



# INSTAR

The Magazine for Young Entomologists, Age 7+

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

*Inside this  
edition*



**Catching  
moths!**



From school project  
to scientific paper

**Insect  
pests**

**Amazing  
ants**



**Beetles  
on the move**

**...and lots more!**

**Discover  
the amazing  
lives of  
insects**



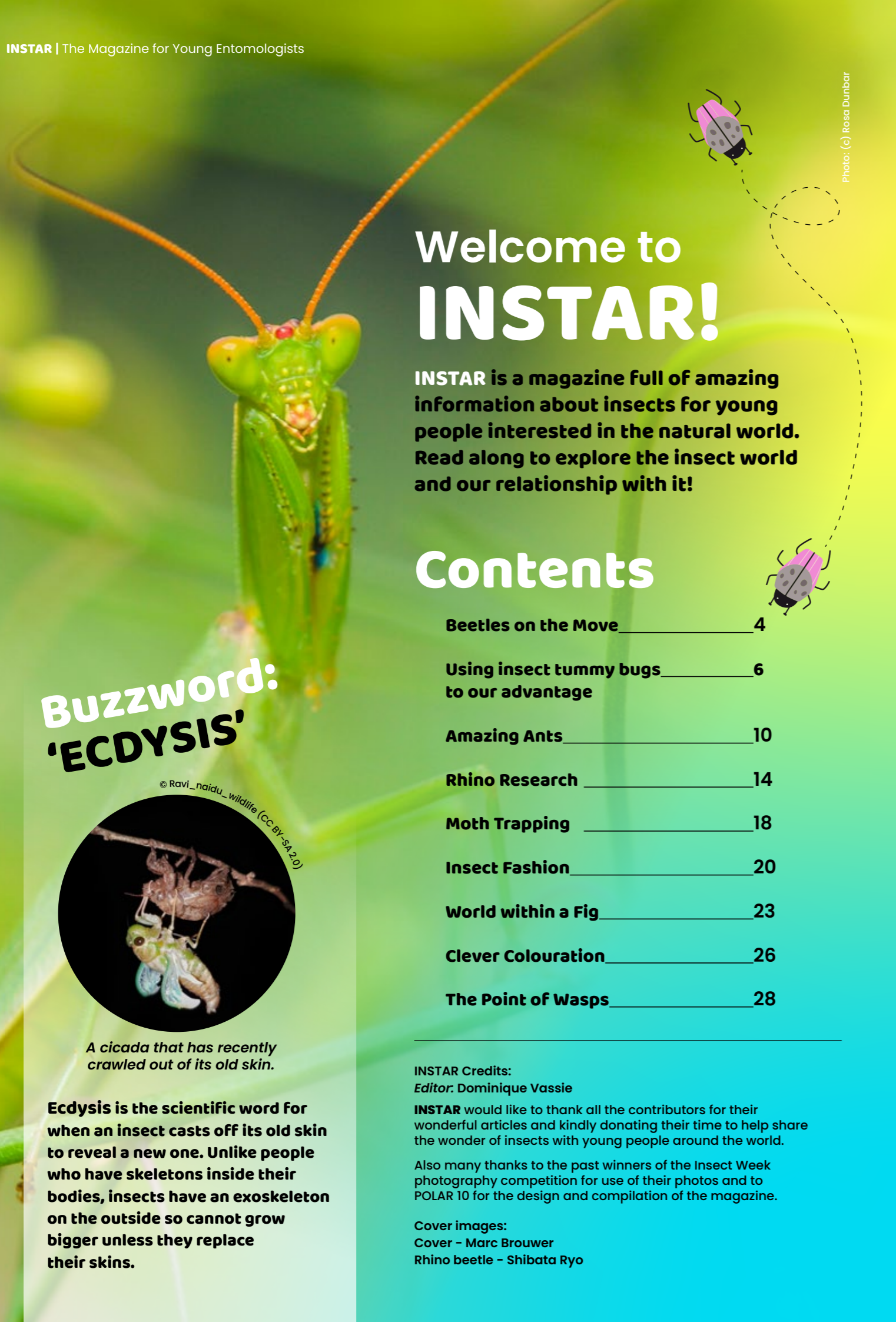


Photo: (c) Rosa Dunbar

# Welcome to INSTAR!

INSTAR is a magazine full of amazing information about insects for young people interested in the natural world. Read along to explore the insect world and our relationship with it!

