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Product Code LW102C v1.0
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**INSTRUCTIONS AND 20 PAGE
FACT FILLED WORM GUIDE**



WORM WORLD



**Explore the wonderful
world of Worms!**

WARNING!

**For children over 5 years of age only.
For use under adult supervision. Read the instructions before use. Follow them and keep them for reference.**

Not suitable for children under 36 months due to small parts that could represent a choking hazard.

None of the accessories in this kit should be allowed to come into direct contact with foodstuffs.

Wash hands after using this kit or the activities contained in this booklet.

- See inside the amazing world of worms!
- Learn about their fascinating lifestyle and their valuable contribution to the world we live in.

CONTENTS:

- Plastic Worm Housing & Lid
- Mounting Feet
- Tunneling Sands - Red, Yellow and x2 Plain
- Cardboard Shade





INTRODUCTION

Worms are brilliant little animals, easy to take for granted and often going unnoticed as they live out their lowly lives right beneath our feet, and yet, we owe them a massive debt of gratitude.

As they quietly work away at their lives, toiling in their tunnels, they enrich the very soil that we depend on; mixing it up, fertilizing it and allowing air and water to penetrate into it. This creates a healthy soil, and when the soil is healthy, then the plants that grow in it are healthy and the animals that eat the plants are healthy; in fact everything is happy from the plants up!

That includes the very plants we depend on from crop fields to forests. The positive influence of worms can be seen and felt everywhere.

The problem with worms is that they spend most of their lives out of sight, living out their lives in private. Worm World gives you a window into the mysterious goings on in the soil beneath our very feet and is a wormery designed to be a safe and pleasant experience for both worms and worm watchers.

So follow these instructions and enjoy studying and getting to know these wonderful little wrigglers a lot better.

WORM WORLD



ABOUT THIS KIT

This kit is a hands-on guide for budding naturalists and contains the equipment you need to observe and study the fascinating life of worms. The kit is designed to be fun and informative for kids of all ages. However, young children will need the help and supervision of an adult.

This kit can be used all year round. However, in hot summer months please ensure your worms are kept in a cool environment and the soil is kept damp. Worms are fairly easy to find locally.

Finally, I hope you have fun with this kit and discover some fascinating insights into the wonderful world of worms.



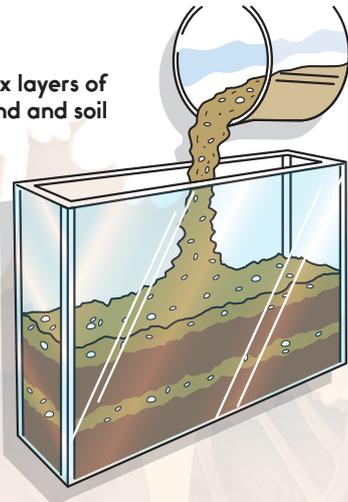
GETTING STARTED

Worm World is a simple device consisting of a clear plastic tank, with a lid and feet for it to stand on. You will also need some soil, sand, some dead leaves or leaf litter and of course some worms, all of which can be very easily obtained.

- 1 Collect some soil from the garden, park or fields. I like to look for molehills as these are a source of good fine soil. You will want to get rid of any big lumps, stones or twigs as well; a good way to do this is to use a soil sieve, or use your fingers.
- 2 The main part of Worm World is the plastic tank and basically what you need to do is build up lots of layers. Start by making a thick layer on the bottom, around 2cm deep. Then add a thin layer of sand, before the next layer of soil. Keep going alternating the layers until you are about 3cm from the surface with a final layer of soil.



Mix layers of
sand and soil



- 3 Then you want to tamp down the soil (you can use the lid of the Worm World to do this).
- 4 Worms don't like things too dry or indeed too wet, soil that sticks together when you squash it in your hands is perfect. You can squeeze the water out if it is too wet! Before you add the soil to your wormery, you can check this. If it is too dry, sprinkle on some water and mix it in.

- 5 Now the fun bit, you've just got to add your worms to the top of your Worm World. Attach the lid as they may try to escape initially by climbing up the sides, but in time (usually an hour or so) they will settle down and start to burrow.

Top Tip: To make life more interesting for you and the worms, try setting it up with different kinds of soil from different places in the garden (look for soils of different colours). Some soil will have more decomposing plant material, other can be sandier or with more clay. Maybe mix in a layer of potting compost as well and see what your worms prefer.

