



**The OPAL Soil and Earthworm Survey**

**Imperial College London**

**Introduction**

Soil is one of the world's most precious natural resources. It is made up of water, air, minerals and organic matter, and is vital for plant survival and crop production. Soil also provides a home for a vast array of animals including earthworms, stores and filters water and provides a foundation for buildings, and therefore is important in many ways.

This fold-out guide is designed to take you through the process described below, and will refer you to the accompanying workbook for further guidance or to record data. Before you start the survey read pages 2-3 of the accompanying workbook. The survey starts by selecting your location, and recording some site characteristics (Section A). You are then asked to dig a soil 'pit', and collect and separate immature and adult earthworms into groups (Section B). The next step focuses on soil properties (Section C). Following this, all adult earthworms from the soil and the pit can be studied (Section D). If you still have more time available, search for earthworms elsewhere or report any other organisms you encounter in your pit (Section E). Submit all data to the OPAL website (Section F).

The survey should preferably be performed in pairs. You are provided with enough material to sample 2 locations. You can photocopy pages 6 and 7 of the workbook for data from the second location. Try to locate your second pit in an area close by, but which looks different from the first.

**The survey starts here**

**A Site characteristics**

Choose a location to carry out your survey. Select a position to dig your soil pit. Now go to the workbook and record the pit's location, site characteristics and other information on page 6.

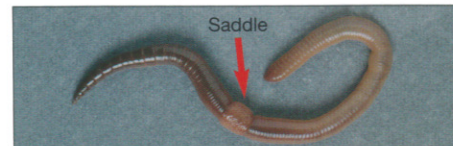
**B Dig the soil pit**

**+** If you find glass, metal or other sharp objects, stop immediately and dig another pit elsewhere

Measure a 20cm x 20cm square and dig the soil pit to a depth of 10cm. For details on how to do this refer to page 4 of the workbook. Place the removed soil on a plastic bin bag and put any earthworms in a container.



Look at each earthworm and see if it has a well-developed saddle. Sort all earthworms found in the removed soil into 2 groups, those with saddles (adults) and those without saddles (immatures), and count the numbers in each group. Now go to page 7 of the workbook and record these numbers in Questions B1 and B2. Please rinse all earthworms with water, and return the immatures to the soil (not the pit).



To extract the deep burrowing earthworms, mix one of the mustard sachets provided into 750ml of water and pour into the pit (this is not toxic to the earthworms). Time how long it takes until the water has drained away (up to 3 minutes). Now go to page 7 of the workbook to record this (Question B3). Collect any earthworms that emerge. Sort, count and rinse them as previously. Now go to page 7 of the workbook to record this (Questions B4 and B5).

**C Soil properties**

Test the properties of the soil (Questions 7-15, record on page 7 of the workbook).

**7** How many plant roots are there in the soil that you have removed?

- a No roots
- b A few roots
- c Lots of roots

**8** Can you see any objects in the soil that do not look like they should naturally be there?

**Remember to take care when handling the soil.**

- a Construction material e.g. brick, concrete, cement, mortar
- b Metal e.g. wire, sheeting, tin
- c Glass e.g. broken bottles, other glass
- d Cut wood
- e Other
- f None

**9** Push the pointed end of a pencil or pen into the soil surface. How hard was it to push it into the soil?

- a Easy
- b Difficult
- c Very difficult

**10** Take a small amount of soil from the pit about the size of a 2p piece and put it on something waterproof. Open the sachet of vinegar and pour a few drops onto the soil.

If the soil fizzes it means it contains a mineral salt called calcium carbonate CaCO<sub>3</sub>.

Does the soil fizzle? Record 'yes' or 'no' in the workbook.

**11** Take a handful of soil in the palm of your hand and squeeze it. How moist is the soil?



a Dry – no water (loose soil does not stick together when squeezed)



b Moist – no visible water (water does not drip out of the soil when squeezed)



c Wet – water visible (water runs/drips out of the soil when squeezed)

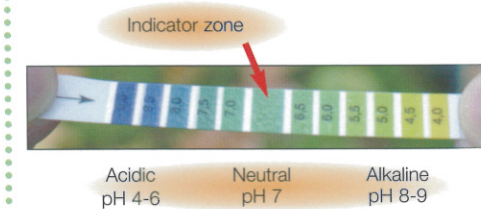
**12** Find out the soil's pH. Place 1cm of the removed soil into a container. Add enough water to cover the soil and stir the mixture for about a minute.

Holding the pH test strip by the arrow, completely immerse the strip in the soil solution for roughly three seconds.




Remove and quickly rinse with fresh water from the same bottle.

Hold the strip up to the light and compare the indicator zone (unprinted area) to the colour scale. Read off the printed pH value and record it.



**13** Follow the **Key to soil texture** (see right) to find the texture of the soil.

Record the soil type in the workbook.

