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CREATURE FEATURE

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Greenfly to take over the world

Ants the biggest family in the world

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INTRODUCTION...

Welcome to the 'Real Bugs' resource pack!

BACKGROUND

In 1999 Dr Karen Gresty, Mr Peter Smithers and Professor Leslie Ebdon, of the University of Plymouth, were awarded a grant from the Biotechnology and Biological Sciences Research Council (BBSRC) to develop a puppet show with Jacolly Puppet Theatre company. Centred around minibeasts and with a large woodlouse puppet, Oniscus, as the star of the 40-minute show, the children were introduced to scientific concepts like biodiversity, food chains and eating mechanisms. 'Real Bugs' was first performed in the Main Hall of the University of Plymouth on 4 October 2000. The show was performed in front of Mount Street Primary School, with a selection of teachers and Kelvin Boot (National Marine Aquarium Education Officer) and Helen Fothergill (Plymouth City Museum Education Officer). Both Kelvin and Helen were so impressed with the show that they made arrangements for the show to perform at their venues.



Jacolly Puppet Theatre present "Real Bugs"

A teaching resource pack accompanied the show and this has now been developed as a standalone pack. Jacolly Puppet Theatre have included a new section in the pack showing you how to develop your own puppet show, including a variety of

short scripts, although they are happy to take bookings to perform the full version of 'Real Bugs' at your school.

Contact: Jacolly Puppet Theatre, Kirkella Road, Yelverton, Devon PL20 6BB Tel:/Fax: +44 (0)1822 852346 E-mail: theatre@jacolly-puppets.co.uk www.jacolly-puppets.co.uk Directors: Jacqueline llett and Holly Griffin





HOW TO USE THE RESOURCE PACK

'Real Bugs' resource pack

The activities and information contained in this resource pack can be used in any order, or as stand-alone activities. The resource is aimed at primary school teachers, for use with Key Stage 2 children (although some activities may be appropriate for Key Stage 1 as well).

Through the activities in this pack, children can be introduced to the world of invertebrates. Invertebrates are often referred to as minibeasts and the activities in this pack reflect this trend. It is up to the teacher whether the correct term – **invertebrate** – is used from the outset or whether they introduce the correct terminology as teaching progresses.

These activities cover a wide range of curriculum aspects, from science to numeracy, from literacy to art. They lend themselves to the study of biodiversity from a variety of different perspectives; introducing children to the world of minibeasts found in their own local environments.

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Yes you can photocopy this pack!

The contents of this pack may be photocopied for use within an educational institution.





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Curriculum Links

This pack has been designed to be used in direct support of Science in the National Curriculum for 7 to 11 year olds at Key Stage 2 for England, Scotland, Northern Ireland and Wales. However many of the activities would also work well and link to the Curriculum for Key Stage 1. Many thanks to the Royal Highland Education Trust for advising on the Curriculum links for Scotland.

Specific areas are:

ENGLAND

- Sc1 Investigative skills, h, Obtaining and presenting evidence
- Sc2 Life processes and living things 1 c, Life processes; 4 a, b & c Variation and classification; 5a, b, c, d & e, Living things in their environment, Adaptation, Feeding relationships

NORTHERN IRELAND

- Investigating and Making in Science and Technology
- Knowledge and Understanding of Science and Technology *Living Things, Animals and Plants, a, b, d, e & i*

SCOTLAND

• Knowledge and understanding - living things and the processes of life Variety and characteristic features, level A, B & C; The processes of life, level A; Interaction of living things with their environment, level A & B

WALES

- Scientific enquiry 2, Communication in science
- Life processes and living things
- 1.1, Life processes; 4.1, 4.2, 4.3, 4.3, 4.5, Adaptation, Feeding relationships, Variation

The pack also has many cross-curricular themes and links well with other areas such as English, Art & Design, ICT and Mathematics.

We have introduced different ways of catching minibeasts based on methods used by scientists and including a student tally chart to encourage the class to record what they have caught.

The minibeast mouthparts and the spot the difference sections include high magnification pictures that can be used in classroom displays. These sections can be introduced by comparing minibeasts to ourselves.

The set of 16 minibeast cards can be used to introduce food chains and webs and minibeast features. The identification keys can then be used to identify the minibeasts on the cards or minibeasts that have been found locally.

The OHP shadow puppets and the plays link well together, covering not only art and design and science, but also including English and drama. You may like to compare 3D and 2D objects in design by making the minibeast models.

If you would like to take this topic further, the class can find minibeast web sites on the computer, or use the minibeast book lists for English.



How to Collect them Safely!

As minibeasts are very small they can hide in tiny nooks and crannies and are not easy to spot. This means you will have to use special bug hunting equipment in order to find the many different kinds of minibeasts that share the school grounds with you.

WHAT IS SAFE TO COLLECT?

Almost every UK invertebrate is 'safe' to collect – if it is collected in the correct way. There are however a number of organisms which are capable of biting, stinging or causing irritation: bees and wasps, ants, dragonflies and dragonfly larvae, caterpillars which have long hairs that can cause irritation e.g. Garden tiger moth, Greater water boatmen, locusts, ladybirds, some species of spider and some species of centipede.

The best solution is, where possible, to study the invertebrate in its natural environment. If invertebrates are collected and removed from their natural environment for short periods of study, it is important that children understand that the animals must be returned to their place of origin as soon as possible. If invertebrates are kept overnight (which is the maximum time that they should be kept) it is important they are held in a secure, moist (but not wet) environment and that food is provided if necessary.

The ASE 'Be Safe!' booklet which covers aspects of safety in school science and technology lists suitable invertebrates for study, including: earthworms, slugs and snails, woodlice, Indian stick insects, Pink winged stick insects and Australian spiny stick insects, meal worm beetles, and some butterfly and moth larvae where their food is available (but not those which are hairy).

