares

ii) Ask a friend to tell you how many squares their foot covers. Whose foot is bigger and by how much?

..... foot is bigger by ..... squares.

iii) Find how many squares are covered by the feet of 8 other children. Write these 10 numbers in a line, starting with the smallest number.

....., ....., ....., ....., ....., ....., ....., ....., ....., .....

iv) What is the difference between the smallest and the largest foot?

The difference is ..... squares.

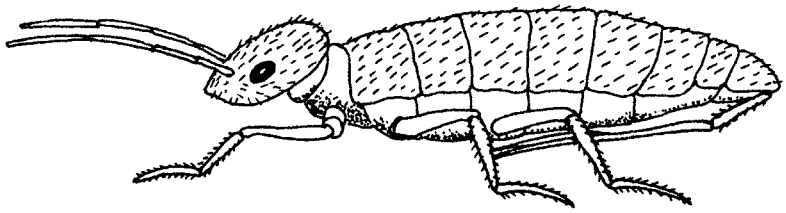
v) Does the smallest foot belong to the shortest child and the largest foot to the tallest child? Write down what you think the numbers show.

.....

.....

# Worksheet D: WINGS OF INSECTS

1. This is a springtail. It is an insect that does not have wings. It has a sort of forked tail that shoots it up in the air when it wants to move quickly.



i) Why do you think it is called a springtail?

.....

.....

ii) Why does springing up like this help the animal to avoid a predator?

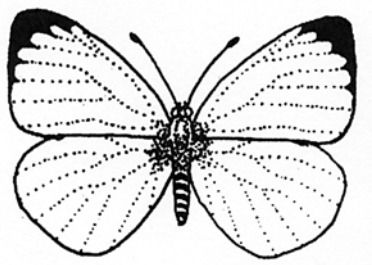
.....

iii) Name **two** other animals that move by jumping.

a) .....

b) .....

2. This is a male Large White butterfly. Butterflies move using their legs and wings.



i) How many wings does a butterfly have? .....

ii) How many legs does a butterfly have? .....

iii) This is a female Large White. Write down **one** difference between the wings of a male and a female Large White.

.....

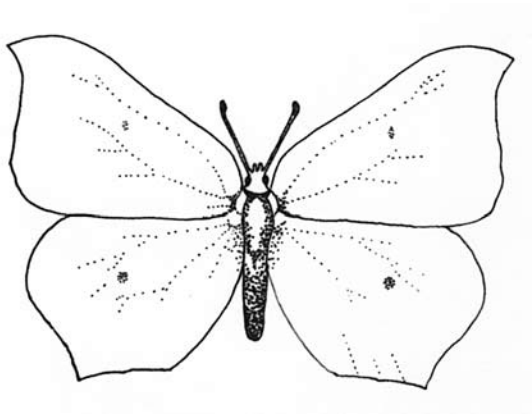
iv) Write down **two** reasons why butterflies might visit flowers.

a) .....

b) .....

# Worksheet D: WINGS OF INSECTS

3. This is a male Brimstone butterfly.



Males have bright yellow wings with a red or orange spot in the centre.

i) Colour the butterfly.

ii) Some people think that the word `butterfly` was given to all these insects because of this butterfly.

Write down why you think this may be.

.....

.....

4. This is a drawing of a bumblebee.

i) How can you tell from the drawing that the bumblebee is an insect?

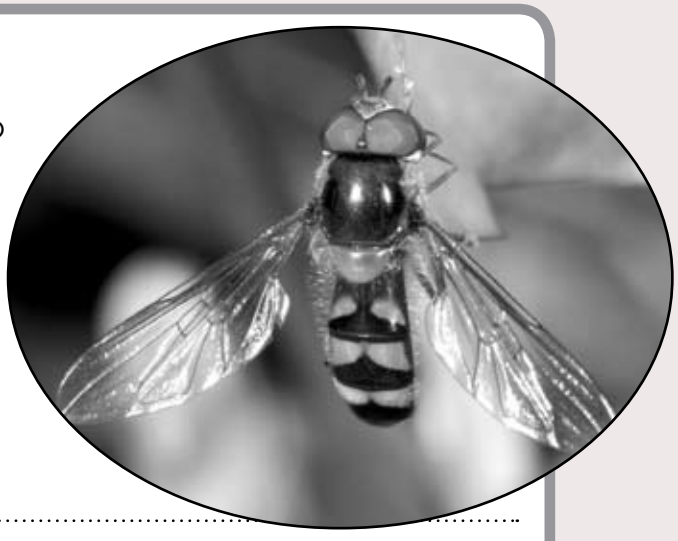
ii) How many wings does a bumblebee have?

.....

iii) The wings of bees have lines on them. What are the lines called?

.....

5) Here is a hoverfly.



Hoverflies are insects that visit flowers to collect nectar from them - nectar is a sort of sugary liquid.

The name of the hoverfly tells you how it moves when it searches for flowers with nectar.

i) What does the word hover mean?

.....

ii) Hovering uses up a lot of energy. What gives the fly its energy?

.....

# Worksheet E: WINGS OF BIRDS - 1

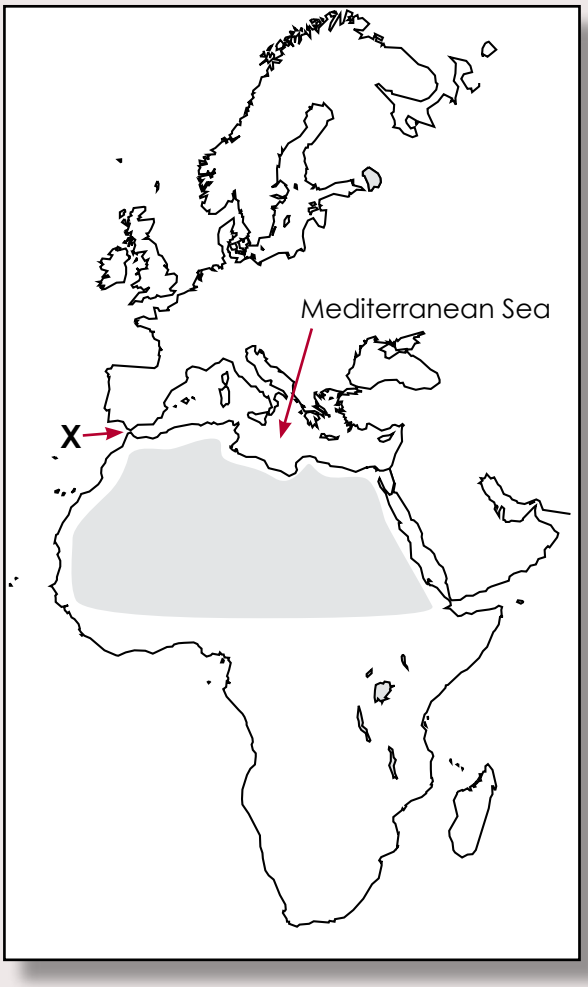
1. Here is a swallow.
Swallows feed on insects. They come to Britain in May and leave us in September. Some swallows fly to South Africa and so they may fly thousands of kilometres each year.

i) Write down **one** reason why the shape of the bird tells you it flies well.

.....

ii) Swallows stop several times as they fly to Britain. Why do they stop?

.....




**This map shows the journey the birds might make.**

iii) Write on the map where London and Cape Town are.

iv) Using the map or an atlas, estimate how far it is from London to Cape Town.

London and Cape Town are
..... km apart.

v) Why do you think swallows, and most other birds, cross the Mediterranean Sea where it is narrowest (at point X)?

.....

.....

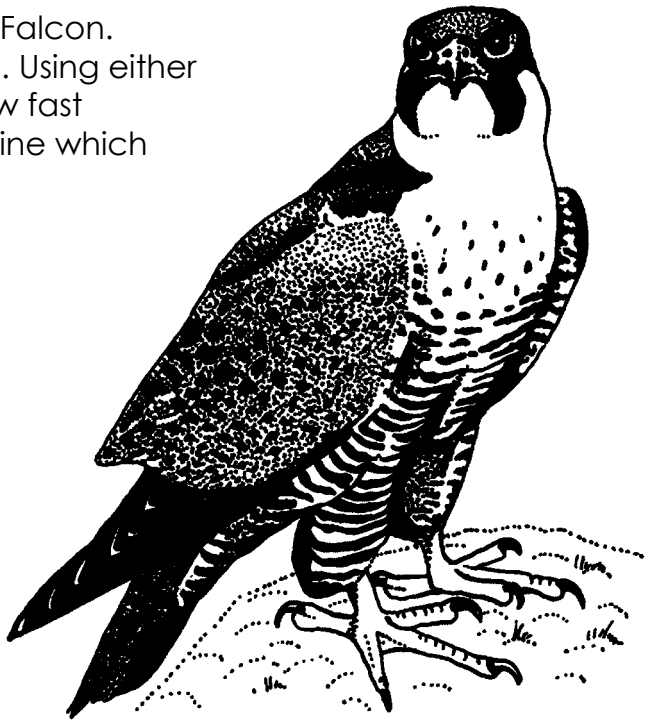
vi) In North Africa there is a desert shown on the map (in grey). What is the desert called? Write **one** reason why this desert is difficult for birds to cross.

It is the ..... Desert. It is difficult for birds to cross because

.....

**CHALLENGE** – *Speedy birds!*

vii) Here is a drawing of a Peregrine Falcon. This falcon is the fastest flying bird. Using either books or the Internet, find out how fast scientists believe it can fly. Underline which answer you think is best below.



a) 30 km per hour

b) 3 km per hour

c) 3000 km per hour

d) 3 million km per hour

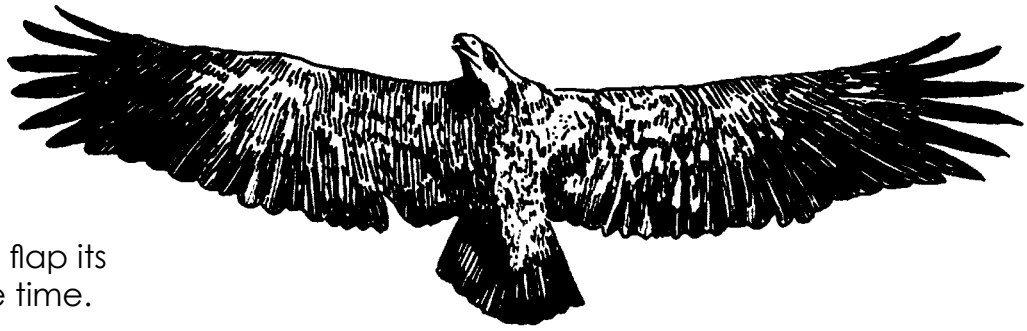
e) 300 km per hour.

viii) A peregrine flies fastest when it is diving onto its prey, birds such as pigeons and ducks. A special word is used to describe this dive. Find the word in a book or on the Internet and complete the correct spelling below. Each dash is one letter.

s _ _ _ p

# Worksheet F: WINGS OF BIRDS - 2

1. This is a drawing of an eagle. It is able to glide very well and it does not need to flap its wings all the time.



i) How do the wings of an eagle tell you it will fly and glide well?