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### Buzzword: 'ECDYSIS'



© Ravi\_naidu\_wildlife (CC-BY-SA2.0)

A cicada that has recently crawled out of its old skin.

**Ecdysis is the scientific word for when an insect casts off its old skin to reveal a new one. Unlike people who have skeletons inside their bodies, insects have an exoskeleton on the outside so cannot grow bigger unless they replace their skins.**

**INSTAR Credits:**

Editor: Dominique Vassie

INSTAR would like to thank all the contributors for their wonderful articles and kindly donating their time to help share the wonder of insects with young people around the world.

Also many thanks to the past winners of the Insect Week photography competition for use of their photos and to POLAR 10 for the design and compilation of the magazine.

**Cover images:**

Cover - Marc Brouwer

Rhino beetle - Shibata Ryo

# Ento Info



Photo © Dominique Vassie



Photo © Dominique Vassie

## Mother Shipton

**Common name:** Mother Shipton moth

**Scientific name:** *Callistege mi*

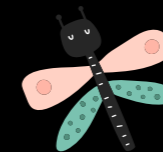
**Order:** Lepidoptera

**Where:** Widespread across Europe and Russia.

**Habitat:** Open grassy areas like hay meadows, heathland and even roadside verges.

**Favourite food:** Adults drink nectar from clover and creeping buttercup and caterpillars like to munch on the leaves of clover, common birds-foot trefoil and various grasses.

### FACTS !!!



- This moth is active during the daytime flying short distances between flowers.
- It is most active on sunny days.
- It is named after a 'witch' known as Mother Shipton from Yorkshire, UK in the 1500s. Each forewing of the moth has markings that resemble a witch's face. Do you see it?

## Spotted lanternfly

**Common name:** Spotted lanternfly

**Scientific name:** *Lycorma delicatula*

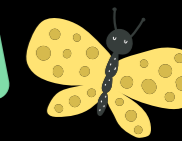
**Order:** Hemiptera

**Where:** Native to areas of China and Vietnam but now invasive in the north-eastern USA, Japan and South Korea.

**Habitat:** Almost anywhere where they can feed on their host plants, be that in a forest or a city park.

**Favourite food:** These insects love drinking plant sap, with their favourite being that of the tree of heaven (*Ailanthus altissima*).

### FACTS !!!



- The spotted lanternfly has been found feeding on over 170 different plant species around the world.
- They can feed in such large numbers that they can kill off parts of a tree.
- Spotted lanternflies are quickly spreading across the Eastern USA which is worrying for crop farmers.

# Beetles on the move!

By Will Pearce

Musician and amateur entomologist

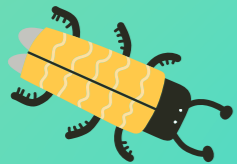
Beetles are one of the largest and most successful groups of animals on the planet - on average 4 new species of beetle have been discovered every day since 1748.



Sometimes, often accidentally, beetles are transported from one part of the world to another. They may be under the bark of a log on a lorry; in a crate of grain on a boat; or tucked away in luggage on a plane.

In many cases the beetle won't be able to survive in its new home, but if it does it can have a large impact.

We use a lot of different words to describe these beetles, such as 'non-native', 'introduced', and 'alien' - all they really mean is a species that isn't quite where you'd expect!



## 1 STAR-THISTLE WEEVILS

Beetles can be intentionally introduced as a **biological control** to reduce the spread of other damaging species. For example, the plant Yellow Star-thistle was accidentally brought to the USA, likely mixed in with crop seeds. It grows readily in bare soil, and is very spiky. As a result it quickly colonises farmland and stops animals from grazing. Several species of weevil have been released to combat Yellow Star-thistle. Their lifecycles involve eating the plant's seed head, limiting the number of seeds each plant produces, reducing the need for chemicals such as herbicides.