The safety booklet also includes the following advice: The children should always wash their hands before and after handling animals. The animals should not be allowed to wander on floors or tables unless these are cleaned afterwards. Consider the safety and well-being of the animals and teach the children to handle them with due care.

Bearing all of this in mind you should now be prepared to go out and hunt some minibeasts!





THE POOTER OR BUG ZAPPER

These help you to pick up delicate minibeasts without squashing them. There are different types of pooters. This pooter can be made quickly using a piece of transparent plastic (neoprene) tubing with an 8 mm inside diameter, connected to a length of soft rubber tubing with a 6 mm inside diameter, using a tubing adapter (available from most science equipment suppliers). A piece of fine mesh is placed between the tubing adapter and the transparent tubing. The rubber tubing is placed in your mouth and the minibeasts are sucked into the clear tubing with short sharp sucks. They cannot get into your mouth as they can not get past the mesh. Don't forget to place something over the end to stop the beasts escaping.



- Do not share pooters
- Do not pooter ants or wasps

BUG TUBES

Once you have caught a minibeast you will need to place it in a container. Old film canisters are ideal for this and can often be obtained free of charge from most film processing shops. Remember, if you are keeping your minibeast overnight you must either provide some air-holes in the canister, or replace the top with a mesh cover. If you are only keeping your minibeast for a few hours, it will have plenty of air.



HUNTING MINIBEASTS - How to Collect them Safely

THE BUG BROLLY

An old umbrella is ideal; a light colour is best as the minibeasts are easily seen against the light background. You will also need a stick about half a metre long. Open the umbrella and hold it under a tree or bush or alongside a patch of long grass. Tap the foliage sharply three or four times towards the bug brolly and the minibeasts that are living on the plants will fall into the umbrella. These can then be sucked up using the bug pooter and transferred into a tube to look at.

PITFALL TRAPS

Pitfall traps can be made easily using plastic coffee cups. These are buried in the ground so that the tops are level with the surface of the soil. It is important to make sure the rim of the cup is flush with the ground, as although it seems a small step for us it would be a giant step for the minibeasts. Minibeasts that are walking around near your pitfall trap will fall into it. It is important to check the traps at least three times a day otherwise the larger animals will eat the rest of your catch. You may also want to make a small hole in the bottom of your cup so that rainwater can escape (although it is better to catch your minibeasts on a dry day). Once you have finished using the pitfall trap, fill in the hole so that other minibeasts don't fall into it.





PAGE

Plastic coffee cup

Real Bugs

TULLGREN FUNNELS

Find a garden sieve that fits on top of a round washing up bowl. Place lots of damp kitchen roll in the bowl and fill the sieve with leaf litter. Shine a desk lamp on the litter (about 15 cm away) and leave it for two to three days, checking each day that the kitchen roll is still wet. Many of the minibeasts living in the leaf litter will have moved away from the light and fallen out of the sieve into the bowl, so by looking amongst the kitchen roll you will find lots of interesting animals. Some of them will be very small so look carefully.



LITTER SIEVING

This is a quick version of the Tullgren funnel but without the lamp. Place a handful of litter in a sieve and shake the sieve over a white plastic sheet. Lots of rubbish and minibeasts will fall through onto the sheet. These can be collected with your bug pooter and placed in pots for viewing.

SEARCHING UNDER STONES AND LOGS

Many minibeasts can be found under stones and logs. Typically these animals are active at night when the air is cool and damp, returning to hide under logs and stones during the day when it can be hot and dry. Carefully turn over the log or stone, being sure to look on the underside of the stone as well as the ground beneath it. Always replace the stone afterwards.

MINIBEAST HUNTING WORKSHEET

The one-page student worksheet can be used by the pupils as a permanent record of their minibeast hunt. We've asked them to record the name of their minibeasts, where they found them and how many they found on a tally chart. If they haven't used a tally chart before you may need to explain how these are used. This will lead them logically to the bar chart which can be completed and kept in their science books.



Name: _____

HUNTING MINIBEASTS TALLY CHART

Class: _____

Complete the tally chart below adding your own minibeasts and habitats.





PAGE TEN

Complete the bar chart below using the

How do Minibeasts Eat?

Now you have collected some minibeasts, this is an interesting extension activity that looks "close-up" at how minibeasts eat. Peter Bond of the University of Plymouth has provided electron micrographs of minibeast heads which are much larger than the real thing.

Each electron micrograph picture has a dotted line that can be folded to cover up the text so that the class can guess what the minibeast is and how it eats before the answer is revealed. These pictures make a stunning classroom display. We have included extra electron micrographs with the "Real Bugs" downloads in the resources section of our website that you may like to download to add to your display.

This topic can be introduced by comparing how we eat to how insects eat, or by looking at the differences between different insects.

Minibeasts have an amazing variety of different types of mouthparts. They range from thin tubes to suck up fluids, to razor sharp scissor-like blades used for cutting up their prey. The type of mouthpart that they possess depends on the kind of food that they eat. Each minibeast has the perfect mouthparts to deal with the particular kind of food that it eats. Minibeasts do not have hands to pass food to their mouths, so instead some minibeasts have tiny leg like structures on the underside of their heads that can manipulate food into their mouth. These are known as palps.

PLANT SAP SUCKERS

These have long thin pointed mouthparts, like a hollow needle that they stick into the plant and suck out the sap. These thin pointed mouthparts are called stylets. However not all of them actually suck the sap. Some pierce the main sap supply in the stem where the sap is under pressure. This is like making a hole in a hose-pipe and drinking the water that squirts out. The plant pumps the sap up the insect's stylets, so they are fed automatically.

e.g. Shield bugs, aphids and froghoppers.





DAGE

ANIMAL SUCKERS

These insert long pointed mouthparts into another animal and suck out the body fluids. Animal suckers that feed on other minibeasts inject their saliva into their prey before they begin to feed. This begins to digest the inside of their prey so that the contents can be sucked out easily.

e.g. Assassin bugs.