.....

.....

ii) It is an advantage to an eagle to glide rather than fly. Underline below the best explanation for the advantage.

a) gliding saves money

b) gliding saves time

c) gliding saves energy

d) gliding saves feeding.

iii) Birds have hollow bones. Why do hollow bones help when birds fly?

.....

.....

.....

.....

.....

.....

.....

iv) Write down the names of any **two** British birds that have:

a) white wings

1..... 2 .....

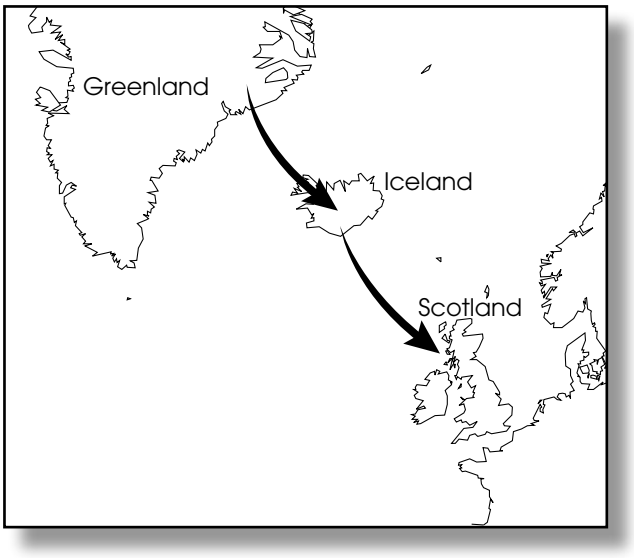
b) black wings

1..... 2 .....

c) black and white wings.

1..... 2 .....

2. Here is a barnacle goose. These birds spend the summer in Greenland and come to Britain for the winter.




The map you see here shows the journey the geese take.

i) Why do you think the geese fly to Scotland to spend the winter?

.....

ii) The birds often stop in Iceland. Why do you think they do this?

.....

iii) Geese are big birds and in two hours they can fly 130 km. From Iceland to an island in Scotland where they stay for the winter is 1300 km.
How long will it take the birds to fly from Iceland to this island in Scotland?

..... hours


Scientists study the birds to learn more about barnacle geese. To do this they put leg rings on a large number of the birds - you can see a photo of a ring here. Each ring has different numbers and letters.

iv) Why are rings put on the legs of a large number of birds?

.....

v) Why are the numbers and letters different on each ring?

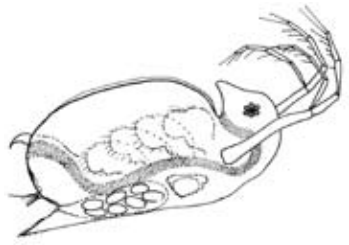
.....

vi) Write down **one** thing that scientists can learn from these studies.

.....

# Years 5 & 6 Worksheet A: AQUATIC ANIMALS – 1

1. Here is a water flea. Water fleas can be found in ponds in very big numbers in summer.



i) How do you think they move?

.....

ii) Water fleas do not always stay in the same place in a pond. In the morning they are usually near to the surface and go down to deeper water at night. Underline which of these reasons best explains why they change their position in the water:

a) they get tired in the evening, fall asleep and sink
b) the water gets too hot near the surface at night
c) they do not like to swim in deep water
d) they visit friends at the bottom of the pond in the evening
e) their food is algae which need sunlight and so fleas follow the algae.

2. Brine shrimps are small animals that live in saltwater. They are always on the move as they breathe by getting oxygen from the water as it moves through their gills.

i) Which parts of the body does a shrimps use to move? .....

ii) How many pairs of legs do brine shrimps have? Is it 6, 11 or 17?

Brine shrimps have ..... pairs of legs.

iii) Children decide to see how fast a shrimp can swim. They use a plastic tube filled with saltwater, a stop watch, a sheet of graph paper and 5 female shrimps. They put 1 shrimp in the tube, place the tube on a sheet of graph paper and time how long it takes for the shrimp to swim 10 cm. They do this with all 5 and these are the times: 5, 3, 10, 21 and 6 seconds.

a) How long did the slowest shrimp take?
..... seconds

b) What was the average time taken to swim 10 cm? ..... seconds

c) What study would you suggest the children do next to get a better picture of how fast shrimps swim?

.....

.....

iii) Mallard ducks eat water fleas; water fleas eat algae.
Put water fleas, mallard ducks and algae into a food chain.

---------- → ---------- → ----------

3. In spring, female frogs lay their eggs in ponds.

i) When the eggs hatch, what are the little frogs called?

Fill in the missing letters.

t _ _ p _ _ _ s

ii) What part of their body do the little frogs use to move through the water?

.....

iii) Suggest **two** reasons why the little frogs move around in the water.

a).....

b).....

iv) After about 5 weeks the little frogs grow legs, lose their tail and leave the pond to live on the land. Suggest **one** reason why they lose their tail.

.....

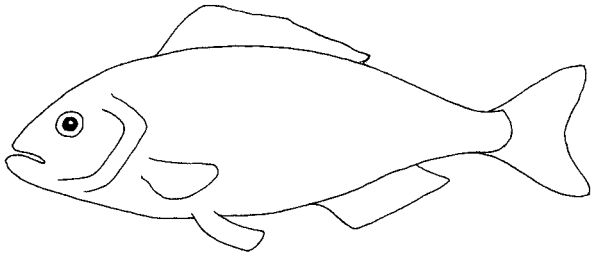
v) What word describes how adult frogs move on land?

.....

vi) Which part of an adult frog provides the power for their movement?

.....

1. This drawing shows a typical fish.



i) Using the letters F, G and T, identify a fin (F), the gills (G) and the tail (T).

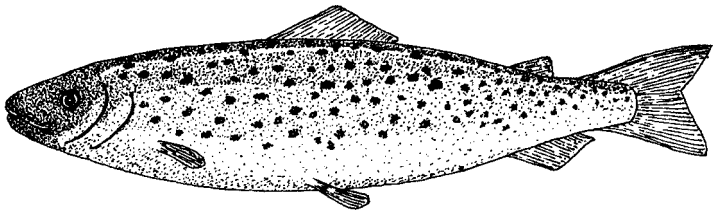
ii) Which part of a fish moves it through the water? .....

iii) Which part of a fish steers it through the water? .....

iv) How does the shape of a fish help to move it through the water?

.....

2. This is an Atlantic salmon. Salmon are born in British rivers and after a couple of years they go to sea. When they are adults, they return to breed in the river where they were born! The salmon usually breed in the first few kilometres where the river begins.



i) How can you tell from the drawing that a salmon is a strong swimmer?

.....

ii) Sometimes salmon have to get over small waterfalls on their journey. How do they do this?

.....

iii) Suggest **one** other problem salmon might face making the journey up a river.

.....

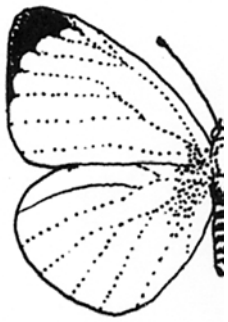
.....

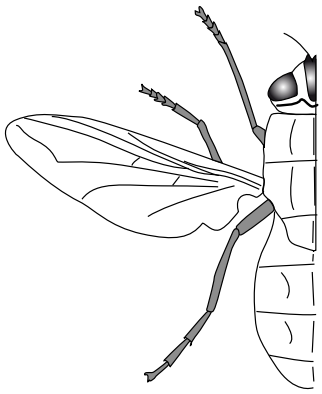
iv) In N. America, bears go into rivers near waterfalls to catch salmon. Suggest **one** reason why being near a waterfall helps bears catch salmon.

.....

1. Here are the wings of a butterfly and a fly.

*Butterfly*





*Fly*

i) Suggest **one** way that the two insects have wings that are similar.

.....

ii) Suggest **one** way that the two insects have wings that are different.

.....

2) This is a 7 spot ladybird. Ladybirds are a type of beetle. They have hard wing cases that cover their wings.

i) Why do you think it is called a 7 spot ladybird?

.....

ii) Suggest **one** reason why having wing covers might help the ladybird.

.....

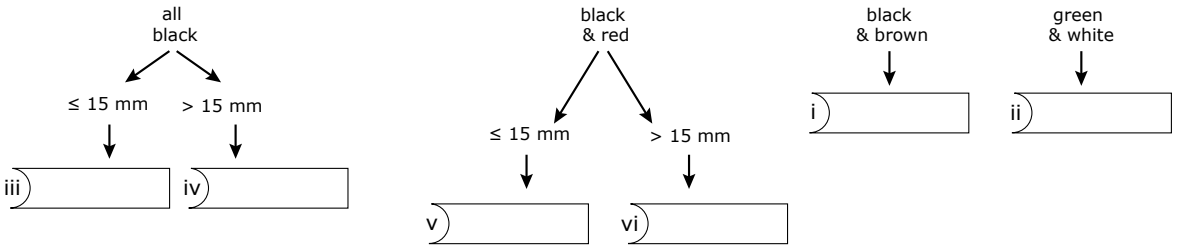
iii) Female ladybirds lay their eggs on plants. The eggs hatch into larvae and the larvae eat aphids, small green insects found on roses and other plants. Why do ladybirds lay eggs on plants rather than on the ground?

.....

.....

3) Here is a table with some information about a number of beetles that can be found in Britain. Look at the table and then put the name for the beetles in the correct place in the flow diagram.

| Type of beetle | Main colours | Size (Length) | Appearance of the wing cases | |
|---|---|---|---|---|
| | | | stripes | spots/blotches/bands |
| cockchafer | brown& black | 25 mm | yes | no |
| 7 spot ladybird | red & black | 6 mm | no | yes |
| rove | black | 13 mm | no | no |
| burying beetle | black & red | 19 mm | no | yes |
| stag | black | 76 mm | no | no |
| tiger | green & white | 13 mm | no | yes |




vii) Burying beetles search for the dead bodies of animals, like mice, to rear their offspring. Use a book or the Internet to find out how they bury the dead mouse. Also, find out **two** facts about burying beetles.

.....

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**Fact 1**

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**Fact 2**

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# Worksheet D: INSECTS – 2

1) Adult insects have 6 legs. Here is a drawing of what a typical insect leg looks like. The leg ends in a hook.

How is the hook useful to a fly when it lands on a ceiling?

.....

.....

.....