### Buzzword: 'BIOLOGICAL CONTROL'

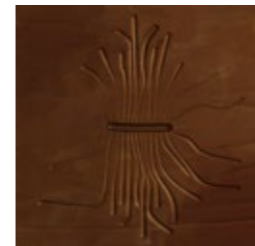
Sometimes certain animals and plants can become a problem to people's livelihoods and wildlife. These species may need to be controlled to stop them causing huge damage. Biological control is where other living things are used to harm the problem species to bring their numbers down. This is different to using harmful chemicals.

## 2 RED FLOUR BEETLES

The Red Flour Beetle is one of the most expensive animals on the planet, costing hundreds of billions of dollars in damage every year. It is a pest of grain stores, and has been unintentionally introduced to every continent. Since they reproduce rapidly and require little more than flour to survive, they are used as a model organism for study in a laboratory. They have even been sent to space, to study how low gravity affects animal growth - In every sense of the word, this beetle is alien!



Photo by Viktor Talashuk on Unsplash



## 3 BARK BEETLES

Bark Beetles belong to a subfamily of weevils. They bore into the bark of a tree, and often have associated fungi which help them digest wood. Many species of Bark Beetle have been accidentally introduced to woodlands, through the transport of infested logs. Sometimes these beetles can also carry fungi which the trees have not evolved to live alongside, causing tree diseases and leading to increased pressures on woodlands.



## 4 HARLEQUIN LADYBIRDS

Colourful Harlequin Ladybirds have been introduced across the world. Sometimes accidentally, and sometimes intentionally to control aphids. They spread rapidly, and quite like the taste of other ladybird eggs and larvae. Fortunately, many of the diseases which affect native ladybirds are spreading to invasive harlequin populations, and it is expected that eventually a balance will be found with native species.