NECTAR FEEDERS

Butterflies and moths have mouthparts like a long coiled tube, which is used to drink nectar from flowers. They stand on the edge of a flower, uncoil their tongue and stick it into the nectar source. Bees have a short tongue so they have to crawl inside the flower to remove nectar.

BITERS AND CHEWERS

These are mainly plant eaters (herbivores) which bite small pieces of the food from the plant and pass it into the mouth.

e.g. Grasshoppers, crickets and caterpillars.

SLOBBERERS

These are mainly flies. They suck semi-liquid foods into their mouths with a hoover-like proboscis. Most of these vomit the contents of their foregut down the hoover first, where it starts dissolving the food, making it easier to suck up.

RIPPERS AND TEARERS.

These use their large sharp tooth-like mandibles to tear their prey into small pieces, which are then passed into the mouth.

e.g. Beetles and Ants.

GRASPERS AND CRUSHERS

These are the spiders. The prey is grasped with the fangs and poison injected into it. Some spiders crush their prey whilst vomiting digestive juices over it. Other spiders squirt their digestive juices in through the holes made by the fangs and suck the fluids out again, leaving an empty shell behind.

SCRAPERS

These are the slugs and snails. They have a tiny tongue that looks like a nail file. The tongue of slugs and snails is known as a radula. This is used to scrape thin layers off the surface of plants on which they feed.







SHIELD BUG HEAD

Shield bugs have long thin piercing mouthparts known as a rostrum. These are held flat against the underside of the body when the insect is not feeding.





FOLD OVER

MINIBEAST MOUTHPARTS - How do Minibeasts Eat?



GRASSHOPPER HEAD

Grasshoppers have what look like 2 pairs of small legs (known as palps) on either side of their mouth. They use them to hold their food while they are eating.

FOLD OVER

FOLD OVER



GROUND BEETLE HEAD

Ground beetles have huge jaws that they use to tear open their prey.

FOLD OVER

FOLD OVER



MINIBEAST MOUTHPARTS - How do Minibeasts Eat?



ANT HEAD

Ants have large biting and tearing mouthparts known as mandibles. These often have sharp teeth on the cutting edge.

FOLD OVER



FOLD OVER

MINIBEAST MOUTHPARTS - How do Minibeasts Eat?

SPOT THE DIFFERENCE....

...between Minibeasts and Us



There are lots of small grooves on the end of the **proboscis**, which help to spread the fly's digestive juices evenly over the food.

FOLD OVER

The eye of the House Fly

FOLD OVER

PAGE

SEVENTEE

s digestive food.

HOUSE FLY HEAD

MINIBEAST MOUTHPARTS - How do minibeasts eat?

SPOT THE DIFFERENCE...

... between Minibeasts and Us

SIZE

Minibeasts are much smaller than us, so they can live, seek shelter and hunt for food in places that we cannot fit into. This means that minibeasts have a greater choice of habitats and food to chose from.

SKELETON

Minibeasts have a hard exoskeleton, which acts as a tough outer skin that protects and supports their body. We have a set of bones that support and protect all of our organs and which stops us collapsing in a heap on the ground. Our skin is not very tough, as it is thin and flexible. A good way to think of the difference is to imagine humans and other vertebrates as a clothes hanger with our organs and muscles attached to it. Our skin is a flexible and waterproof bag that protects our insides from the outside world. The minibeasts are more like tin cans with a tough outer shell, in which their internal organs are safely stored.

BLOOD SUPPLY

We have a heart that pumps blood around a series of veins and arteries to ensure that blood reaches every part of our bodies. Minibeasts are more like an aquarium, with a pump in one corner that circulates water around the tank. They have a heart but no veins and arteries, the heart pumps their blood around a large open space inside their exoskeleton.

BREATHING

We breathe air by pulling it into our lungs, which then extract the oxygen from it. The used air is then blown back out of our bodies. Minibeasts have a series of fine tubes that run throughout their bodies, these are known as tracheae. Air diffuses into these tubes and the minibeasts use the oxygen it contains. But as they need very little oxygen compared to us they are able to wait for more oxygen to diffuse down the tubes when they need it.

BODY TEMPERATURE

Our bodies maintain a constant temperature so that no matter what the weather we are always able to move around. Minibeasts are dependent on the temperature of the air, if it is too cold they can not move quickly and may not be able to move at all. As the air warms up they are able to move and the hotter the air becomes, the faster they can move.

THE EYE OF A HOUSE FLY

Flies see the world very differently to humans. They have many hundred six sided lenses in each eye which produces a fuzzy image of the world in front of it. Each of these lenses is at a different angle and produces a slightly different view of the world around it (some of them are looking backwards). So the fly has to put all these images together just like a jigsaw puzzle and build up a complete image of its surroundings. Whilst a fly's eye does not produce a clear image it is very good at detecting movement.





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MINIBEAST CARD ACTIVITIES...

Some of the minibeasts and plants that you may have found on your minibeast hunt, have been printed onto the following two sheets. These have a picture of the minibeast or vegetation type on the front (drawn by Gareth Prowse, University of Plymouth) and a description of the main characteristics of the minibeast or plant on the reverse. By cutting along the dotted lines you should have a set of 16 cards ready to use in the classroom activities below.



MINIBEAST CARD FOOD CHAINS AND WEBS

The minibeast cards are an excellent way to look at simple food chains and webs (for more food chain activities you can order the BBSRC Minibeast Discovery Pack from the BBSRC Schools and Community Links Officer). **Food chains** show who eats what! Introduce the concept that a food chain will always start with a plant, the **producer**. Explain that plants grow using energy from the sun, and that each time something is eaten, the energy from the sun is transferred to the next link in the food chain.

Ask the class to read the information on the back of the minibeast cards, lay the cards on a sheet of paper and put them in order to make a chain of who eats what. Ask the class to be creative and think of different pathways.