GETTING YOUR WORMS

Anywhere there is un-disturbed soil you will find earthworms, they are best collected by digging up the soil. Alternatively you can look under logs and rocks as sometimes you will find earthworms hiding.

You don't need too many; 5 big Earthworms or 15 Brandling Worms (see the guide to common worms) are plenty for the size of your wormery.

If you're wanting to bag the big ones, then it's best to hunt for them after dark with a torch.

At night they often surface from their burrows and can be easily found on lawns. However, catching them is a different matter, as they are very sensitive to vibrations and if they feel your footsteps they'll quickly shoot back into their burrows.

You therefore have to be sneaky and quick, but at the same time quite gentle. Try and block their retreat with one hand and then slowly and gently pull them from their burrow, don't be too hasty or you'll snap them in half and contrary to urban myth - that doesn't mean you've created two worms, a badly injured worm like any other animal will die.

MAINTENANCE

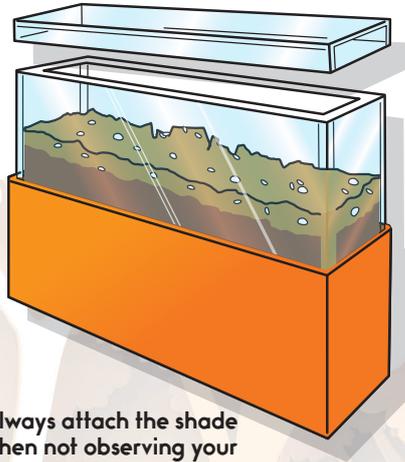
Once your worms have settled down and started burrowing then you just need to keep the conditions right for them. A warm room is fine as long as the soil is kept nice and damp. **Never let the soil dry out as this is the quickest way to make your worms very unhappy!**

When not observing your worms, attach the shade to Worm World because worms are happiest in the dark.

Provide plenty of food in the form of organic material - if you've got big earthworms then dead leaves are best. It's quite an interesting experiment to see which species of leaf are favoured. I always find it quite amazing that you can pop a leaf in the top of Worm World and overnight it magically disappears.

This demonstrates on a small scale what happens all over the country... so if you have ever wondered where all the leaves go that fall in autumn, well now you know.

Once you've finished studying your worms it is time to let them go where you found them. You can keep worms happy in your Worm World for around 4-6 weeks. After that it is kindest to release them where you found them, preferably on a nice damp, warm night.



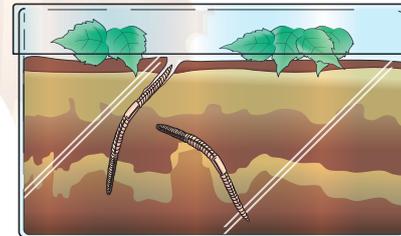
Always attach the shade
when not observing your
worms

WHAT YOU CAN OBSERVE IN WORM WORLD

There are many interesting things to see in
Worm World.

- 1 When you first introduce worms to Worm World you will see how they move and how easily they can burrow under the soil.
- 2 You will see how they churn and loosen compact soil.

- 3 You will see them underground in their burrows and see how the tunnels they make allow air and water into the soil.
- 4 By adding leaves you will see how they take them underground. An interesting experiment is to count the number of leaves they bury. Add about ten leaves each day and see how many are left on top the following morning. You'll probably be surprised at the number they drag into the ground.
- 5 After a few weeks you will see how they mix up the soil. Gradually the layers of sand and soil will become mixed.
- 6 You may see a worm resting on the surface, once you disturb it you will see how quickly it moves back into the soil.