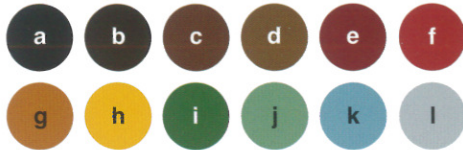
If you have a camera, when you see this symbol  take a photo to upload to the website



14 Smell the soil ribbon, does the soil have:

- a A sour, putrid or chemical smell?
- b No smell?
- c An earthy, sweet, fresh smell?

15 What colour is the soil ribbon? Choose the nearest colour match.



### D Earthworms



Using the earthworm record sheet provided on page 7 of the workbook, record the length (using the ruler provided on the guide) and colour of each adult earthworm. Using the key overleaf, and with the help of the magnifier provided in the pack, identify and record the species of each adult earthworm found.

### E Additional search



If there are no earthworms in your pit and you still have more time available record the other organisms in the pit (page 8 of the workbook). Then search for earthworms in habitats within 5 metres of your pit as described on page 4 of the workbook. Follow the process outlined in Section D for any earthworms found.

When you have finished return the soil to the pit, replace any turf carefully and leave the area tidy. Take any litter away with you.

### F Data submission

Upload your results and images to the OPAL website:

[www.OPALexplore.org](http://www.OPALexplore.org)

### Key to soil texture start here

Put some soil about the same volume as an egg in the palm of your hand. Add drops of water and work the soil with your fingers to break down any lumps. Add sufficient water until the soil is evenly moist and feels like putty. **a**

Now feed the ribbon through your hand so that it supports its own weight. **d**

Squeeze the soil in your palm. Can you form it into a ball? **b**

YES

Can you pinch the ball to make a flat ribbon of about 3mm thickness? **c**

YES

NO

**a**  
Sand

**b**  
Loamy sand



a



b



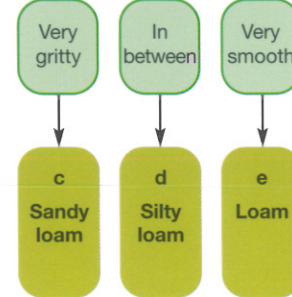
c



d

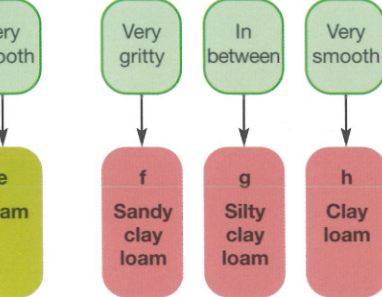
Is the soil 'ribbon' less than 2.5cm long before it breaks? **NO**

Take a pinch of soil and add water to make it very wet. Rub it between your fingers. How gritty does the soil feel?



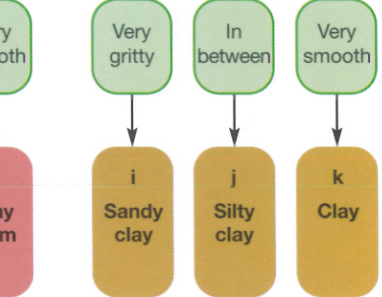
Is the soil 'ribbon' between 2.5cm and 5cm long before it breaks? **NO**

Take a pinch of soil and add water to make it very wet. Rub it between your fingers. How gritty does the soil feel?



Is the soil 'ribbon' longer than 5cm before it breaks? **YES**

Take a pinch of soil and add water to make it very wet. Rub it between your fingers. How gritty does the soil feel?



### Safe fieldwork

We don't advise you to work on your own. Make sure that you know what to do in an emergency. Take a responsible friend who can help if things go wrong. Ensure that you have permission from the landowner to dig holes on their land. Wear plastic gloves and wash your hands before eating. Cover any open wounds before starting the activity.

**FSC** Designed by FSC Publications  
[www.field-studies-council.org](http://www.field-studies-council.org)



Open Air Laboratories (OPAL) is a new partnership initiative which is encouraging people to spend more time outside understanding the world around them. OPAL wants to get everybody involved in exploring, studying but most of all enjoying their local environment. OPAL will be running a programme of events and activities until the end of 2012. To find out more about events in your region please visit the website: [www.OPALexplore.org](http://www.OPALexplore.org)