A simple food chain could be:



You could also ask them to write out their food chain, for example "Plants grow using energy from the sun, caterpillars eat the leaves of plants, spiders eat the caterpillars and birds eat the spiders. Caterpillars, spiders and birds are all consumers."

Another food chain could be:



This may be more confusing as it starts with dead plant material, but it is equally valid. If the pupils wrote this out it, they may say "Plants grow using energy from the sun, then the plants die and fall to the ground, where they form part of the litter layer. Springtails eat the dead plant material, centipedes eat the springtails, ground beetles eat the springtails and birds eat the ground beetles."

PAGE

NINETEEI

MINIBEAST CARD ACTIVITIES...



You could ask the class which minibeasts are found in both of their food chains, or how they are similar. In the previous example, plants start both of the food chains and birds finish the food chains, but if you look more closely there may be other links between the two chains. If we draw this out with the links between the two chains added, it becomes more like a web. This is exactly what it is, a **food web**.



Ask the class to read the back of the cards and on the sheet of paper to draw lines between the minibeasts that eat each other. Another way to do this is to pin the cards onto a board and use cotton or string to link the minibeasts together. You have a ready made display! You could also ask the class to add a picture of a sun to the board.

MINIBEAST FEATURES GAME

This is best played in groups of 2 to 4 players. The game is played in a similar style to the game "Top Trumps[™]". Deal the cards so that all players have an equal number of cards. The player to the left of the dealer (the caller) chooses a feature with a number next to it from the back of the card (either food, season, habitat, activity, enemies or size). The other players then choose their card with the highest number for that feature. The player holding the winning card (with the highest number for the chosen feature) wins all of the cards played in that round. If the highest number is the same as another card and there is no winner, then the caller must choose another feature. The player with the most cards at the end of the game is the winner.

This is one way in which to introduce the concept of variation and classification. *How do we group things? Why does each minibeast have certain characteristics? How are they adapted to live in their habitats?*

MINIBEASTS CARD ACTIVITIES 2

MINIBEAST IDENTIFICATION KEYS

The minibeast cards are an ideal way to introduce the concept of making and using keys. Explain that the variety of plants and animals makes it important to identify them and to sort them into groups. Keys are a way of finding out the name of a plant or animal.



At first glance keys appear to be very complicated but once you have used them a few times they become very easy to use. There are two main types of keys, numbered keys and branching keys. Both ask a series of questions about the animal or plant that you wish to identify. Each question will eliminate some of the possibilities until there is only one left.

The minibeast cards feature animals or plants that may be found locally. Your class can identify some of the minibeast cards using the numbered or branching keys provided. Ask the class to work with a partner to develop a different key to sort and identify 4 of the minibeast cards. Ask the class to swap their key and their cards with another group to see if they can use it as well.

Here is an example of a numbered key that you may like to use to introduce the topic, you may decide to change it slightly to feature six children in your class.

For example we have a group of six people: Harry wears glasses and has short black hair, John is bald, Fred has long brown hair, Jane has short black hair, Chloe has long black hair and wears glasses and Samantha has long brown hair.

If we have a photograph of one of them, we can ask a series of questions to find out who it is.

Each question is in two parts and we have to decide which part fits the person in the photograph best.

Question 1 (a) Does the person have long hair. Go to question 2.(b) Does the person have short hair or no hair at all. Go to question 4.

If (a) is right it is either Fred , Chloe or Samantha. If (b) is correct it is either John, Harry or Jane.

- Question 2 (a) Does the person have black hair. It is Chloe.(b) Does the person have brown hair. Go to question 3.
- If (a) is right it is Chloe.

If (b) is correct it is either Fred or Samantha.

- **Question 3** (a) Is the person male. It is Fred. (b) Is the person female. It is Samantha.
- **Question 4** (a) Is the person bald. It is John. (b) Does the person have short hair. Go to question 5.

If (a) is right it is John.

If (b) is correct it is either Harry or Jane.

Question 5 (a) Does the person wear glasses. It is Harry. (b) Does the person not wear glasses. It is Jane.

You can see that by asking a number of simple questions it is possible to work out who is in the photograph.



MINIBEAST IDENTIFICATION KEYS



Try using these keys to identify your minibeast.

Try using this numbered key to identify a minibeast.

Start at question 1 and work down until you find the correct answer.

- 1 (a) Minibeasts with legs. Go to question 2.(b) Minibeasts without legs. Go to question 4.
- 2 (a) Minibeast with 6 legs. These are Insects.(b) Minibeast with more than 6 legs. Go to question 3.

Sometimes there are more than two parts to a question.

- 3 (a) Minibeasts with 8 legs. Spiders and their cousins.
 - (b) Minibeasts with 14 legs. Woodlice.
 - (c) Minibeasts with more than 14 legs. Millipedes and Centipedes.
- 4 (a) Minibeasts with eyes on stalks. Slugs and Snails.(b) Minibeasts without eyes on stalks. Worms.

Try using this branching flow chart key to identify a minibeast.

You are asked a question and you answer yes or no.

START HERE



These models are very easy to make using:

- 1. Plastic coffee cups
- 2. Drinking straws with a bendy section
- 3. Sticky tape
- 4. Sheets of card

Choose what minibeast you want to make and collect a coffee cup body plan sheet.

1. STICK THE BODY TOGETHER

If the cups are facing the same way, you need to attach a card circle to them. Cut out the card circles and attach them onto the open end of the cups. Stick in place with sticky tape.



Now you're ready to stick the body together using the body plan.

2. ADD THE LEGS.

Cut the straws to make the legs. Make a hole in the cup with scissors (take care when doing this) and push the legs into the holes, or stick the legs to the outside of the body using sticky tape.

3. STICK ON THE FACE.

Cut out the face and any other parts supplied on the sheets and stick them on to the animal.