See how many
leaves your
worms drag into
the soil

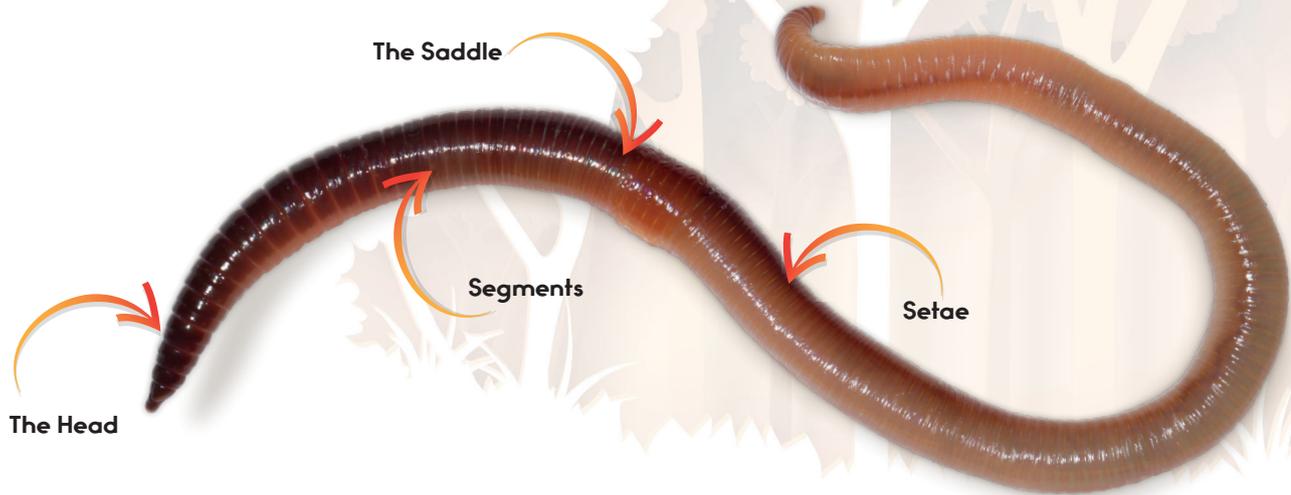
WHAT'S A WORM?

Worms are fairly basic creatures; simply put they are like little free living intestines that specialize in eating dirt and rotting plant matter.

70-90% of their bodies are made up of water and because of their very thin skin they can dry out very easily and quickly which is why they don't like dry conditions. These soil eating machines are basically one tube (the gut) held within the body wall or skin.

Sandwiched between the two are loads of muscles, blood, hearts and other things that a worm needs to live and survive. Although they are quite simple animals, do have a good look at a worm really close up and see if you can identify all the various parts of its body using the annotated photograph below.

Understanding what all the bits are for will help you understand worms much better and it might help explain what they get up to in your Worm World.





The Saddle - This is the thick section of a worm and is only found in adults. It is used to make a special kind of mucous for egg cases and it is also used when worms mate.

The Head - This is usually much more pointed than the other end and it contains a tiny mouth, hidden under a lip like flap. You will have to watch your worms very quietly and for a long time to see it being used to grasp and drag leaves into its burrow.

The hind end is usually much wider and 'paddle' shaped, very useful for expanding and helping to anchor the worm into its burrow.

Top Tip: If you put a worm on the lens of a torch you will see the dark squiggle of its guts running the length of its body. Next to this is a bright red blood vessel, watch out for pulses of blood being pumped along it by the worm's five hearts.

Top Tip: Go out into the garden on a warm but damp night (especially in late summer/autumn) and you will see fully grown adult earthworms, stretched out of their burrows reaching for dead leaves to drag underground. If you tread carefully (worms are very sensitive to vibration) you might get to see them mating.

Setae - These are the little bristles that stick out of the worms body, 8 for every segment. They are hard and spiky and are used to help the worm grip the inside of its burrow when digging and moving around. If you have ever seen a worm being pulled out of the ground by a blackbird, the setae are the reason that it looks like such hard work for the bird!

Segments - All earthworms belong to the group of creatures (phyla) called the annelids or ringed worms and you can see why they're called that, can't you?

KNOW YOUR WORMS!

A worm is not just a worm; there are 60 different species in the UK alone, although only 26 of these are thought to be native.