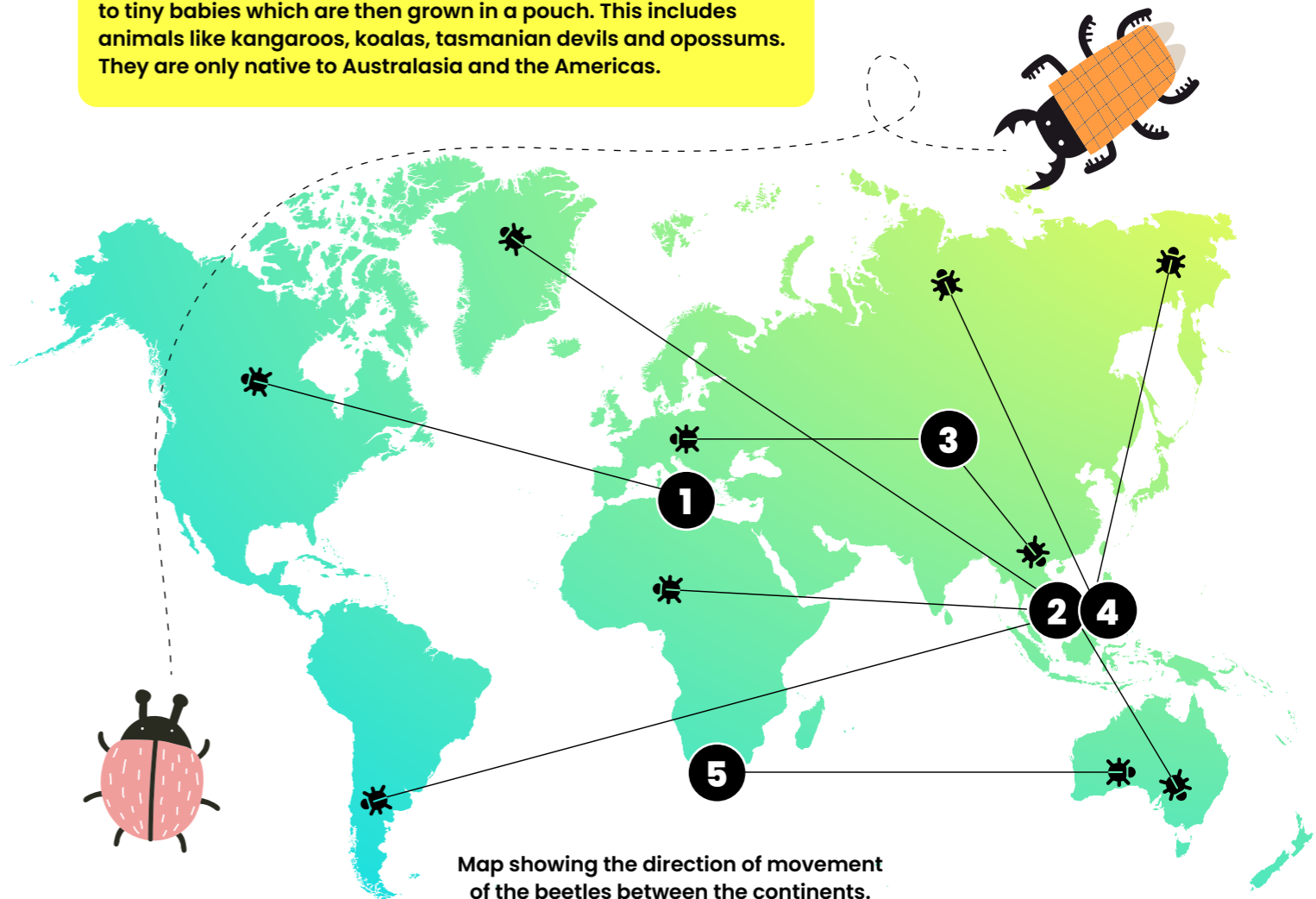


## 5 DUNG BEETLES

Native Australian Dung Beetles struggle to digest cow pats, as they evolved to eat dry **marsupial** poo. When cattle were first brought to Australia, cow poo started to lie undigested in the fields. This led to plagues of biting midges, and crusty dried poo across the Australian landscape. In 1967, a handful of Dung Beetle species which are able to eat cow poo were introduced to Australia, helping to break the cow pats down and to enrich the soil. This ecosystem service that Dung Beetles provide saves farmers hundreds of millions of dollars every year.

### Buzzword: 'MARSUPIAL'

The marsupials are a group of mammals which give birth to tiny babies which are then grown in a pouch. This includes animals like kangaroos, koalas, tasmanian devils and opossums. They are only native to Australasia and the Americas.



Map showing the direction of movement of the beetles between the continents.