4. DECORATE YOUR COFFEE CUP BUG.

Use the coloured sticky tape to decorate your minibeast. You could even draw patterns onto paper and stick this on to your model. Don't forget that if the model is plastic you will not be able to use pens to colour it.





Body plans for cup centipedes or millipedes

You will need: 5 coffee cups and 5 or 10 straws. Cut around the pictures to complete your bug.



CENTIPEDE

Centipedes have one pair of legs on each body segment (they have up to 80 segments, but you should make a shorter centipede with 5 segments)





Millipede (face)

Centipede (face)

MINIBEAST MODELS



Body plans for cup spiders and harvestman

You will need: 2 or 3 coffee cups and 4 or 5 straws. Cut around the pictures to complete your bug.





Body plans for a cup fly

You will need: 3 coffee cups and 6 straws. Cut around the pictures to complete your bug.





Fly Halters

Fly (face)







Body plans for cup Bee or Wasp

You will need: 3 coffee cups and 6 straws. Cut around the pictures to complete your bug.





OHP SHADOW PUPPETS

Your class could devise and make their own Bug Show by making simple shadow puppets. An exciting way to stage it is with the use of an overhead projector (OHP). Jacolly Puppet Theatre are a successful touring puppet company, and they have kindly shared some of their techniques that are easy to use in the classroom.



You Will Need:-

- A darkened room
- An overhead projector (with protective sheet of clear acetate covering the glass)
- A projector screen (a blank wall or, if you want to use a human actor as well, a cotton sheet about 2m sq. See Fig 1)
- Pencils & rubbers
- Rough paper
- OHP pens (various colours)
- Sellotape
- Scissors

For Puppets

- Paper Fasteners (i.e. the kind that look like tiny, metal clothes pegs!)
- Thin wire for control rods

Silhouette Puppets

- Card (postcard thickness)
- Scraps of acetate

Coloured Shadow Puppets

- Clear acetate sheets (postcard thickness)
- Diamond Ultraclear Sellotape (which does not show on acetate)

For Scenery

• Card or stiff paper

Coloured Scenery

Sheets of clear acetate

First make a template of the OHP glass to help you to decide the size of your puppets. Remember that the further away your projector is from the screen the larger your images will appear e.g. a 20 cm high puppet projected from 2 m away appears the size of a real-life adult! This is one trick that puppeteers can use to include people in their puppet plays. If you hang a cotton sheet about 2 m square and project the puppet from behind the sheet rather than in front of the sheet, then the students can act behind the screen with the shadow from the puppet. This is the one time that your class can talk to a human-sized ant!



A simple screen is made by hanging a thin white sheet. It is a good idea to weight the sheet (using wooden bars) and to hang the screen so that the bottom is just off the floor.

Most shadow puppets can be easily made from just card and acetate. We will show you some easy techniques to make silhouette and acetate puppets, and how to joint them to really bring your minibeasts to life.



SILHOUETTE PUPPETS

First ask the class to decide what puppet they want to make. They may need to draw a picture of the puppet first to visualise it. Remind them that for any features to be seen they can't be drawn onto the puppet, they will have to be cut out or cut around. You can add some colour to your silhouette puppets by sticking an acetate picture behind the card silhouette.



Card silhouettes usually look best as a side view





The features do not show clearly from the front

...unless you cut them out



Silhouette puppets over acetate & paper scenery



Birds' eye view of silhouette puppets over acetate scenery

MAKING A COLOURED EYE FOR SILHOUETTE PUPPET



Cut eye hole out of fly's head



Draw eye on acetate & colour with OHP pens



GF





MAKING A SIMPLE ACETATE PUPPET

Acetate puppets are easy to make as they are very similar to the pictures that the students have already drawn. Ask the class to draw the outline of their insect onto an acetate sheet. This can be coloured in with OHP pens and cut out. It is helpful if the central part is covered with card so that a control rod can be taped onto the body. Think about which way you will need to tape the control rod! Will your insect be flying from the top of the projector, or moving around in the grass at the bottom of the projector?

Add the pictures and text from the sheet.



Use an OHP pen to draw or trace the outline of butterfly onto an acetate sheet



Colour the wings with OHP pens, cover body with card and cut out



Make the control rod out of thin wire and tape it onto the body

JOINTING YOUR PUPPET

Decide what actions your puppet needs to perform in your play. You can give your puppet movement by jointing it: But remember that it is hard to work more than two control rods at a time.



Cut out sections & make holes for fasteners. Fix wire control rods on to head and abdomen with strong tape. Join section together, as shown above, with paper fasteners



PAGE

THIRT







It would be complicated to make all 14 sections of a woodlouse's legs move separately, but just moving the three jointed sections of this puppet woodlouse can give the impression that they do!



If you want to make a very supple minibeast, it needs lots of joining. This maggot can easily be adapted to make, say, a caterpillar or millipede.

NB Although it is made in twelve segments, this maggot still only needs two control rods!



SCENERY

The students may prefer to draw some scenery. This can be made by using an acetate sheet slightly larger than OHP glass, draw and colour the scenery with OHP pens. To add further drama to your scenery, frame your acetate sheet with silhouette shapes. Use a piece of card as big as the projector, and cut tree or grass shapes around the outside of the card to give the puppets a "stage" to perform in. Paper leaves can be cut and taped to surround the coloured acetate scenery.

SUGGESTED ADDITIONAL MATERIALS

You can also experiment making your puppets and scenery with feathers, fur, net, lace, coloured cellophane, ferns & grasses.

Points to Remember

- the OHP mirror will reverse the image you lay on the glass (i.e. your puppet will face in the opposite direction. Experiment and see!)
- Before fastening your paper puppet together, decide which way it is to face. Insert fasteners with the sharp ends away from the glass.
- As in a film, you can have close-ups (e.g. make a bug's head nearly fill the whole screen) or long shots (e.g. a swarm of bugs in the distance)
- To make your bug's wings look translucent, make out of acetate & decorate with OHP pens.
- Make the puppets' control rods long enough so that the puppeteer's hands are not seen over the glass when they are moving the puppet.
- Check your OHP before you use it, does it get hot? You should use heat resistant materials if it is warm.