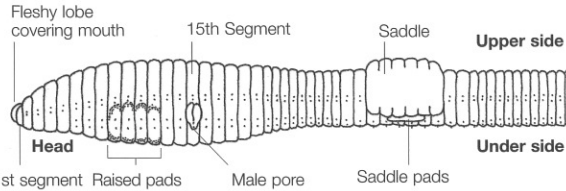


Photographs by: Martin Head<sup>1</sup>, Simon Norman<sup>4</sup>, Louise Parker<sup>4</sup>. Text by: Martin Head<sup>1</sup>, Nick Voulioukis<sup>1</sup>, James Bone<sup>1</sup>, Laura Edwards<sup>1</sup>, Elizabeth Stevens<sup>1</sup>, Declan Barraclough<sup>3</sup>, Tatiana Boucard<sup>3</sup>, David Jones<sup>2</sup>, Paul Eggleton<sup>2</sup>, Stephen Brooks<sup>2</sup>, Simon Norman<sup>4</sup>, Louise Parker<sup>4</sup>, Rebecca Farley<sup>4</sup>, Mark Dowding<sup>4</sup>, Linda Davies<sup>1</sup>, Carolina Bachariou<sup>1</sup>. <sup>1</sup> Imperial College London. <sup>2</sup> Natural History Museum. <sup>3</sup> Environment Agency. <sup>4</sup> Field Studies Council.

# Key to common British earthworms

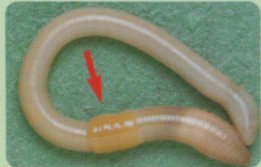
By David T. Jones and Chris N. Lowe

These are the earthworm features used in this key



## Start here

Is it more than 2cm long, AND does it have a clearly developed saddle?



The saddle is usually a different colour to the rest of the body, and slightly wider

NO

It is not a mature earthworm - you can't identify it with this guide. At least 50% of the earthworms you find will be immature

YES

Is the whole body clearly stripy on its upper surface when moving?



It has dark red bands, with a narrower pale pink or yellowish band in between

YES

NO

Is it greenish (dark green, yellowish green or muddy green)?

YES



**3. Green worm**  
green form  
*Allolobophora chlorotica*

**Hints**  
Often curls up in the hand  
Yellow ring on body  
Has 3 pairs of sucker-like discs (see 13)  
Can exude a yellow fluid when handled



NO

Is the upper surface of the body, from the first segment to the saddle, entirely dark in colour (dark red, purplish red or chestnut brown)?



YES

**Red earthworms**

NO

Return to start

YES

Is the body from the first segment to the saddle partly or entirely pale in colour (whitish, pink or grey)? It may have some reddish or dark segments



**Pale earthworms**

NO

Is the earthworm longer than 8cm when NOT moving?

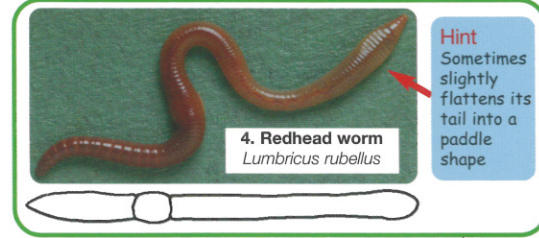
YES

NO

Are the male pores visible?



YES



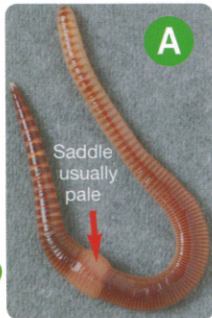
**4. Redhead worm**  
*Lumbricus rubellus*

**Hint**  
Sometimes slightly flattens its tail into a paddle shape

NO

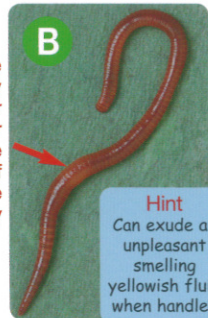
## Stripy earthworms

Which description best matches your worm? Is the body:  
**A** Longer and wider or **B** Shorter and narrower?



**A**

**1. Compost worm** *Eisenia veneta*



**B**

**2. Brandling worm** *Eisenia fetida*

**Saddle usually similar colour to the rest of the body**

**Hint**  
Can exude an unpleasant smelling yellowish fluid when handled

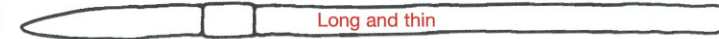
**Hint** Line drawings show the typical sizes of the adult earthworms

## 5. Black-headed worm *Aporrectodea longa*

**Hint**  
Often a dark purplish head, the rear end of the body is often much paler

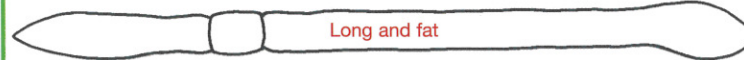


**A**



Long and thin

Which description best matches your worm? Is the body:  
**A** Long and relatively thin or **B** Long and relatively fat?