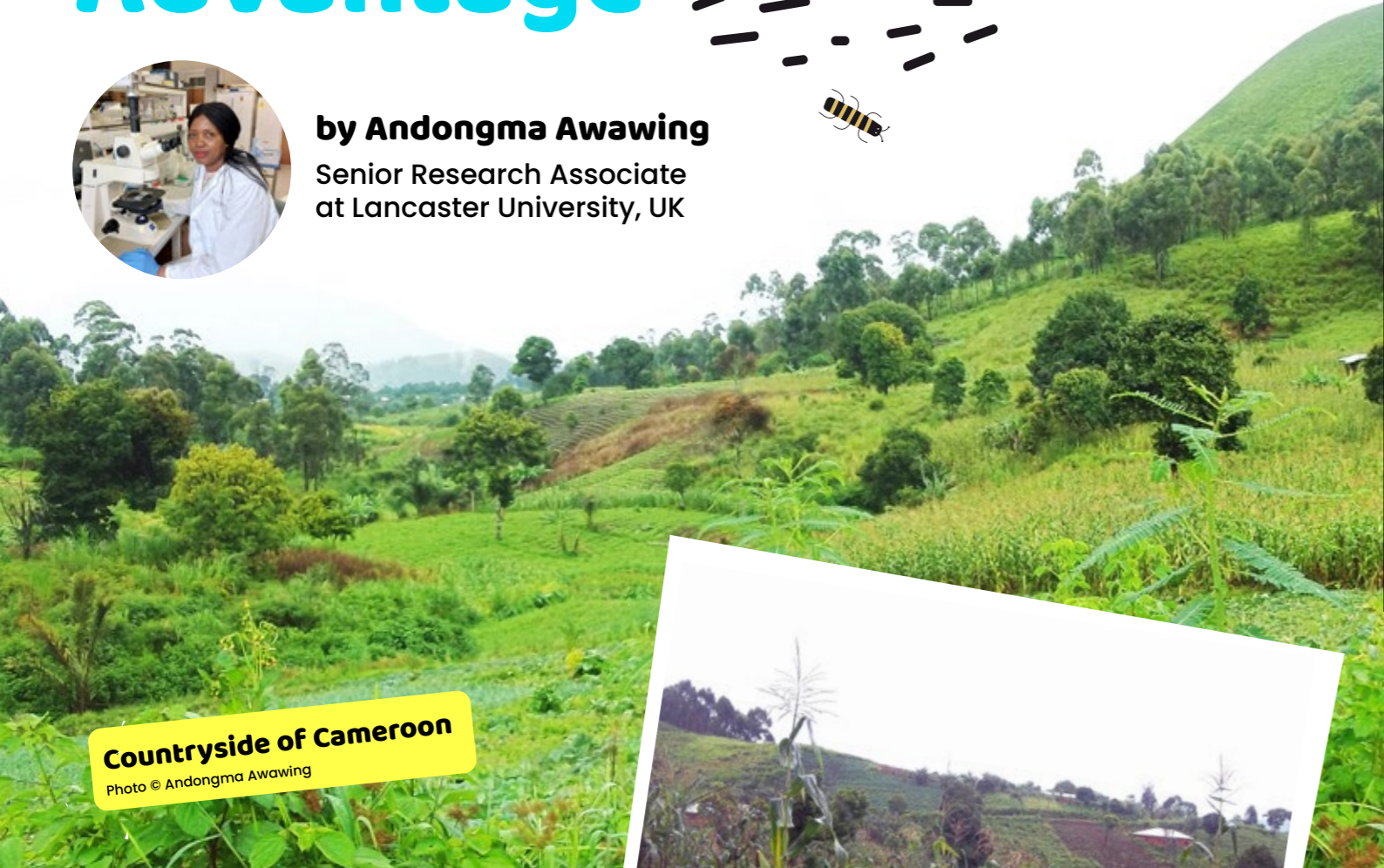
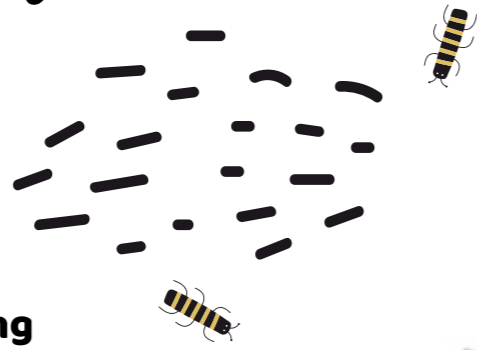
Beetle illustrations 1 and 2 by Will Pearce