PERFORMING YOUR OWN PLAY



Peter Smithers and Jacolly Puppet Theatre have created a set of scripts especially for classroom use. The scripts can either be used for the class to perform their own shadow puppet show (don't forget you'll need someone to work the puppet and someone to be the voice of the insect) or the class could act out the characters in a short play.

On and the Roller Ball Crew

is a full eight-page script, that can be downloaded as PDFs from the BBSRC website www.bbsrc.ac.uk/schools. This script has also been adapted into three smaller scripts.

Lunch-time with On and the Roller Ball Crew

is a three-page script that deals with how different insects eat, with six characters.

Legless

is a two-page script that deals with classification and grouping, but looking at the number of legs, with five characters.

On the ball

looks at different types of woodlice, through a lively two-page script based around football. This script will be useful to introduce classification in science. You could also include this in assemblies that have a citizenship angle as there may be close parallels with people or things being the same even though they act differently or look different.



Jacolly Puppet Theatre present "Real Bugs"





Written by Peter Smithers & Jacolly Puppet Theatre

CAST

Puppets/Puppeteers ONISCUS, a woodlouse ARMADELIDIUM, another kind of woodlouse MARGO, a maggot SPECK, a butterfly DYSDERA, a woodlouse-eating spider

Voices

NARRATOR ONISCUS, a woodlouse ARMADELIDIUM, another kind of woodlouse MARGO, a maggot SPECK, a butterfly DYSDERA, a woodlouse-eating spider

Sound effect producers

Scenery

(card/paper/coloured acetate with fabric leaves)

NARRATOR: Oniscus the woodlouse is out hunting for some high quality rotting leaves before the day becomes too hot for him.

[MUSICIANS: accompany song in blues style]

- ON: <u>(Ambles in, singing.)</u>
 I woke up this morning, I was hungry as a hog.I went over to the compost heap I could almost eat a log. Wanted some rotten leaves, but the ones there were all new. Oh, Oh, Oh, I got those rotten leaf blues.
- NAR: On has to find leaves that are just right as, if they are too fresh, they are tough as old boots. But if they are too old they have too much fungus growing on them and they taste terrible. So he has to find just the right patch where the leaves are perfect.

[SOUND EFFECTS: walking on dead leaves].

- ON: (On wanders along looking at leaves and turning them over.) This one may be OK. But no. It's too far gone. Ah! How about this one? No. It's too new.
- MARGO: (Pops her head out of the leaves in front of ON.) Hold it right there!
- ON: Who are you?
- MARGO: Who are you? more like! And what are you doing?
- ON: I'm Oniscus, and I am searching for rotten leaves.
- MARGO: Leaves, is it! Are you sure it's leaves you're after?
- ON: Of course I'm sure. I am a woodlouse.
- MARGO: I've heard about woodlice. Weird creatures that eat rotten leaves.
- ON: That's what I said.
- MARGO: Don't get clever with me. I'm just guarding my dead mouse.
- ON: Whatever turns you on. (Exits).
- MARGO: (Vanishes back into the leaves)

[SOUND EFFECTS: Slurping, gobbling]



>

Lunch-time with On and the Roller Ball Crew. 2



- NAR: Well, that's Margo the maggot for you. She's really tucking into her rotting mouse.
- ON: <u>(*Re-enters*)</u> Listen to that maggot. What a messy eater. And she'll be even worse when she grows into a fly.
- NAR: When maggots turn into flies they are sick all over their food before they eat it.
- SPECK: (Flies in and flutters around above ON.) Hi there, On! How are you today?
- ON: Oh hello, Speck. I'm fine. Just out looking for some nice, rotting leaves.
- SPECK: I don't know what you see in them. Give me some fresh nectar any day.
- ON: It's OK for you high fliers, sipping those exotic cocktails. But us workers have to keep our strength up, so it's good, old-fashioned plain food for me.
- SPECK: Oniscus, you need to get out more. Bye. (Exits)
- ON: (Watches Speck fly off then bumps into the large BALL)
- AR: My name's Armadelidium but most people call me Armie.
- ON: I'm Oniscus. On for short.
- AR: Hullo
- ON: How do you roll into a ball like that? None of my family can.
- AR: Really? Well, I guess we're different types you and me. All of my family can. It's a great trick. If anyone tries to eat you, just roll into a ball and you are safe as houses.
- ON: Impressive! What's all that noise.
- AR <u>(Enters, terrified)</u> A Dys! It's a Dys! A woodlouse spider. It will have us all for breakfast. Quick. Hide. I'm going to roll into a ball.

<u>(Exit left)</u>

- ON: Hide? Good plan! (Dives under rock).
- NAR: Just in time, Oniscus hides under a rock.
- DYS: <u>(Enters, crawling down side of screen. Exits left. Immediately re-enters</u> pushing in BALL (AR) which it then attacks)

[SOUND EFFECTS: scraping noises].

- NAR: The spider tries to bite the rolled-up woodlouse but its fangs just slide off the hard carapace ~ the woodlouse's hard, protective back.
- DYS: (Enraged.) Haaaaaah! Let me get at you! I'm hungry!
- NAR: Just then...
- ON: (Peers out from under the rock).
- NAR: ... the spider sees ON
- DYS: Ah! What's this? (Moving towards ON) A woodlouse that can't roll up!
- ON: (Backs away up the rock, terrified).



Lunch-time with On and the Roller Ball Crew. 3



- DYS: You look tasty! (Jumps at ON) Ha!
- ON: Oooo er! (Turns around and runs up the side of the screen, along the top, and back down the other side)
- DYS: <u>(Pursuing ON around the screen. Sweetly coaxing)</u> Don't go, my friend. No need to be afraid.
- NAR: Woodlice can't usually run very fast but, fortunately, to-day ...