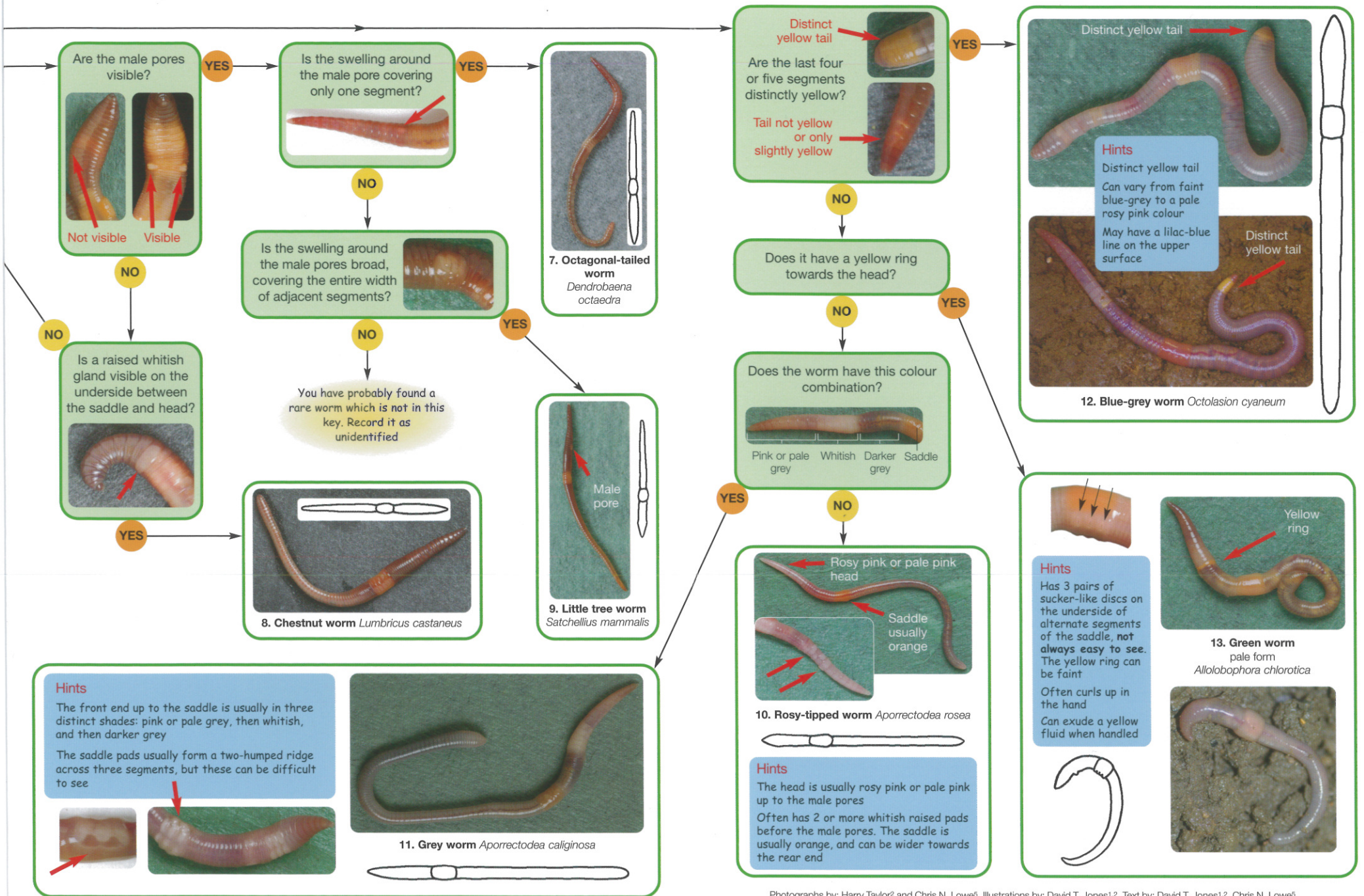
Long and fat



**B**

**Hint**  
A stout worm, often as thick as a pencil

**6. Lob worm** *Lumbricus terrestris*



Photographs by: Harry Taylor<sup>2</sup> and Chris N. Lowe<sup>5</sup>. Illustrations by: David T. Jones<sup>1,2</sup>. Text by: David T. Jones<sup>1,2</sup>, Chris N. Lowe<sup>5</sup>, Harry Taylor<sup>2</sup>, Paul Egglestone<sup>2</sup>, Stephen Brooks<sup>2</sup>, Emma Sherlock<sup>2</sup>, Simon Norman<sup>4</sup>, Louise Parker<sup>4</sup>, Rebecca Farley<sup>4</sup>, James Bone<sup>1</sup>, Martin Head<sup>1</sup>, Nick Voulvoulis<sup>1</sup>, Linda Davies<sup>1</sup>, Carolina Bachariou<sup>1</sup>. <sup>1</sup> Imperial College London. <sup>2</sup> Natural History Museum. <sup>3</sup> Environment Agency. <sup>4</sup> Field Studies Council. <sup>5</sup> University of Central Lancashire. Supported by the Esmée Fairburn Foundation.