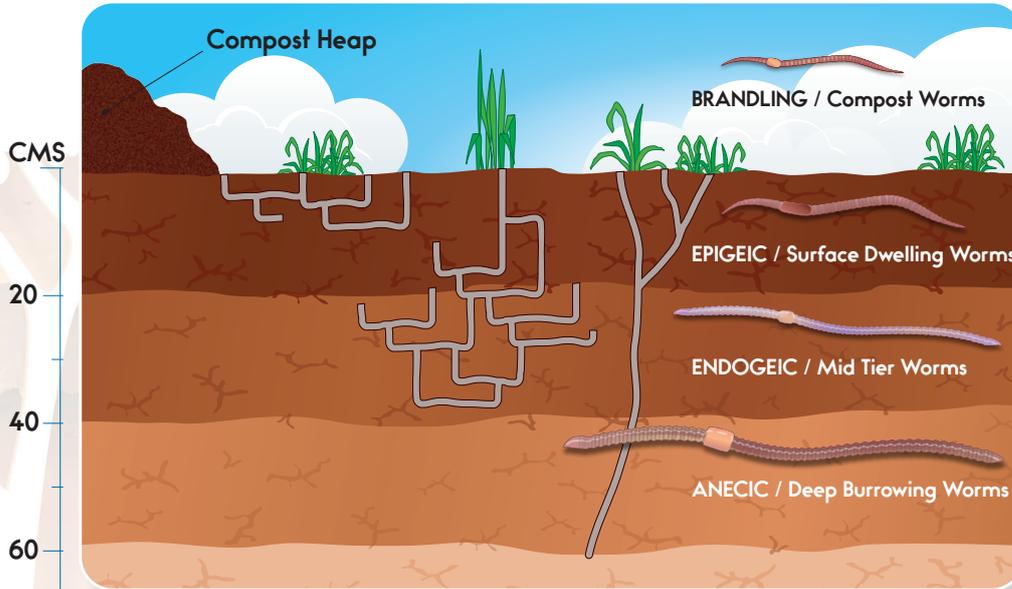
They can be split into four main groups (called ecotypes). There are those which live in decaying matter, those that live in the surface among leaf litter, and those that live in horizontal burrows. Then there are those that live in vertical burrows lower down in the ground and make the squiggly worm casts on the surface of your lawn. Have a look around and why not try them all out in your Worm World at different times?

Compost Worms also known as Brandling or Tiger Worms live in and around any compost heap. They are red and stripy worms and there are two very similar species *Eisenia fetida* (has a pale saddle) and *Eisenia veneta* (has a red saddle). They are not too fussy about the conditions and like lots of dead plant material to eat.

Next come **Surface Worms** – look under logs and you might find some other pink or reddish worms. These will be the species that worm experts call epigeic worms, they rarely burrow into the soil but love crawling about among rotting material. Leave folded plain cardboard out in the garden so it becomes soggy and then after a few weeks peel the layers apart and you will probably find them.



The pale worms are sometimes called **Endogeic Worms**. They occupy the mid-tier, living 20-40cm below ground. There are several species in this group but all of them have a pale grey or green pallor. They tend to tunnel on the horizontal; some make casts on the surface too. The commonest is a greenish looking fella called *Allolobophora chlorotica* who looks distinctly unwell.



The next species are called **Anecic Worms** and they live in permanent vertical burrows about 60cm below ground but can be found as far down as 3 metres! They tunnel vertical burrows like mine shafts and make a living dragging leaves into their burrows from the surface. They are also largely responsible for most worm casts found on playing fields.

The **Common Earthworm** (*Lumbricus terrestris*) is a member of this species and is the biggest earthworm in Britain growing up to 30cm in length. They do very well in Worm World, although because of their size, it's best to have no more than five.

THE WONDERFUL WORLD OF WORMS

Some people will not understand worms at all let alone why you might want to keep them in a wormery. So I find it best to be ready to enlighten these individuals with a few undeniably mind blowing facts about these simple but incredibly important, underestimated and under-appreciated creatures.

Worms have many fans including the famous naturalist Charles Darwin who dedicated 39 years of his life to studying them. Also, The Egyptian queen, Cleopatra deemed them sacred and even Aristotle, had many words of praise for these lowly creatures calling them 'the intestines of the soil' in recognition of the good they do to the land.



Worms are the staple diets of many animals including badgers.



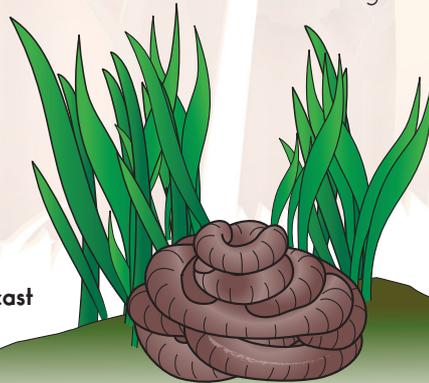
If this still isn't impressive enough then many animals are also fans of worms. Badgers, moles, hedgehogs, frogs and many species of birds all depend on them for food.

Worms find other worms by smell - their mucus contains special chemicals that other worms can sniff out. The squiggly worm casts that you might find on your lawn are actually worm poo! But don't worry it is good stuff and completely harmless.

Scientists have shown that plants such as flowers and vegetables grown in worm composted soil grow 36% better than those in regular expensive compost you get from the garden centre!