(ON scrambles over BALL and dives under rock.)

 \ldots Oniscus escapes back to safety. Dysdera, the spider, is too big to follow him under the rock \ldots

(DYS crashes into the rock and bounces back onto the ground.) [SOUND EFFECTS: dull thud]

- DYS: Ouch!!
- NAR: ... and crashes into the side of the rock, instead
- DYS: <u>(Yells to ON)</u> Come out! <u>(Yells to BALL)</u> Unroll so that I can eat you! <u>(In disgust, kicks BALL offstage</u>) Idiot! At this rate, I'll starve <u>(Exits</u>)
- ON: <u>(Pokes head out from under the rock)</u> Phew! <u>(Calls to AR)</u> Nice one, Armie! She's gone!
- AR: <u>(Enters)</u> I hate that almost eaten feeling. I could feel her fangs scraping on my carapace.
- ON: What was it?
- AR: Dysdera are spiders whose favourite food is woodlice.
- ON: Us!
- AR: If you are not rolled up tight they can spear you right through the middle with those huge fangs.
- ON: Gross! I'm out of here. I'll just ... (Starts to dig in ground)

[SOUND EFFECTS: scuffling in leaves]

take this (*Pulls LEAF up from below ground and, with an effort, starts to* drag it up over the top of the rock) Nice leaf. Thanks. 'Bye!. (*Exits*)

Written by Peter Smithers & Jacolly Puppet Theatre

CAST

Puppets/Puppeteers

ONISCUS, a woodlouse GLOMERUS, a pill millipede ARMADELIDIUM, another kind of woodlouse INSECTA, an insect (maybe a butterfly, a ground beetle or a ladybird)

Voices

ONISCUS, a woodlouse GLOMERUS, a pill millipede ARMADELIDIUM, another kind of woodlouse INSECTA, an insect (maybe a butterfly, a ground beetle or a ladybird) NARRATOR

Sound effect producers

Scenery

(card/paper/coloured acetate with fabric leaves)

There are leaves on the ground and a ball centre stage

NARRATOR: AR has taken ON to meet another minibeast who may be able to help ON find some good rotting leaves.

(Enter ON and AR who wander over to the ball and tap on it) [SOUND EFFECTS: light tapping]

- AR: Wake up Glom , you lazy thing. The day began hours ago.
- GLO: (Muffled) Push off. Leave me alone.
- AR: (*Taps GLOM again*)

[SOUND EFFECTS: LIGHT TAPPING]

Hey! We want your advice.

- GLO: (Less muffled, as begins to unroll) Oh alright, alright. (Unrolls facing AR)
- AR: Meet Oniscus.
- GLO: On what?
- ON: <u>(Enters on top of rock)</u> On iscus.
- GLO: <u>(Turns around to face ON).</u> What! You're just a woodlouse! Why should I want to meet a sad little woodlouse!
- NAR: This gets On a little cross.
- ON: So what's your problem then, mate. What makes you so different?
- AR: <u>(Exits, backwards</u>)

(As they argue, GLOM marches around and ON shuffles up and down the rock)

- GLO: (Outraged) What makes me different from you? How dare you! I'm not a woodlouse! I am a millipede. A pill millipede, if you must know. My family name is Glomerus and we millipedes are far more important than you common woodlice.
- ON: So what's the big deal with being a millipede then, you great compost chomper!

PERFORMING YOUR OWN PLAY - Legless 1

Legless 2



NAR: Oh dear. On is getting really mad now.

- GLO: We millipedes have two legs on each of our many segments, unlike you coarse crustacea. How many legs have you got?ON: Fourteen
- GLO: Only fourteen legs! And so few segments! Pathetic! Face it. I'm a superior life form!
- ON: What! (Shuffles to & fro making strange stuttering noises)
- NAR: This makes poor On so angry he doesn't know what to say. And Glom just looks smug...
- GLO: Huh! <u>(Exits</u>)
- NAR:and marches off into the wood.
- ON: Well! How rude. There was really no need for any of that"
- AR: <u>(*Re-enters*)</u> Sorry about that! Glomerus has been a bit strange about this leg thing lately. But he does know how to find the best leaves. There must be some specially tasty rotting leaves near here. Let's look.
- INS: I can help you to find the food, I'm very good at finding food and I'm very important.
- NAR: We know that there are many different kinds of minibeast and the number of legs that they have varies from 6 to over a hundred. Having more legs does not make them more important as they are all important. Without them the world would come to a halt.



On the Ball 1

Written by Peter Smithers & Jacolly Puppet Theatre

CAST

Puppets/Puppeteers ONISCUS, a woodlouse BOMBUS, a bee ARMADELIDIUM, another kind of woodlouse

Voices ONISCUS, a woodlouse BOMBUS, a bee ARMADELIDIUM, another kind of woodlouse NARRATOR

Scenery

Sound effect producers

(card/paper/coloured acetate with fabric leaves)

There are leaves on the ground and a ball centre stage

NARRATOR: ON is out for a walk in the woods as part of his football training

- ON: <u>(Enter On who wanders along then bumps into the ball)</u> [SOUND EFFECTS: bump!]
- *ON:* Ouch! What's this? Hey this could be good. I can get in some practice for the match on Saturday. (*Rolls the ball around and then pretends he is playing football, butting the ball higher and higher into the air.*)

[SOUND EFFECTS: the BALL always lands with a bump]

- *NAR:* On the woodlouse has bumped into some kind of ball. Oh. Nice try, Oniscus!
- BOM: (Off) Zzzzzz! Zzzzzzz!
- *NAR:* Uh Oh! That sounds like Bombus the Bee. He's always fancied himself as a football commentator
- *BOM:* <u>(Flies in. Buzzes around screen, excited. Gets increasingly louder</u> <u>and faster</u>) Zzzzzzzz! ...And On takes the ball in a decisive tackle!