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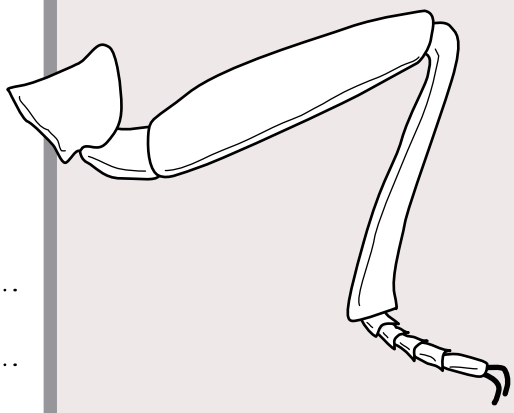


2. Here are drawings of a fly and a moth. Give **one** similarity and **one** difference between the two insects.

**Similarity:**

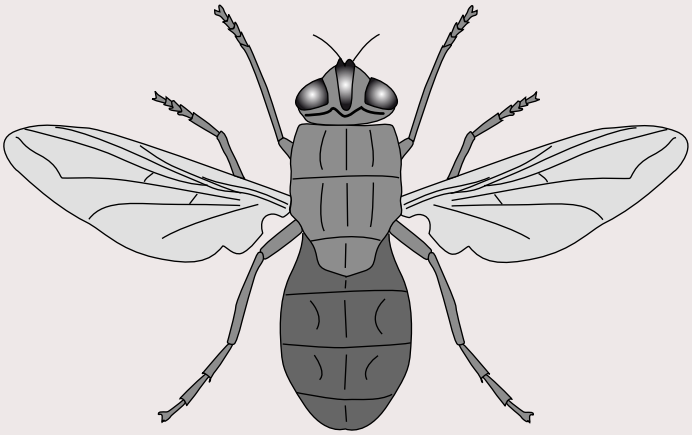
.....

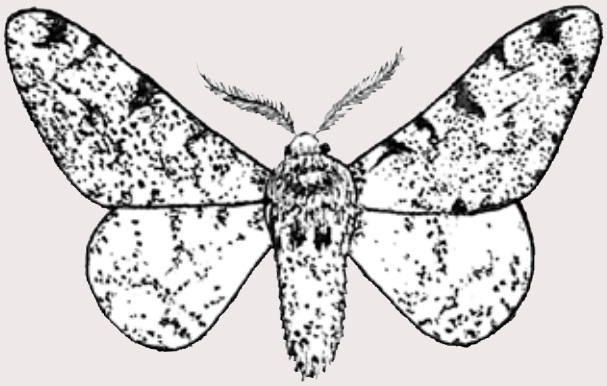
.....

**Difference:**

.....

.....



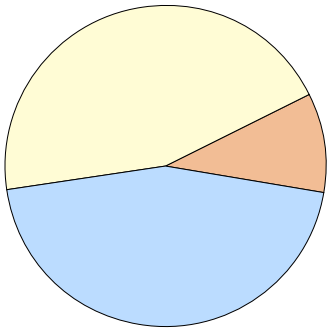


3) A scientist collects 20 large yellow underwing moths and takes them to an empty room. She releases them one at a time and records whether they land on the floor, wall or ceiling. Two moths land on the floor, 9 on the wall and 9 on the ceiling.

i) How many more moths land on the ceiling than the floor? ..... moths

ii) What percentage of the moths land on the wall? ..... %

iii) She draws a pie chart to show this information which you can see here. However, she forgot to label the chart!



Put the correct letters (the letters are F, W and C) in the correct piece in the pie chart.

iv) Very few moths landed on the floor but equal numbers landed on the walls and ceiling. Why can we not say that moths are just as likely to land on the wall as on the ceiling? Explain your answer.

.....

4. Here is a photograph showing a female spring usher moth and a male spring usher moth: female spring usher moths do not have wings.

i) Which of the moths in the photograph is the female? Cross out the incorrect answer.

The female is the moth on the left/ right.

After mating, a female spring usher moth lays her eggs in several different crevices on the bark of oak trees at night. The larvae emerge from the eggs in April and May.

ii) Why do you think the female lays her eggs in several places on the tree trunk?

.....

iii) When the larvae emerge, what will they do to find their food?

.....

# Years 5 & 6 Worksheet E: BIRDS – 1

1. Some birds get their food from water: these birds include mallard ducks, tufted ducks, gannets and ospreys.

Mallard: they up-end and search for plants and seeds.

Tufted ducks: jump up and then dive for plants, insects and snails.

Gannets: plunge dive into the sea for fish.

Ospreys: fly down to a lake and grab a fish with their talons.

i) On a pond, where might be a good place for mallard to feed?

.....

ii) About how deep in the water could a mallard go to find food?

.....

iii) Give **one** advantage to a tufted duck of diving into a lake for its food.

.....

iv) Tufted ducks eat a wide variety of foods. Why is this an advantage?

.....

v) Suggest **one** advantage and **one** disadvantage of the gannet`s way of catching fish.

An advantage would be

.....

A disadvantage would be

.....

vi) Suggest **one** advantage and **one** disadvantage of the osprey`s way of catching fish.

An advantage would be

.....

.....

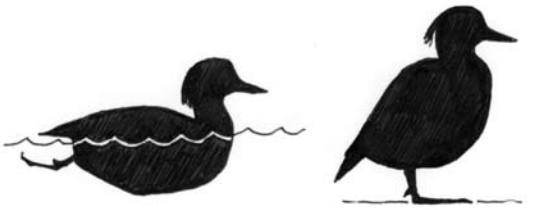
A disadvantage would be

.....

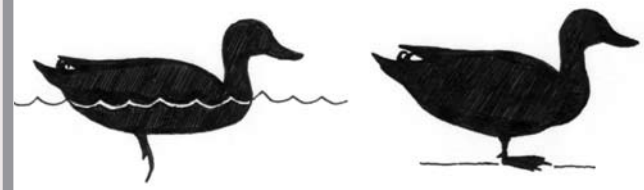
.....

2. Some ducks are `divers`, like tufted ducks - some ducks are `dabblers`, like mallard ducks. Divers have their legs near the ends of their bodies, walk upright, or waddle, in a rather funny way and usually have short tails. Dabblers have legs near the middle of their bodies, walk more easily on land and sometimes have elaborate tails (such as a pintail).

A diving duck.



A dabbling duck



i) Why do diving ducks have their legs near the end of their bodies?

.....

.....

.....

ii) Why would an elaborate tail be a disadvantage to a diving duck?

.....

.....

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iii) Why do dabbling ducks have their feet in the centre of their bodies?

.....

.....

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iv) Why would an elaborate tail not be a problem for a dabbling duck?

.....

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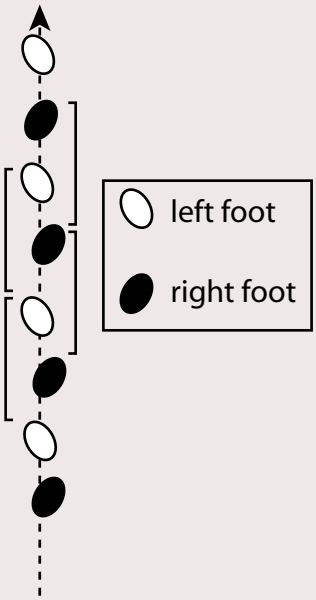
# Years 5 & 6 Worksheet F: BIRDS – 2

1. Some birds, such as robins and house sparrows, move around by hopping. Some birds, such as gulls and pigeons, walk.

i) Name **one** other British bird that hops. .....

ii) Name **one** other British bird that walks. .....

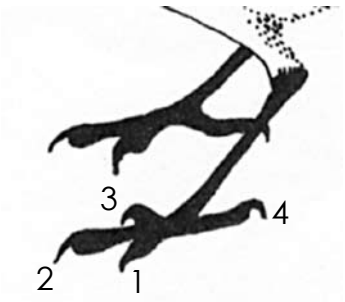
Here is the trail of a bird that walks




iii) Draw a similar trail for a bird that hops.

iv) Here is the foot of a typical bird that perches on twigs and branches, like a blackbird. Why does toe 4 point backwards?

.....




v) Here is the foot of a woodpecker. Why is it helpful for the bird to have 2 toes pointing forward and 2 backwards?

.....

vi) A stork has left this footprint in some soft mud. Which way was the stork moving? Explain your answer.

.....

vii) Here is another footprint of a bird. How can you tell this is the footprint of a duck?

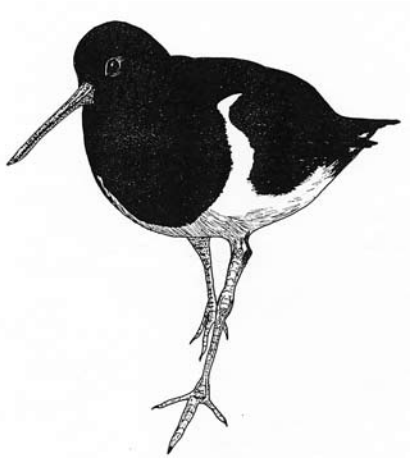
.....

viii) Why would a foot like this be useful for a duck?

.....

.....

2. This bird is an oystercatcher. It is a wading bird found along the coast of Britain. It searches for shellfish in the sand and mud. It opens the shell with its beak to eat the soft flesh inside.



A scientist watches an oystercatcher searching for food on a sandy beach. The scientist records how many steps the bird takes before it puts its beak into the sand: he records this on 10 occasions as it searches for food.

Here are the number of steps it took: 4, 3, **3**, 8, **6**, 11, 5, 4, 7, **9**. The bold numbers show when the oystercatcher found food.

i) How many steps did the oystercatcher take altogether? ..... steps

ii) What was the average number of steps the oystercatcher took before it stopped and put its beak in the sand? ..... steps

iii) How many times was food found? ..... times

iv) Why was the oystercatcher not successful at finding food all the time?

.....

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3. Here is a drawing of a greater flamingo. These are very tall birds, some adult birds can be 150 cm in height.

i) What colour are flamingos?

.....

.....

ii) A flamingo has an unusual method of finding its food in a lake. (They feed on brine shrimps and other animals). Using a book or the Internet, describe how a greater flamingo feeds.

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iii) The flamingos have very long legs. How might this be helpful when they are searching for brine shrimps?

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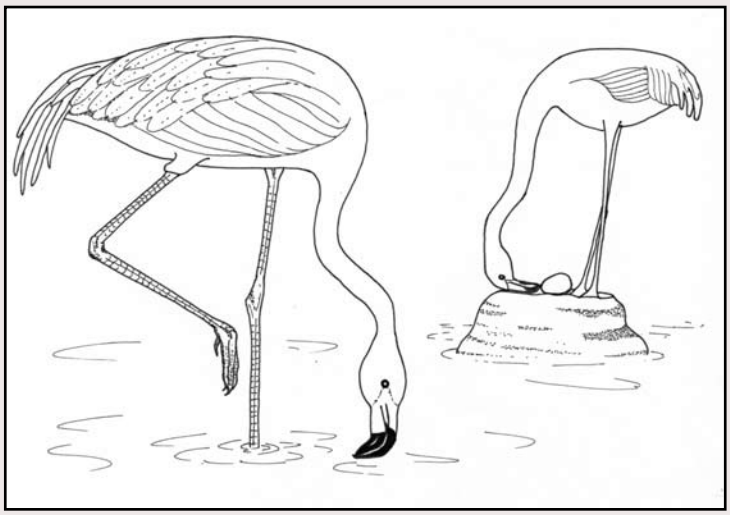


**CHALLENGE** – *Who in your class is taller than a flamingo?*

Draw a horizontal line **(with a pencil)** on a wall in the classroom that is 150 cm above the floor. Ask each child to stand against the mark and discover which ones are taller than a flamingo! How many are there?