Here's why... A worm cast contains many nutrients essential to healthy plant growth, including 1-2% nitrogen, 1-2% phosphorus, 1-2% potassium and loads of good squishy organic matter!

Worm cast





If you like fruit and veg then it's worth remembering that worms are very good for the soil. In fact soil is much more than just dirt, it's a balanced mixture of elements and compounds all held together with water and humus.

Worms put all these things together, they could be said to build good soil.

In an acre of healthy grassland there may be something like 3 million worms! Between them they can turn over and bring to the surface 8-10 tonnes of soil in a year... That's a lot of worm poo.

Worms have five hearts towards the front of their body. You can see the effects of these strong little blood pumps in the pulses of blood running down the main blood vessel that travels along the length of the body - you might need to use a magnifying lens to see this properly.





You can tell if your worm is a fully grown adult, as only the grown-ups have a saddle as it is used in mating and in the production of the egg cocoons.

You might think that finding worm eggs is next to impossible but they are quite easy to find if you know what you are looking for. You might notice them in your wormery as small yellow, brown or white lemon shaped objects about 2mm long.



Worm eggs

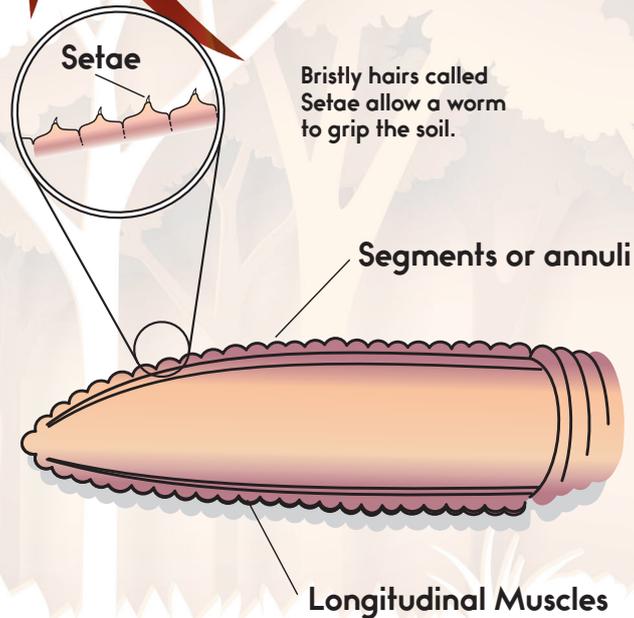
A big Earthworm can shift a stone weighing more than 50 grams, which for an animal weighing less than 2 grams is like you or me shifting a small van without any help!

HOW DOES A WORM DIG?

Take your finger and try to push into the soil in your garden lawn, wriggle it about. It's quite difficult, isn't it?

Even with all your body weight, your great mind and all that muscle you have to admit the lowly worm does a much better job than you.

The question is how? Well it's because worms don't have a skeleton, and can contract and expand different parts of their body. They use their muscles to squeeze, push and pull through the soil, wiggling into a tight space and then squeezing the blood into the body to lever apart the soil and then dragging the rest of its body in behind.





The job is made all the smoother by the addition of mucous and of course the worm comes complete with its own ground grips, its bristly setae which stick out sideways and allow the worm to pull on the sides of its burrow.

If you gently pull a worm (the bigger the better) backwards between your fingers you will feel the rough and spiky setae.

If you put a worm on a piece of paper and listen to it you will hear a scratching sound as it moves around. How does a soft and squidgy animal make such a noise?

Well again it's those hard little bristles the setae at work and it is these which help a worm to grip the inside walls of its tunnel.



USEFUL BOOKS AND WEBSITES

The Earthworm Society of Britain

www.earthwormsoc.org.uk is an excellent organisation all about promoting the understanding and the recording of British Earthworm species - it kind of does what it suggests in its title!

The Worm Book

by Nancy Nancarrow and Janet Hogan Taylor. Published by Ten Speed Press. This is a fantastically readable book stuffed with many worm facts, with plenty about how to get the worms to work for you and make compost.

Earthworms Nature's Gardeners

by A. John Morgan. This is a good little book about worms, their identification, their lives and how to harness their incredible powers to our own advantage.

MORE GENERAL INSECT GUIDES!

Nick Baker's Bug Book - I write a chapter on the common garden species. A book for any youngster who likes creepy crawlies.

Bug Zoo - This is another book I wrote to help those who want to keep creepy crawlies including a section on worms.