[SOUND EFFECTS: lots of cheering from the crowd]

He flies down the wing, weaving between defenders. What a performer. Look at this woodlouse go!

- ON: (Heads BALL off screen).
- *BOM:* He is past the backs and it's in the net.

[SOUND EFFECTS: crowd's final roar of approval]

What a goal! Zzzzzzzz! (Exits)

- ON: (Bows to imaginary audience) Thank you, fans.
- AR: (Off) Oi! Leave it out mate.

On the Ball 2

umb data

- ON: Who said that?
- AR: <u>(Enters from side BALL had been kicked into)</u> Me, you dumb crustacean.
- NAR: To On's surprise the ball has turned out to be another woodlouse.
- AR: Will you stop kicking me around. It's not polite.
- ON: Sorry mate. I didn't realise there was anyone in there. Who are you?
- AR: My name's Armadelidium but most people call me Armie.
- ON: I'm Oniscus. On for short.
- AR: Hullo
- ON: How do you roll into a ball like that? None of my family can.
- AR: Really? Well. I guess we're different types you and me. All of my family can.It's a great trick. If anyone tries to eat you, just roll into a ball and you are safe as houses.
- ON: Impressive!
- AR: Do you play football for a team?
- ON: Yes. I play for the Compost Kings. How about you?
- AR: No. Not me. I always feel sorry for the ball.



PAGE

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MINIBEAST WEB SITES

Information for bug hunters on the internet.

You may like to find out more information about minibeasts using the internet. These sites have been recommended by the entomologists (insect specialists) at the University of Plymouth.

AES BUG CLUB

The site for British bug hunters. It contains information on British bugs and details of activities organised by the Bug Club. <u>http://www.exeter.ac.uk/bugclub/main.html</u>

AES (Amateur Entomological Society)

GORDONS ENTOMOLOGICAL PAGE.

THE WONDERFUL WORLD OF INSECTS

Lots of information on a wide range of minibeasts. [Reference/webpage no longer available – May 2016]

ANT CAST the web window on the life of ants. Live video footage from an ant colony. [Reference/webpage no longer available – November 2016]

NAT HIST MUSEUM CREEPY CRAWLY EXHIBITION

A guide to the Bugs exhibit at the Natural History Museum London. [Reference/webpage no longer available – November 2016]

ORIGAMI: THE ARTHROPODA

This page contains origami bugs, spiders, and crustaceans. Jasper's Origami Menagerie (USA) <u>http://www</u>.folds.net/menagerie/arthropoda.html





MINIBEAST BOOK LISTS

There are also some excellent books about insects. Libby Allman, a Children's Book Specialist at *In Other Words Bookshop* Ltd, has compiled a list of Fiction and Non-Fiction Books. You can contact the bookshop by writing to Libby Allman at *In Other Words* Ltd, 64 Mutley Plain, Plymouth, PL4 6LF, phoning **01752 663889** or emailing **books@inotherworlds.co.uk**.



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MINIBEAST BOOK LISTS

INFORMATION BOOKS

Eyewitness Explorer : Insects		Dorling Kindersley	0/51360953
Eyewitness Readers	-Bugs, Bugs, Bugs Busy Buzzy Bee Spiders Secrets	Dorling Kindersley Dorling Kindersley Dorling Kindersley	0751358576 0751362107 0751345989
Usborne Beginners - Spiders			0746045425
Lift the Flap-Bugs and Slugs		Usborne	0746027737
Big Bug Search		Usborne	0746027036
Spotters Guides-Bugs and Insects		Usborne	0746040717
Fly Traps		Walker	0744562740
Caterpillar Caterpillar		Walker	0744536367
Oxford Reds- Spiders		O.U.P.	0199106894
Best Book of Creepy Crawlies		Kingfisher	0753403099
Question Time Creepy Crawlies		Kingfisher	0753406276
Are You a Ladybird?		Kingfisher	075340530X
Are You a Snail? [Up the Garden P	Path Series]	Kingfisher	0753406683
Awesome Facts about Bugs		Watts	0749639385
Awesome Facts about Spiders		Watts	0749639326
I wonder why Spiders Spin Webs Looking at Minibeasts [series]		Kingfisher	0753407523
Ladybirds and Beetles		Belitha	1841383902
What's Creepy and Crawly?		Frances Lincoln	0711218889
Usborne Discovery BUGS		Usborne	0746046944
Mega Bites Bugs		Dorling Kindersley	0751330817
Horrible Science: Ugly Bugs		Scholastic	0590558080
Horrible Science: Microscopic Monsters		Scholastic	0439995019



USEFUL KEYS FOR MINIBEAST IDENTIFICATION.

The Woodland Name Trail. Ann & John Bebbington and Steve Tilling. Published by the Field Studies Council. A simple flow chart on a fold out card that identifies the main minibeast groups.

Minibeasts. An Identification Guide. Peter Smithers and John Walters. (available mid 2003). A more in depth flow chart that identifies all minibeast groups using easily observed features, with information about each of them.

A Key to the Terrestrial Invertebrates of the British Isles. Steve Tilling. Published by the Field Studies Council. An in depth scientific key for those who wish to take a scientific approach to minibeast identification. It contains information on the ecology of each group and references to other books that give more information about them.



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BACKGROUND TO REAL BUGS

'Real Bugs' grew out of a successful primary school workshop and puppet show developed by Peter Smithers, Karen Gresty and Leslie



Ebdon at the University of Plymouth and Jacolly Puppet Theatre, and funded by the Biotechnology & Biological Sciences Research Council. This activity pack is aimed at primary school teachers for classroom use. It can either be used as a stand-alone resource, or to accompany the 'Real Bugs' puppet show.

We hope that you find the material informative but perhaps more importantly, enjoyable!



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