Beetle illustrations 3, 4 and 5 by Will Pearce

# Using Insect Tummy Bacteria to our Advantage



**by Andongma Awawing**  
Senior Research Associate  
at Lancaster University, UK

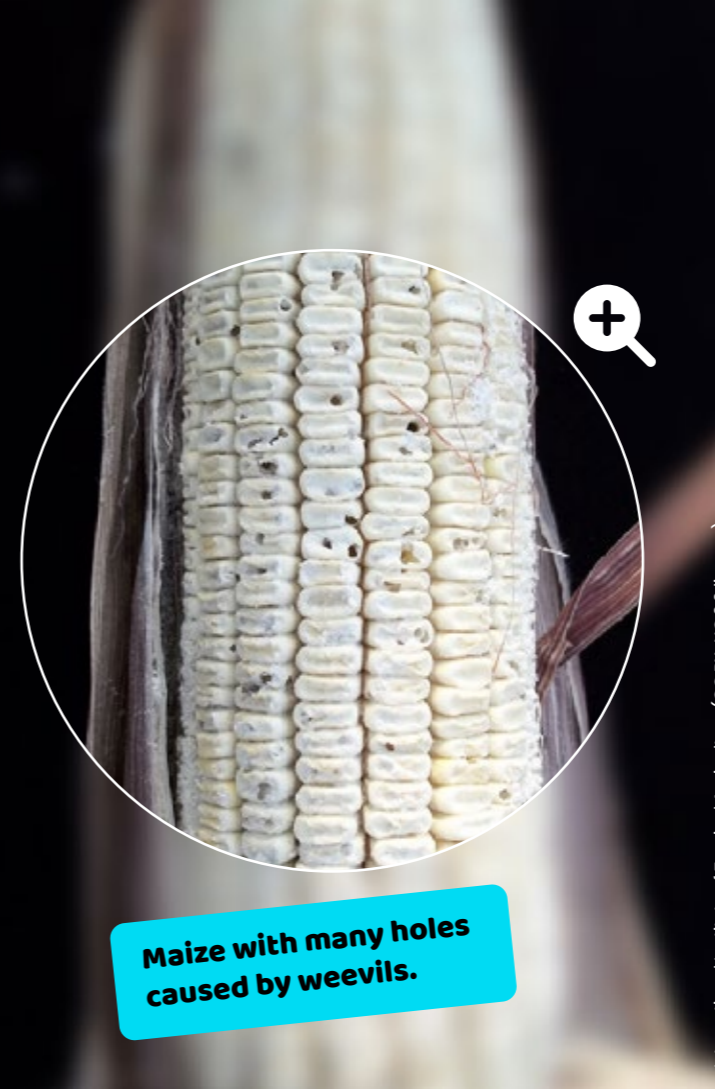
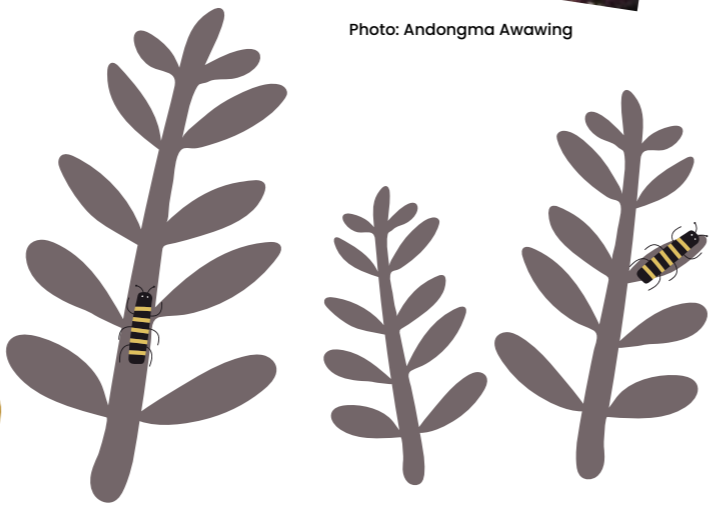
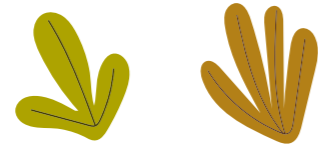
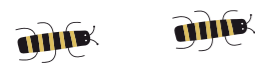