.....children are taller than a greater flamingo.

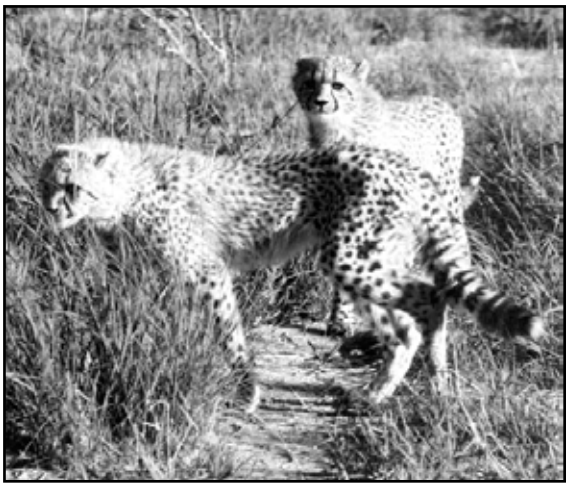
ii) Who is the tallest child in your class and how much taller are they than an adult greater flamingo?

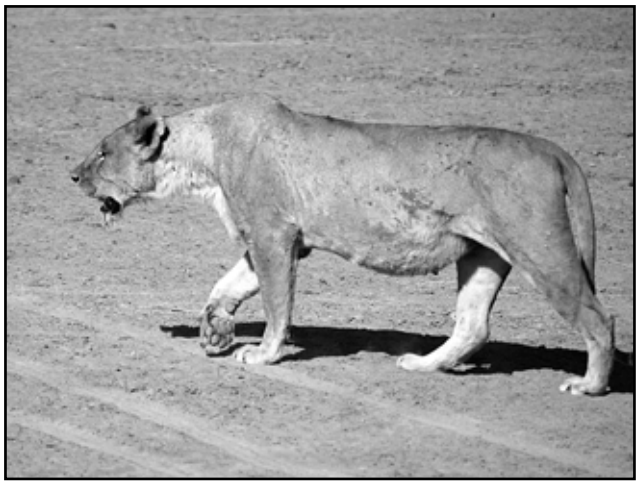
..... is the tallest child in the class.

She/he is..... cm taller than a greater flamingo.

# Worksheet G: MAMMALS – 1

1. The pictures show a female cheetah and a female lion. Both kill and eat gazelles.





Below are 3 facts about how cheetahs hunt and 2 facts about how lions hunt. Unfortunately they have been mixed up! Write C (cheetah) or L (lion) beside each fact to indicate if that fact is about how a cheetah hunts or is about how a lion hunts.

| Fact | Animal |
|---|---|
| i) Tries to trip up the prey as it chases it. | ..... |
| ii) Walks openly towards the prey it will chase. | ..... |
| iii) Often hangs on to prey until others join it to kill it. | ..... |
| iv) Uses bushes, trees and grass to creep up on the prey. | ..... |
| v) Runs after the prey with tremendous speed. | ..... |

When young gazelles are born they feed on their mother`s milk. The mother leaves the young on its own when she feeds. The young gazelle is well-camouflaged and sits quietly in the grass, keeping very still.

vi) Why does the young gazelle keep very still?

.....

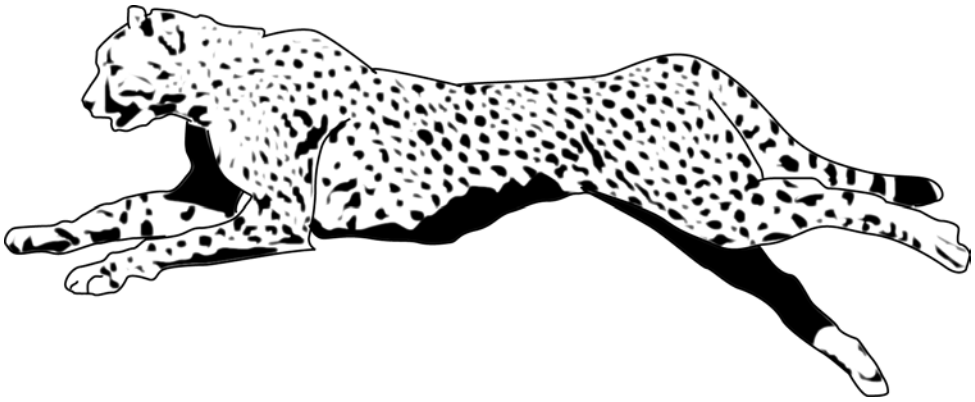
vii) Why does the young gazelle keep quiet?

.....

viii) What does well-camouflaged mean?

.....

2. The cheetah is the fastest land animal and can reach speeds of 112 km per hour. However, it can only keep up this speed for a few hundred metres before it stops, exhausted.



i) How can you tell from the drawing that the cheetah is a fast runner?

.....

.....

ii) Cheetahs catch and eat animals such as gazelles. Cheetahs always try to approach a gazelle so that the wind is blowing from the gazelle to the cheetah and not from the cheetah to the gazelle. Why do they always try to approach so that the wind blows from the gazelle to the cheetah?

.....

.....

iii) A cheetah tries to get as close to a gazelle as it can before it runs at it to catch it. Why does it try to get close to the gazelle?

.....

.....

iv) Cheetahs can run faster than gazelles, but they don`t always catch them. Why?

.....

.....

3. Here are drawings of a cow and a sable antelope. They are both mammals, both are about the same height and both usually have just one calf. Cows only run occasionally: antelopes can keep running for a long time and may have to run several times a day to escape from predators.

i) Write down **two** differences between a cow and a sable antelope.

a) .....

b) .....

ii) Both animals eat grass. Are they herbivores, carnivores or omnivores?

.....

iii) How can you tell from the drawings that an antelope can run faster and further than a cow?

.....

iv) What natural predators do cows have in Britain? .....

**CHALLENGE** – *Cows on the moove!*

v) Suppose you wanted to find out where and how far a cow moves in a field in a day. Describe how you would carry out such a study.

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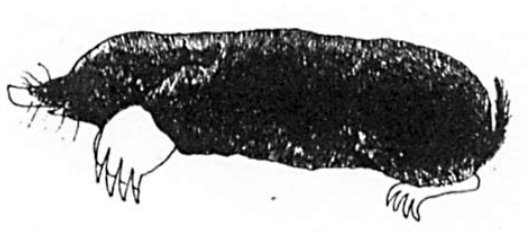
# Years 5 & 6 Worksheet H: MAMMALS – 2

1. Here is a mole. Moles spend almost all their time underground. They dig tunnels in the soil and



then move up and down the tunnels looking for their prey.

i) How can you tell from the drawing that a mole can dig and move soil very well?

.....

.....

ii) Where do the moles leave the soil they move to make their tunnels?

.....

.....

iii) Moles are carnivores. What is a carnivore and suggest **one** animal a mole might eat?

.....

.....

.....

iv) Moles have poor eyesight. Why is this not a big problem for them when they move along their underground tunnels searching for food?

.....

.....

2. This is a hedgehog, a British mammal.

i) If attacked by a predator, a hedgehog does not run away.

How can you tell from the drawing that hedgehogs are probably not very quick runners?

.....

ii) What do hedgehogs usually do when they are attacked?

.....

iii) Why is this not a good idea if the hedgehog was on a road?

.....

iv) Hedgehogs are sometimes seen in our gardens at night, looking for food. Suggest **two** different foods they might find in a garden.

.....

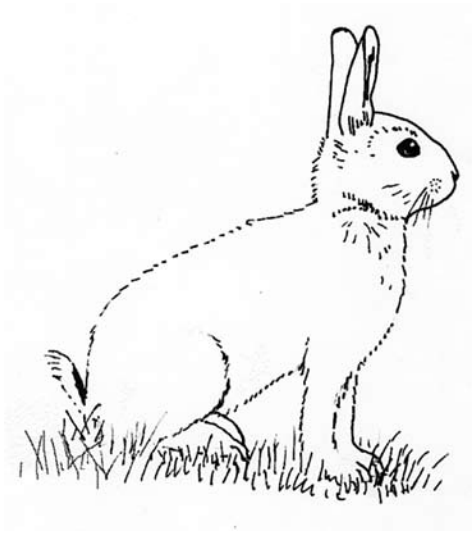
v) Hedgehogs are active at night. Why is this an advantage to them?

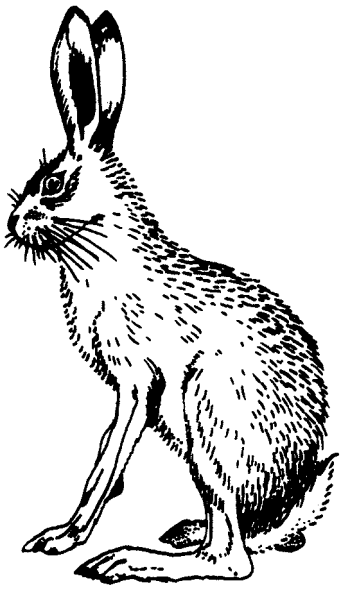
.....

vi) Name **one** other British animal that is active at night.

.....

3. Here are drawings of a rabbit and a hare. Hares are almost twice the size of a rabbit. Hares live in open country, such as fields, and eat plants.





i) Are hares omnivores, carnivores or herbivores?

.....

ii) Rabbits live in burrows but hares live in fields. Hares breed in early spring so that young hares can grow up and can run quickly by summer. Why is it be important for hares to move quickly if they live on farmland?

.....

**CHALLENGE** – *Haring around!*

iii) Some books say that hares can run at speeds of up to 40 miles per hour. Suggest how scientists could measure just how fast they can run.

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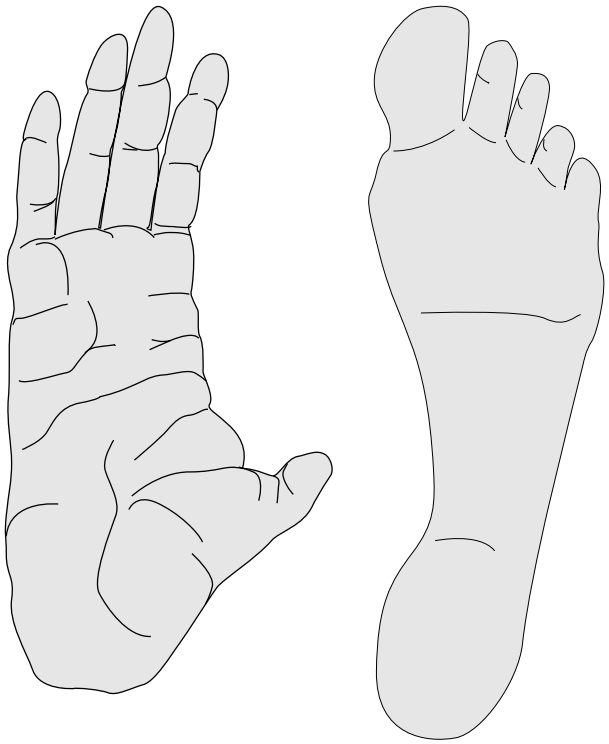
1. Here is the outline of a chimpanzee`s foot and a human foot.



i) Identify **two** similarities and **two** differences between the two feet.

a) One similarity is

.....

b) Another is

.....

c) One difference is

.....

d) Another is

.....

ii) Suggest **one** way that a chimp could use its foot in a way that a human could not.

