



# Munching Worms Save Planet



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## Worm facts

- There are about 4,000 species of worms known worldwide. There are many more in our oceans.
- Worms are among the most ancient of terrestrial animal groups. They play a vital role in the formation and maintenance of fertile soils and are thus paramount for primary production.
- In the size of a football field there can be over a million earthworms
- Even though worms don't have eyes, they can sense light, especially at their anterior (front end). They will move away from light and will become paralysed if exposed to light for too long (approximately one hour).
- Worms cannot hear, but they can feel the vibrations of animals moving nearby
- If a worm's skin dries out, it will die. Earthworms breathe through their skin and therefore need their living conditions to be moist and humid to prevent drying out.
- Worms are hermaphrodites. Each worm has both male and female organs. Worms mate by joining their clitella (swollen area near the head of a mature worm) and exchanging sperm. Then each worm forms an egg capsule in its clitellum.
- Worms can eat half their weight each day. They possess very strong mouth muscles but they do not have teeth. Some worms can eat their weight a day. Can you imagine an elephant doing that?
- Worms have up to 5 hearts, yet no lungs or eyes.
- Worms only mate with members of their own species; there is no such thing as a hybrid worm.
- Under favourable conditions, mature worms will produce egg capsules every 7 to 10 days.
- Each egg capsule contains from 2-20 baby worms.
- The Australian Gippsland Earthworm is the biggest worm. It grows to 4 metres and can weigh 3/4 kilo
- The largest earthworm ever found was in South Africa and measured more than the length of a cricket pitch from its nose to the tip of its tail.

## Worm farming: the history

- In the days of the dinosaurs and until man built cities, nature was in balance. Worms converted organic wastes into natural fertiliser that was used by plants.
- However, as man built cities, more and more of the land was covered by buildings and roads making it impossible for the worms to get at the waste.
- During the late 19<sup>th</sup> century, chemical fertilisers and pesticides were developed. While these increased farm production, they also started to kill the life in the soil, particularly worms.
- The more soil health declined, the more chemicals farmers used until even the rivers became polluted with all the chemicals.

## Worm farming: the solution

- Vermiculture or worm farming is an environmentally friendly, cost effective method of removing urban waste and converting it into a valuable resource.
- Waste from our large cities can be fed to worms and who convert it into a natural fertiliser – vermicast- that can then be used by farmers. Vermicast contains millions of beneficial microbes that actually restore life to dying soils and help farmers to grow more crops and to use fewer chemicals.
- Worms - **nature's perfect recyclers** - can help to solve three great problems facing the world:
  1. Safe disposal of rubbish
  2. Restoration of dying soils
  3. Reduction in the use of chemical fertilisers

## Worm tunnels or burrows

The tunnels that earthworms make beneath the topsoil do a tremendous service to the trees and plants above. The burrowing aerates the soil, which is why earthworms are called "nature's plough".

Worms not only help bring oxygen down into the soil, but their tunnels allow rainwater carrying organic and inorganic nutrients into the soil to the roots of the trees and plants.





## Worm anatomy- how does it work?

### Body segments

The worm's body is divided into 100 or more body segments. As the worm works its way forward, successive peristaltic or contracting waves of thickening and thinning (7-10 per minute) pass down the body. At each place where the body bulges out at a given moment, the bristles, or setae, are extended and grip the burrow walls.

### Body hair or legs!

Called Setae, they are not true legs but pairs of bristles or horn-like hairs, attached to each segment of the worm's body, which push against the ground with each contraction and help the animal move. They are used for grip (and also as sensors). They are arranged on the body in differing patterns or groups according to the species.

### The clitellum

Usually the most obvious feature is the clitellum, the section of the body, which denotes sexual maturity. This is a saddle or ring, sometimes raised or wider than the body. Its position varies between species. If the worm has a clitellum, it is sexually mature. **Q. Can earthworms lose their clitellum?** Yes! When the environment becomes stressful for the worm e.g. during periods of drought, some species of earthworms do temporarily lose all secondary sexual characters such as the clitellum. When conditions become favourable, it comes back.

### Worm eggs

The clitellum produces a mucous sheath and nutritive material. As the sheath slides forward, it picks up ova from the earthworm's ovaries and then packets of sperm that have been transferred to the worm from another worm during mating. Then the sheath slides off the worm's head, and the ends are sealed to form a capsule. Initially, the capsule or cocoon is quite soft but soon after it is deposited in the soil, it becomes slightly amber in colour, leather-like and very resistant to drying and damage.

### Circulatory System

Three to five pairs of simple hearts control an earthworm's circulatory system with the positioning and number varying between species. The old story that, if you cut a worm in half, you have two worms is largely wrong. With a few exceptions, worms need all their hearts and if you cut some off, they will die.

### Breathing

Worms breathe, or absorb oxygen, through their skins. After heavy and prolonged rain, worms can often be found dead, scattered about on the soil surface. As the soil becomes saturated with water, the air, being less dense than the water, is displaced and the worms rapidly begin to suffocate.

### Long life

Worms have a long life span and the beauty industry considers the oil as a beneficial aid against aging. A Red worm kept isolated for fifteen years was killed and dissected. No signs of ageing were found. But this is not true for all species, some of which are thought to live for a year only, while others have been found to have a two-year cycle.

## Body parts

**Mouth:** Earthworms have mouths that they can open wide to fit leaves and other good things to eat. But they don't have teeth!

**Pharynx:** The throat (pharynx) comes out of a worm's mouth to grab leaves and to pull them back into its mouth. Then the worm's saliva moistens the food.

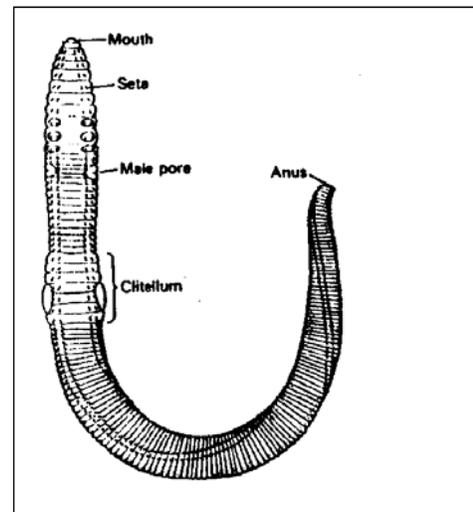
**Crop:** Worms store this food in their crop before it gets passed down to the gizzard.

**Gizzard:** The gizzard is where the work happens. The gizzard muscles are so strong they can grind up leaves-- it's almost like teeth!

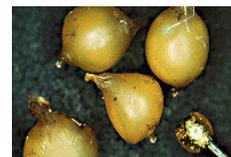
**Intestine:** The intestinal juices break down the ground up food even more.

**Bloodstream:** After the food is all digested, some of it will pass into the bloodstream.

**Anus:** Whatever is leftover comes out the anus as castings (worm poop).



The ova within each cocoon are fertilised, and the resulting embryos grow inside the sealed unit, much like a chick developing inside an egg. When the embryos have consumed all the nutritive material, they completely fill the lemon shaped cocoon and are ready to hatch out one end.



Worm capsules shown next to a pinhead