**Countryside of Cameroon**  
Photo © Andongma Awawing



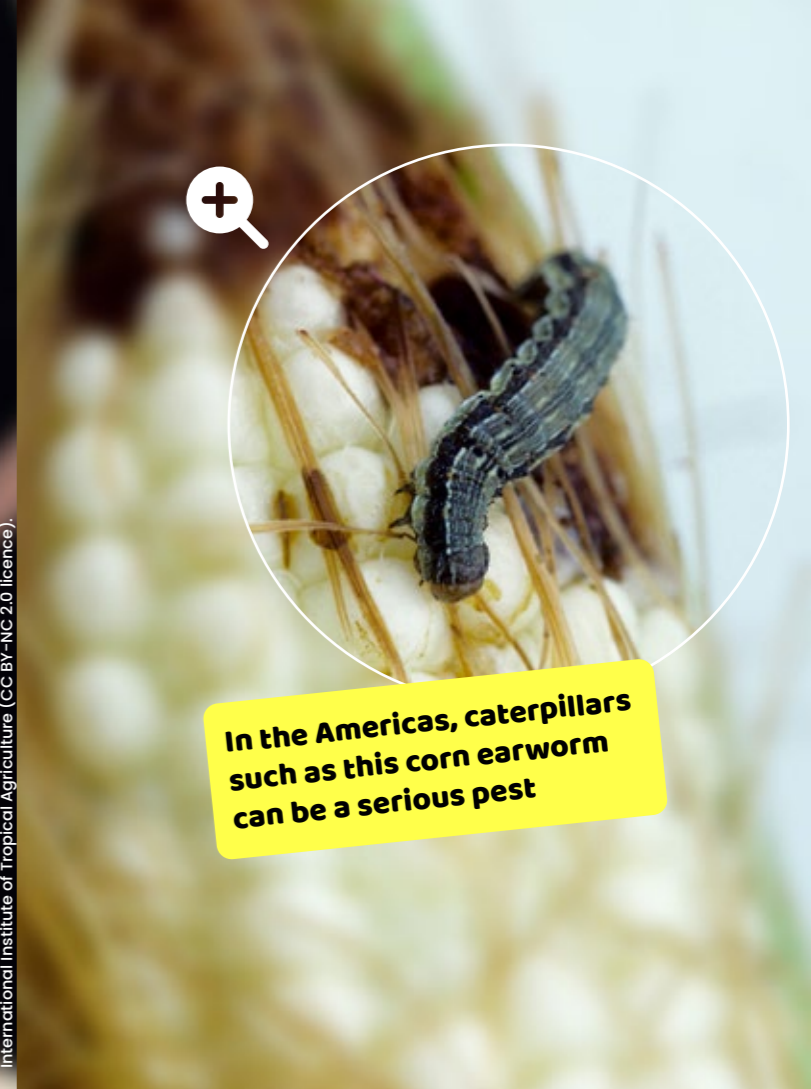
**A maize farm in Cameroon**  
Photo: Andongma Awawing

When I was young, my parents farmed maize. Unfortunately, loss after harvest due to infestations of hungry weevils (a kind of beetle) was a big problem as they would chew most of the grains to powder during storage. Since then, I knew I wanted to learn more about how to efficiently control pest insects to make it easier for people to grow and store food.



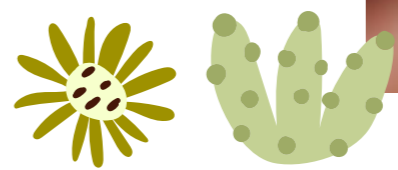
**Maize with many holes caused by weevils.**

International Institute of Tropical Agriculture (CC BY-NC 2.0 licence).



**In the Americas, caterpillars such as this corn earworm can be a serious pest**

I managed to get good grades in sciences at school and went on to study a degree in Zoology in my home country of Cameroon. During this time at university, my fascination for insects grew even stronger! so, after completion I was awarded a scholarship to study a master's degree in entomology at the University of Ghana. After I finished that, I was awarded another full scholarship to study for a Ph.D. in agricultural entomology and pest control in Wuhan, China and later travelled to France for research training. Studying entomology has taken me all around the world!



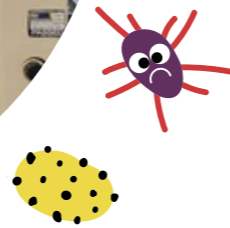
Currently, most farmers use special chemicals designed to kill insects to help manage pests on their crops. Unfortunately, these chemicals, called pesticides, can have bad effects for human health, pollute water and even kill beneficial insects like bees. Therefore, I am trying to explore other ways to control insect pests. Specifically, my research is focused on understanding the relationship between insects and bacteria and how we could use this relationship to develop more efficient and environmentally-friendly insect pest control technology.