.....

iii) Chimpanzees are only active during daylight. Before dark they build a nest in a tree where they spend the night. The nest consists of branches and large leaves placed on other flat branches in the upper part of the tree. Suggest **one** reason why chimpanzees sleep in trees.

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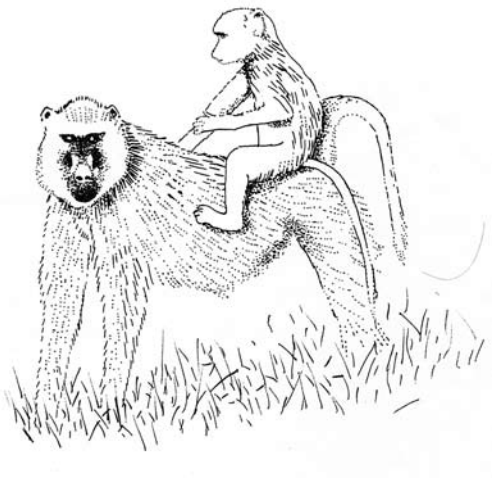
2. This is a female baboon with her young baboon. Baboons live in groups and spend much of their time on the ground moving around and searching for plant and animal food. When they move, the young go with their mother. When they are very young, a youngster is carried underneath and clings on to its mother`s fur as she moves. After a few months the youngster jumps on her back and rides like a jockey.



i) Why do you think youngsters are carried underneath the mother`s body when they are very young?

.....

ii) Why might they switch when they are older and ride like jockeys?

.....

iii) When adult baboons are eating, young baboons often play together nearby. Suggest **one** reason why young baboons play together.

.....

iv) Suggest **one** possible danger to a young baboon when it is playing.

.....

v) Why do young baboons play fairly close to their mothers?

.....

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# Worksheet J: MAMMALS – 4

1. The drawing shows a gibbon. Gibbons are apes that live in forests, spending almost all their time in the tree tops. They are very agile and move easily through the trees. Their arms are longer than their legs and their hands are longer than their feet!

i) How does the drawing suggest that gibbons spend most of their time in the trees?

.....

.....

ii) Gibbons have their fingers hooked inwards. How might this help them when moving through the trees?

.....

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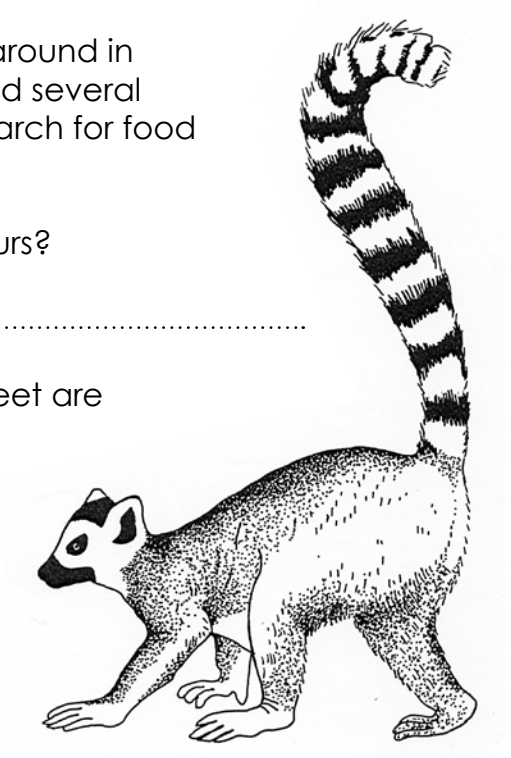
2. Here is a ringtailed lemur. These animals move around in groups made up of adult females, adult males and several youngsters. Ringtailed lemurs live in forests and search for food in the trees and on the ground too.



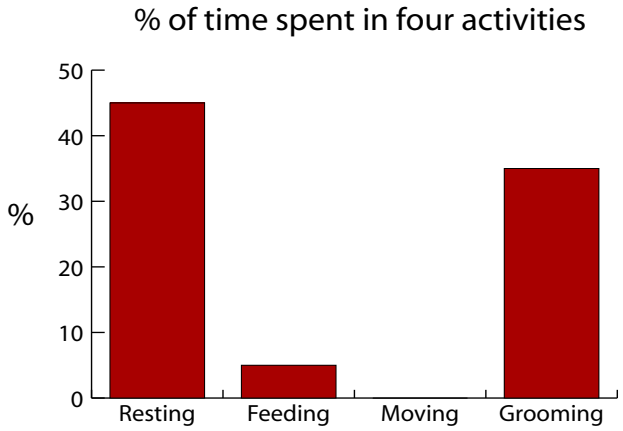
i) Why do you think they are called ringtailed lemurs?

.....

ii) The palms of their hands and the soles of their feet are leathery, a bit like the sole of your trainers! Why would this be helpful to them when they walk and leap from tree to tree?

.....

3. A scientist goes to a zoo to observe ringtailed lemurs as they move around a large outdoor enclosure. He watches one adult male lemur for two hours and records how long it spent feeding, moving, resting and grooming. The scientist then draws a bar chart to show the percentage of time that is spent at each activity.




i) How much time did the lemur spend resting? ..... minutes

ii) How much more time did it spend resting than feeding? ..... minutes

iii) What fraction of the time did the lemur spend grooming? .....

iv) The lemur spent 18 minutes moving around the enclosure. Draw the bar to represent this on the graph.

v) Suggest **one** reason why the lemur may have spent most of the two hours resting.

.....

vi) This study was carried out at a zoo. Suggest **one** advantage and **one** disadvantage of recording what lemurs do in a zoo.

**An advantage is**

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**A disadvantage is**

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# Worksheet K: Speedy movers!

1. Cheetahs are the fastest animals on land and can reach speeds of 112 km/hour. [So cheetahs could travel at the legal maximum speed of a car on the motorway!] However, they can only reach this amazing speed over a short distance. When they get close to the prey they try to trip it up. If they do, the prey animal usually tumbles over.

i) Suggest **two** reasons why tripping the prey helps the cheetah.

a).....

b).....

ii) What possible danger might a cheetah face when it is running at such high speeds?

.....

2) Here is a table showing how fast some animals can run.

| **Animal** | **Speed** (km/hour) |
|---|---|
| cheetah | 112 |
| antelope | 96 |
| lion | 80 |
| rabbit | 56 |
| giraffe | 51 |
| elephant | 40 |
| squirrel | 19 |
| snail | 0.05 |

i) Lions and cheetahs catch, kill and eat antelopes. But, if antelopes can run faster than lions, how can lions ever catch them?

.....

.....

ii) Cheetahs and lions can both run much faster than elephants. Why do lions and cheetahs not chase elephants to catch, kill and eat them?

.....

iii) The table shows that, on average, giraffes can run at a speed of 51 km/hour. Some giraffes would run faster than this and some would be slower. Suggest **three** things that might affect how quickly an individual giraffe would run on any day.

a) .....

b) .....

c) .....

iv) How far could a snail move in 1 hour? Underline the correct answer.

5 m 5000 m 5 km 50 m 500 m

v) If a snail continues to move at 0.05 km/hour, how long would it take it to cover 1 kilometre?

..... hours

**CHALLENGE** - *A rabbit and snail race!*

vi) Imagine that we have a very fast rabbit that can run at 60 km/hour and that it challenges a snail to a 1 km race. The snail begins the race at midday on Tuesday and keeps moving at 0.05 km/hour. The rabbit decides to wait as it thinks that it would be good to beat the snail by just one minute in order to make it an exciting race.

When does the rabbit start running in order to get to the winning post 1 minute before the snail?

It starts running at ..... on Wednesday.

# Worksheet L: Long distance movers!

1. Here is an Arctic tern. It breeds in the Arctic and then spends the summer in and around Antarctica. This tern makes the longest migration of any bird.

i) Using an atlas, find out how long the journey is from the Arctic to the Antarctic. Underline the correct answer.

18 km  180 km  18 million km
18 000 km  1.8 km

ii) How do the wings of the tern suit it to long distance flying?

.....

iii) The birds often cross long stretches of ocean but still manage to feed. What do you think they eat when they feed?

.....

iv) Terns make several stops as they migrate. Why do they do this?

.....

.....

v) Why do you think the terns do not stay in the Arctic during the winter?

.....

.....

.....

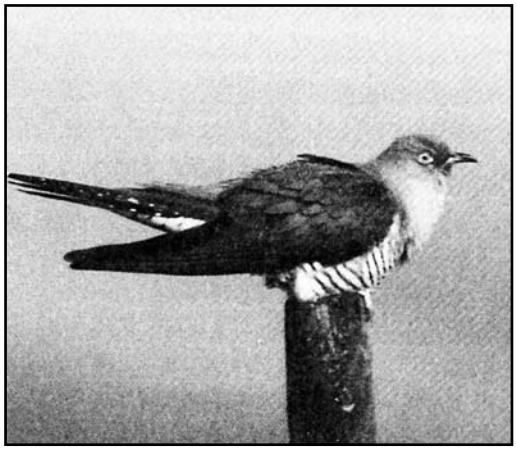
.....

.....

.....

# Worksheet M: Medium distance movers!

1. Here is a cuckoo. Cuckoos spend the winter in Africa and visit Britain in spring and summer to breed. After mating, the cuckoo parents never see their chicks as the female cuckoo lays one egg in each of the nests of several other birds. These other birds rear the cuckoo chicks.



i) Suppose a cuckoo flew from Accra in Ghana to spend the summer in London. Using an atlas, estimate how far that journey would be.

..... km

ii) When a cuckoo chick hatches it is soon very active in the nest. It moves around a lot and if it touches another egg or chick it throws it out of the nest. Why do you think the cuckoo chick behaves like this?

.....

.....

.....

iii) When a cuckoo chick is fully grown it will fly to Africa. However, all the adult birds will already have left Britain yet the chick still manages to fly to Africa. How does it do this? Underline which of the following statements is the best answer.

a) It buys a map and follows the best route to Africa;
b) it follows any other bird it sees flying;
c) it waits for its parents to return next year;
d) it does not need to learn the route to take as it seems to have the correct information already in its brain;
e) it follows signposts on the roads in Britain and Europe.

iv) Name **one** British bird that often raises a cuckoo chick. .....

v) What do we call parents who raise the young of other animals? Underline the answer you think is correct.

a) silly parents b) foster parents c) generous parents d) single parents

# Years 5 & 6 Worksheet N: Fairly short distance movers!

1. This is a pigeon. Some people use the birds in races. The birds are taken to an unfamiliar area, released and then they find their way to their `home`.

i) If a pigeon is released in Paris and then flies home to Birmingham it would make a journey of around 400 km. Pigeons can fly at 96 km/hour. About how long would the journey take?
..... hours

ii) Which of the following might help a pigeon find its way home?
a) rain b) radio messages c) sun and stars d) aeroplanes e) luck

iii) Suggest **two** types of weather that might make it difficult for a pigeon to find its way home.

a) ..... b) .....

iv) In towns, pigeons often move around in flocks. Suggest **one** reason why it might help a pigeon to be in a flock.

.....

2. The roadrunner is a desert bird that can fly but prefers to run! It chases its prey along the ground. The bird eats lizards and snakes.

i) It can run at 42 km/hour. What does this fact tell you about its prey?

.....

ii) The roadrunner can also turn quickly when running. Why might this be helpful to the bird when it is chasing prey?

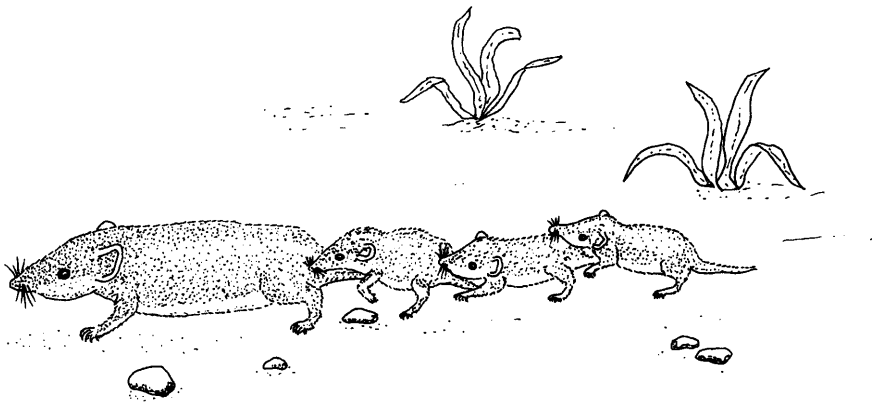
.....

iii) Which sense do you think is really important to the roadrunner when it is chasing prey? Underline your answer.

a) hearing b) smell c) touch d) taste e) sight

# Worksheet O: Short distance movers!

1. European shrews have 4 or 5 young at a time. When they are born they are cared for in the nest but at about 7 days old they join their mother searching for food. When they move from place to place the shrews move in a very unusual way, called `caravanning`.



i) Why do you think the mother and young move like this?

.....

ii) Why do you think this is called `caravanning`?

.....

iii) When the young shrews are around 7 - 8 days old they will grab hold of almost any big, soft object, even a dishcloth! Between 8 and 14 days old they learn to follow and grab either their mother or one of their brothers and sisters.

Which sense do you think they use to recognise and follow the right thing? Underline your answer.

a) hearing b) smell c) touch d) taste e) sight

iv) Why is this the best sense to use to keep close to mum?

.....

.....

2. Here is a duckling. Ducklings also keep close to their mother when they are young, though they do not move in a line like young European shrews!

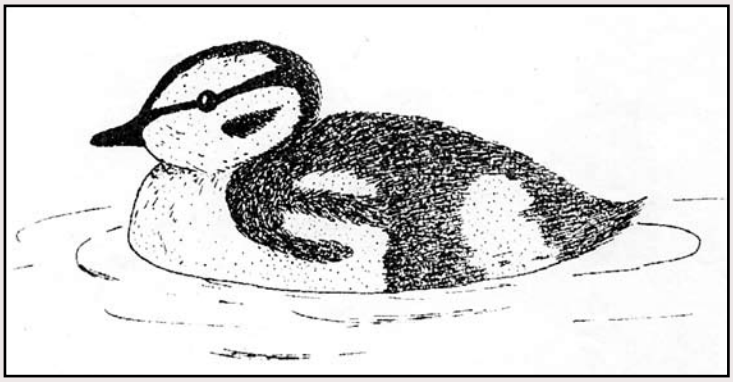
i) Suggest **two** reasons why ducklings stay close to their mother.

a)

.....

b)

.....



ii) Sometimes they ride on their mother`s back on the water. Why is this an advantage for a duckling?

.....

.....

iii) Ducklings learn to follow the first big, moving object they see shortly after they hatch. Usually this is mum! This way of staying close to mum has a special name. Try to find the name in a book or on the Internet.

Fill in the missing letters:

i m p _ _ _ t _ _ g

## CHALLENGE

*Mum`s the word!*

3. i) Sometimes scientists study very young children to see how close they like to stay to their mother. Usually the studies are done in a room in which there is a chair on which mum sits and there are lots of toys on the floor for the child. After mum and the child have been in the room for a while a stranger comes in and sits in another chair.

Describe what you think the scientists might do to see how close a child stays to its mother.

.....

.....

ii) Suggest **one** other measurement that scientists might make to record the behaviour of the baby when a stranger comes into the room.

.....

.....

# Worksheet P: Animals that rarely move

1. During the day, most moths don`t fly. They find a place to rest and keep very still. Some moths rest on trees, some on walls, some on buildings and some on the ground.

i) If you can spot the moth that is resting on the tree in the photograph, trace around the edge of the moth using a piece of tracing paper.

ii) Why do you think this is a good place for a moth to rest?

.....

.....

iii) Why do moths want to keep still during the day?

.....

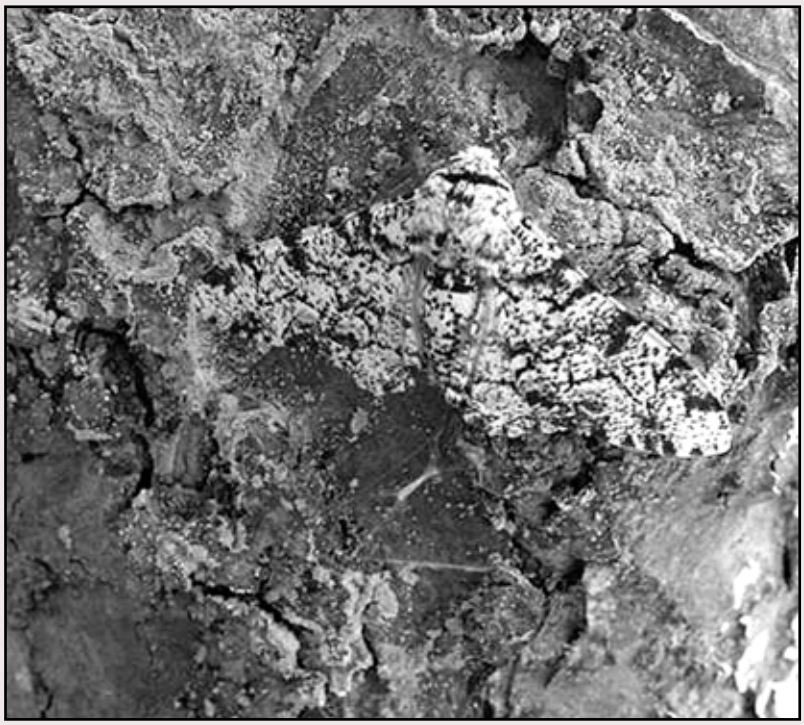
.....

iv) Moths might occasionally move during the day. Suggest **one** reason why a moth might move during the day.

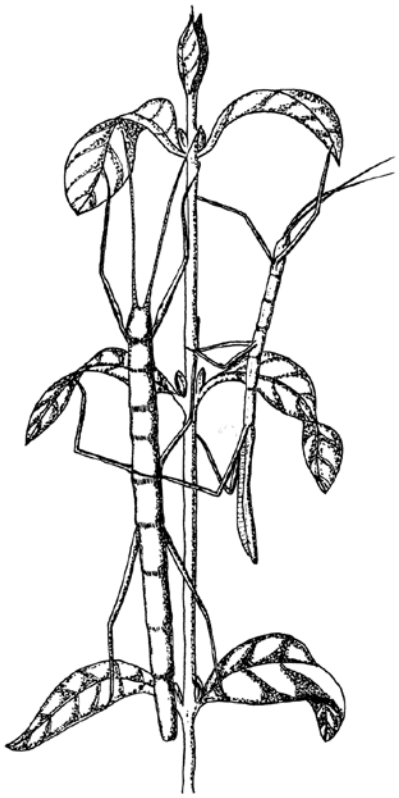
.....

.....

.....



2. Here are two stick insects. Stick insects generally keep still but if they are attacked by a predator they often simply fall off the tree or bush they are resting on.



i) Why do you think they are called stick insects?

.....

ii) How would falling off a tree help a stick insect?

.....

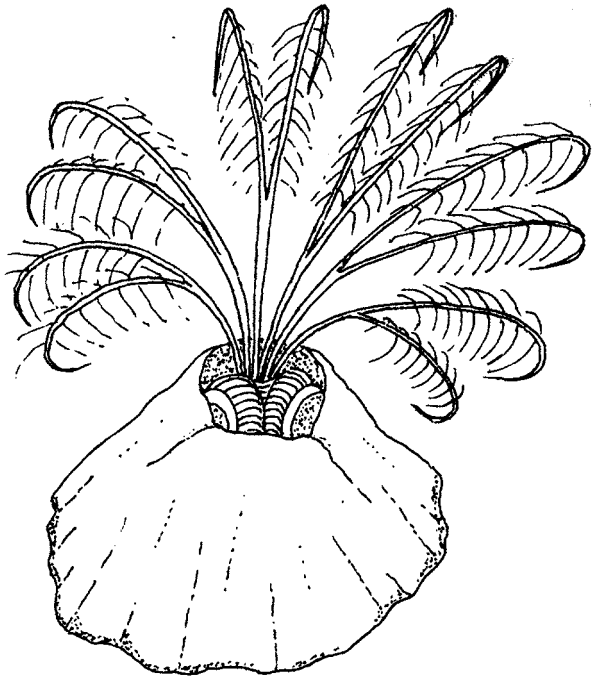
.....

.....

.....

# Years 5 & 6 Worksheet Q: Animals that never move!

1. Here is a barnacle. Barnacles are animals that stick themselves to rocks, piers, walls, the hulls of ships and even the shells of crabs! Adult barnacles have tough shells that protect their soft bodies underneath. They feed by putting out feelers to trap small particles of food that are floating in the sea and are moved around by the waves. They pull their feelers in if danger threatens or when they are not feeding.



i) Why can barnacles stay in one place rather than go and look for food?

.....

ii) Why do barnacles need to be stuck down really well?

.....

iii) Suggest **one** advantage and **one** disadvantage for a barnacle that is stuck on to a crab`s shell.

a) An advantage would be

.....

b) A disadvantage would be

.....

iv) Underline the best explanation for how barnacles stick to rocks.

a) they buy some super-glue in a shop;
b) they produce their own cement-like glue to stick to a rock;
c) they stick where oil has coated a rock;
d) they find a spot where another barnacle has lived;
e) they search for rocks and walls that have been freshly painted.

1. The skeleton protects our body parts, supports our body and lets us move around. It is the muscles and joints that let our bodies move. Muscles work in pairs and as one contracts (gets shorter) the other stretches (gets longer or relaxes).

i) What job do the joints do?

.....

.....

ii) Name **three** of the joints in the body.

a) .....

b) .....

c) .....

iii) Why are the leg muscles bigger than the arm muscles?

.....

iv) Write down **one** difference and **one** similarity between the leg and arm bones.

A difference is

.....

A similarity is

.....

2. i) Draw the outline of your left foot and your left hand on a sheet of 1 cm graph paper. Keep your sock on when drawing around your foot!

a) What is the area of your foot? ..... $cm^2$

b) What is the area of your hand? ..... $cm^2$

c) Which is larger and explain why?

.....

3. When you exercise, muscles have to work harder.

i) Which of these **two** things happen when you exercise? Underline the correct answers.

a) Your heart beats faster or your heart beats more slowly.
b) You breathe faster or you breathe more slowly.

ii) Complete this sentence by crossing out the wrong words.

The fitter we are the faster/slower our heart beats and the faster/slower our heart beat returns to normal when we stop exercising.

4. Some humans can run faster than other humans. Give **two** reasons why some people can run faster than others.

i) .....

.....

ii) .....

.....

**CHALLENGE** *Jump to it!*

5. Children want to see if taller pupils can jump further than shorter pupils when they are standing on a line with both feet together. Describe how they could carry out such a study.

.....

.....

.....

.....

.....

# Puzzle sheets

## *Years 3 & 4*

*A How do these animals move? Track down the animal.*

*B Be an insect detector!*

*C Design a fly!*

*D Have a go at being a sheepdog!*

## *Years 5 & 6*

*E Watch the birdie!*

*F Snakes alive!*

*G All very fishy!*

*H A speedy bird!*

*I Birds of a feather*

*J Quiz 1 - How many legs?*

*K Quiz 2 - Miscellaneous.*

## How do these animals move?

1. Here is a list of words that describe movement. From the list, choose **three** different words for each animal that could describe how it moves.

| | | | | |
|---|---|---|---|---|
| climb | hop | slither | amble | charge |
| stroll | run | wriggle | somersault | fly |
| leap | swim | stalk | glide | walk |
| sneak | crawl | jump | cruise | slide |
| race | chase | bob | pounce | |

### Animals

worm ..... ..... .....

elephant ..... ..... .....

shark ..... ..... .....

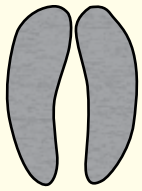
robin ..... ..... .....

cheetah ..... ..... .....

## Track down the animal.

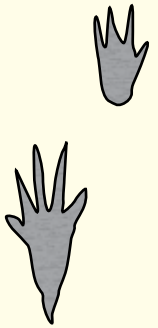
2. Here are some animal tracks. Match each track with the correct animal.

**Track A**
2 toes on each of its 4 feet



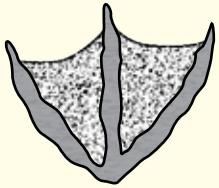
**Track B**
5 toes, with claws, on each of its 4 feet

**Track C**
2 front feet with 4 toes 2 back feet with 5 toes



| Animal | Track |
|---|---|
| badger | ☐ |
| duck | ☐ |
| cow | ☐ |
| rat | ☐ |

**Track D**



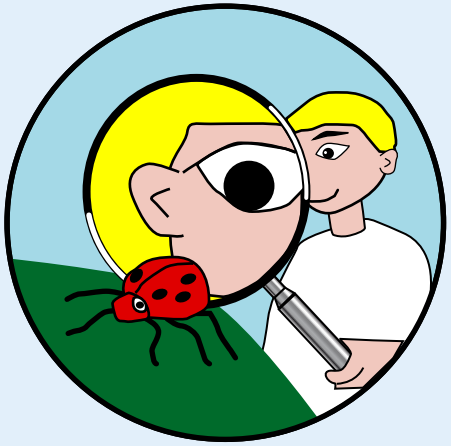
## Be an insect detector!

Try to find the flying, jumping, crawling insects that are hidden in these sentences.

For example:

The old lady, bird`s wing and green arches are the names of three British moths.

(ladybird or ladybirds)

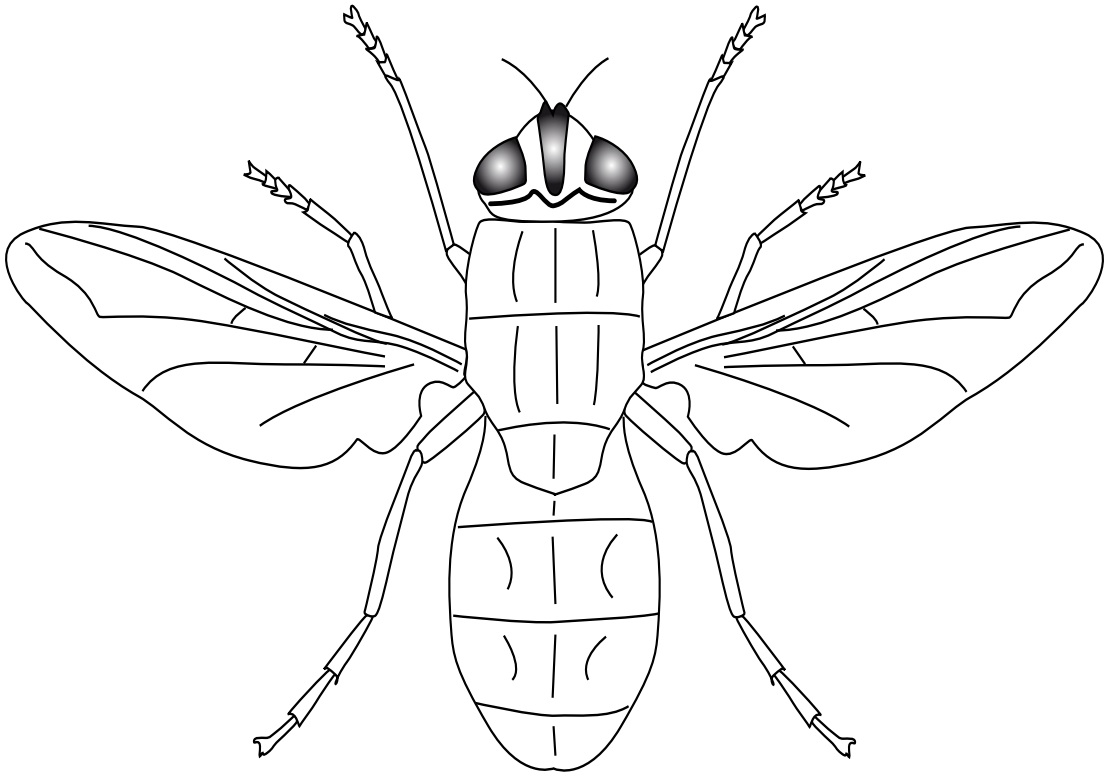


1. "She was probably our best player", said the manager. (.....)
2. Egg and bacon has always been my favourite breakfast. (.....)
3. Elephants are sometimes seen in circuses. (.....)
4. Torn, dawn, corn, lawn, horn, etc. are words that rhyme. (.....)
5. Mother, father and their two children got on the train. (.....)
6. Drinks can be bought in blue bottles and in red ones. (.....)
7. Bib, ugly and hot are easy words to spell. (.....)
8. "Do you like trifle?" asked the waiter. (.....)
9. Sign at the bottom of the piece of paper. (.....)
10. If you see a grizzly bear wiggle your ears, it scares them. (.....)

## Design a fly!

Adult flies have
- 6 legs
- 2 wings
- 3 body parts (head, thorax and abdomen)
- often large eyes
- usually feed on liquid food.

1. Using the large fly outline, colour your fly and give it a name. Add other bits too if you want, for example, an extra antenna to detect spiders!



2. Flies sometimes land on a ceiling. Why don`t they fall off?

## Have a go at being a sheepdog!

Search for some sheep. There are 8 different breeds of sheep hidden in the word search. The words may run horizontally, vertically or diagonally and may be forwards or backwards. Find the breeds and circle your answers.

The breeds are:

Clun,

Herdwick,

Swaledale,

Southdown,

Suffolk,

Blackface,

Romney,

Cheviot.

| S | P | V | G | W | C | I | R | H | S |
|---|---|---|---|---|---|---|---|---|---|
| W | O | Y | O | Z | L | H | P | E | U |
| A | H | U | A | M | U | L | C | R | F |
| L | Y | C | T | S | N | A | U | D | F |
| E | U | H | X | H | F | M | X | W | O |
| D | A | O | J | K | D | B | J | I | L |
| A | B | P | C | N | X | O | L | C | K |
| L | D | A | Z | F | V | M | W | K | O |
| E | L | R | O | M | N | E | Y | N | P |
| B | Q | Q | T | O | I | V | E | H | C |

1. How can you tell from the photograph that a sheepdog can run and walk many kilometres in a day rounding up sheep on the hills?


2. Give **two** reasons why farmers often use dogs, not tractors, to move sheep.

i)

ii)

3. Make a list of all the names of the dogs belonging to pupils in your class. Your teacher will give you a list of names that farmers often call their sheepdogs. Why do you think sheepdogs don`t usually have pet names?

# Watch the birdie!

Here is a list of birds whose names include a type of movement.

Black-throated Diver

Dipper

Pied Wagtail

Treecreeper

Turnstone

Mandarin Duck

For any **one** of these birds in the list:

1) Provide 3 facts about it.

a)

b)

c)

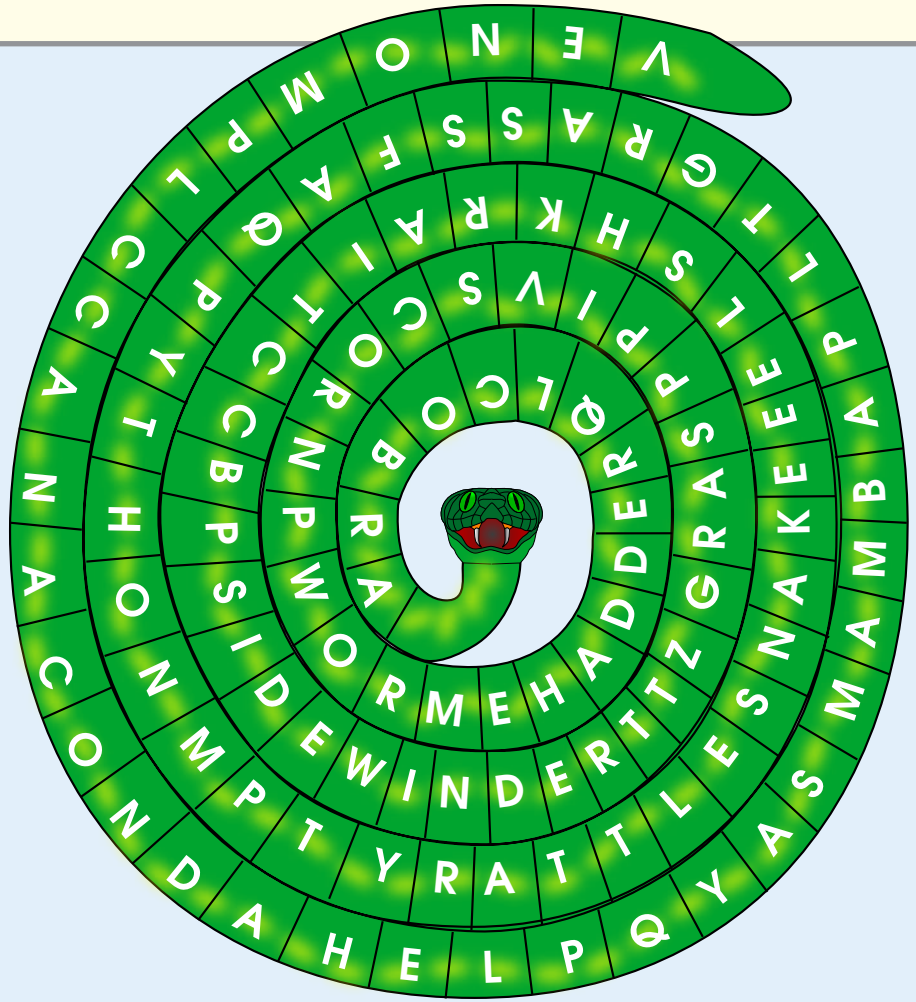
2) Make up the name for an imaginary bird that moves in a special way. For example, the upside-down owl, named because it flies upside down!

Draw your bird in the space here, using coloured pencils or pens to show the colours of its feathers.

3) Explain why the bird has this name.

## Snakes alive!

1. Starting at the tail and using 2 different coloured pencils, find the consecutive letters that are the names of types of snakes from around the world. There are 11 in all. After you have coloured the letters of the first snake, choose the other colour for the second snake and so on.




2. Write down **three** words to describe how snakes move.

a) .....

b) .....

c) .....

3. Make a record card with five fascinating facts about **ONE** of the snakes in the snake spiral.

***Five fascinating facts about ...***

1.

2.

3.

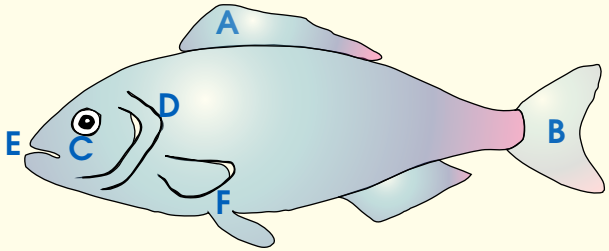
4.

5.

## All very fishy!

1. Here is the outline of a fish.

Identify the six parts, labelled A - F.




The missing labels are: tail fin, eye, dorsal fin, mouth, pectoral fin, gills.

A is the …….. B is the ……..

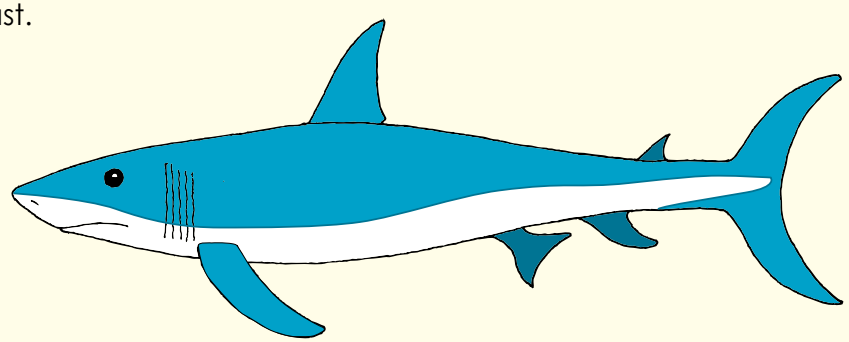
C is the …….. D is the ……..

E is the …….. F is the ……..

This table shows how fast some fish can swim (in kilometres per hour).

| | |
|---|---|
| Sailfish | 105 |
| Mako Shark | 96 |
| Marlin | 80 |
| Bluefish Tuna | 70 |
| Blue Shark | 69 |
| Swordfish | 64 |

2. Here is the outline of a Mako Shark. Explain why it can swim so fast.



3. Describe how scientists could measure how fast a fish can swim.

# A speedy bird!

Here is a drawing of a speedy bird, the roadrunner. (You might have seen it in a cartoon!) It is an unusual bird because it prefers to run or walk rather than fly: it can run up to 27 km per hour. It lives in desert areas of North America and nests in bushes or low trees.

1. It eats lizards, snakes, rodents, birds and insects. Is it a carnivore or a herbivore?

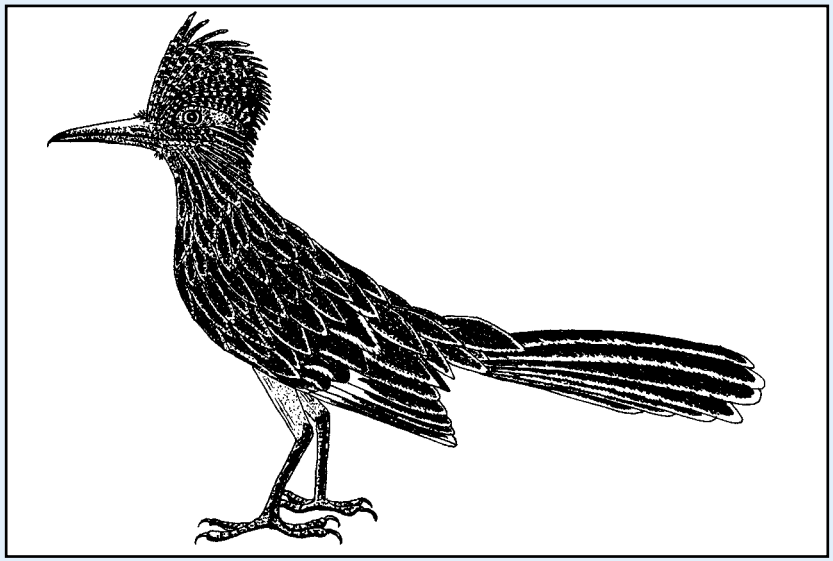
It is a .....

2. **One** snake it might eat makes a noise if it is threatened. Fill in the missing letters to make the name of the snake.

r a _ _ l e s _ _ _ e

3. Roadrunners can fly and do so occasionally. Suggest **one** reason why they might fly?

4. How can you tell from the drawing that the bird can run quickly?



5. Name **two** birds that cannot fly. Write down **two** facts for each bird.

a) ..... can`t fly

i)

ii

b) ..... can`t fly

i)

ii)

## Birds of a feather.

Try to find the names of these birds by putting one letter in each gap.
Use the clues to help you find the birds.

| | |
|---|---|
| 1. R _ _ _ N | Comes bob, bob, bobbing along at Xmas. |
| 2. B _ _ _ /_ I _ | A small bird with a blue head, wings and tail, often at garden feeders. |
| 3. M _ G _ _ E | A large, black and white, noisy bird with a long tail: eats eggs and young of other birds. |
| 4. H _ B _ Y | Is this bird of prey a leisure activity? |
| 5. A V _ _ _ T | A black and white bird with an upturned beak. |
| 6. B _ _ _ K _ I _ _ | Dark coloured bird, yellow beak, eats worms, often seen in gardens. |
| 7. T _ _ N _ T _ _ _ | Coastal bird, finds food under pebbles! |
| 8. P E _ _ G _ _ _ _/ F _ L _ _ _ | Fastest of all birds, catches pigeons. |
| 9. S _ A _ L _ W | Gulp! A summer visitor with a long, forked tail. |
| 10. L _ P _ _ _ G | Also called a peewit: seen in fields and farmland, it has a crest of feathers on its head. |
| 11. W _ E _ | A tiny, brown bird with a turned-up tail. |

The letters in the box spell out the name of a bird which visits Britain in summer.

nliighaentg n i _ _ _ _ _ _ _ l _

Draw the bird here.

Write down **2** facts about the bird.

a) .....

.....

b) .....

.....

## QUIZ 1 - How many legs?

[Each dash is one letter]

1. What is Britain`s only **legless** lizard?

s l _ _ - w _ _ _

2. What is the name of the large pink bird we can see in zoos that often stands on **one** leg?

f _ _ _ _ _ _ o

3. Which **two-legged** summer visitor to Britain is very colourful and its name suggests it feeds on stinging insects?

b _ _ - e _ t _ r

4. What is the commonest **two-legged**, non-human, creature in Britain?

c h i _ _ _ _

5. What is Britain`s largest **four-legged** wild creature?

r _ _ d _ _ _

6. What is the name of the **six-legged** carnivorous bug found in ponds that swims upside down (its less common name is the backswimmer)?

w _ t _ r b o _ _ _ _ n

7. What is the name of the animal that has **seven pairs of legs** and is found in dark, damp places, e.g under stones?

w _ _ _ l o _ _ e

8. What was the **eight-legged** creature that frightened Miss Muffet?

s _ _ _ _ _

9. What animal with **eleven pairs of legs** lives in saltwater and eats algae?

b r i _ _ s h r _ _ _

10. What are these two **multi-legged** animals?

a) A carnivorous animal found in soil and leaf litter?

c e n _ _ _ _ _ _

b) A herbivorous animal found in soil and leaf litter?

m i l _ _ _ _ _ _

11. There are a few birds that can be seen in Britain that have a leg, or part of a leg, in their name: for example, the Rough-**legged** Buzzard.

Try to find the names of the birds with these leggy connections.

a) P i n k - f o _ _ _ _ Goose

b) R e d _ _ _ n k (a wading bird)

c) R e d - l e _ _ _ _ Partridge

d) G r e e n _ _ _ n k (a wading bird)

## QUIZ 2 - Miscellaneous

1. Which mammal is the fastest land animal?

c _ _ _ _ _ _ _

2. Which animal is the fastest bird?

p e r e _ _ _ _ _ f _ _ _ o n

3. When predators catch some prey animals the prey often pretend to be dead! [This is called lying doggo!] Why do they do this?

4. Why should centipedes not really be called centipedes?

5. Name **three** species of birds that migrate to Britain in **summer**.

a) ..... b) ..... c) .....

6. Name **three** species of birds that migrate to Britain in **winter**.

a) ..... b) ..... c) .....

7. Which tropical bird can actually fly backwards?

h u m _ _ _ _ _ _ _ _ _

8. Which town in the county of Surrey nearly describes how a caterpillar moves? (Make sure you spell the town name correctly.)

C r a _ _ _ _

9. How, according to a popular song that people sing at Christmas, do robins move?

b _ _ b _ _ b _ _ _ _ _ _ _

10. Which bird of prey do we sometimes see hovering along the sides of a motorway looking for prey?

k e _ _ _ _ l

11. Which British carnivore moves on land and also in the water, where it finds its main prey, fish?

o _ _ _ r

12. Which black and white British bird has a name that describes how it finds its food by going under the water in mountain streams?

d i p _ _ _

13. Most animals generally move forwards but a few move sideways. Name **two**.

a) ..... b) .....