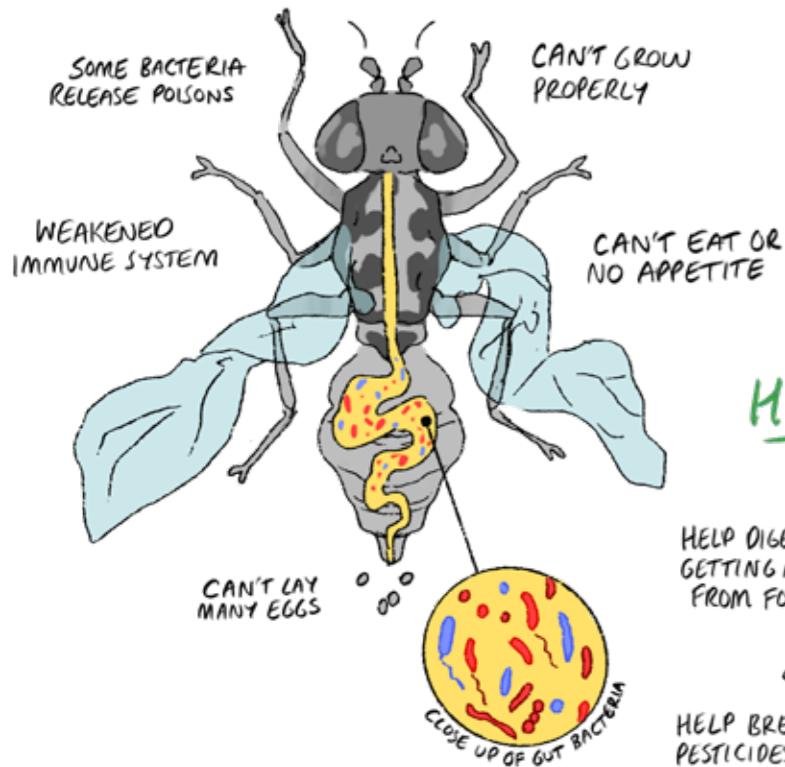
**A crop plant infested with insect pests from my Masters research.**

Photo: Andongma Awawing

Just like human beings, insects are home to thousands of different bacteria species living on the outsides and insides of their bodies. Bacteria are very very small and cannot be seen with the naked eye. So when I was studying in China, I used microscopes to let me see them up close and special scientific techniques to identify the bacteria and work out what they were doing inside the insects. Some bacteria are helpful to the insects, some hurt them and others are neither good or bad. Understanding the relationship between bacteria and insect can help us learn which ones might help us control the insect pests.



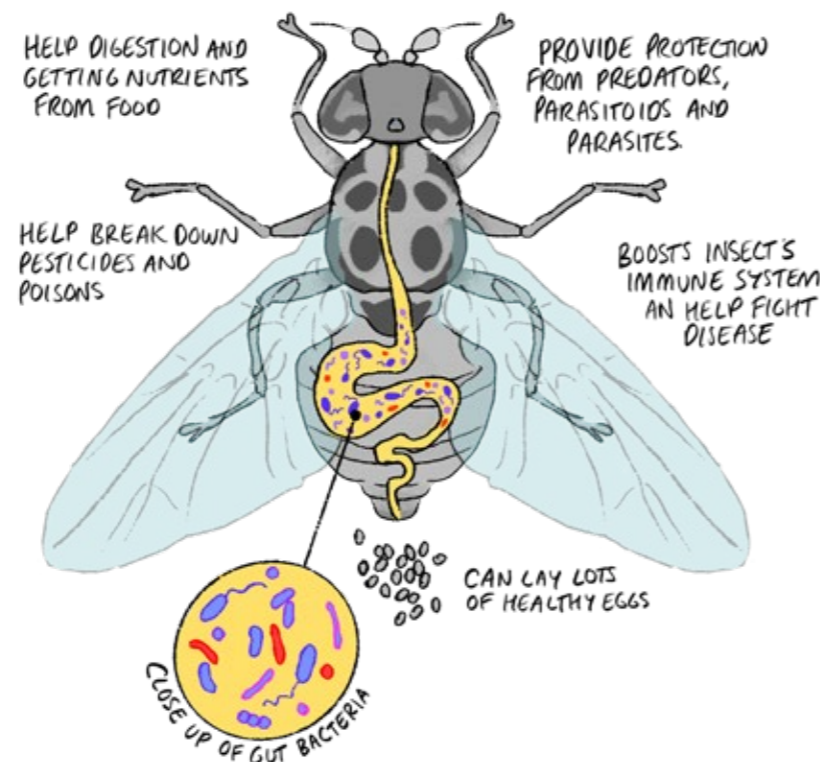
## INSECT INFECTED WITH HARMFUL GUT BACTERIA



The balance of different gut bacteria can be helpful or dangerous for an insect. We can use these bacteria to control damaging insects.



## AN INSECT WITH HEALTHY GUT BACTERIA



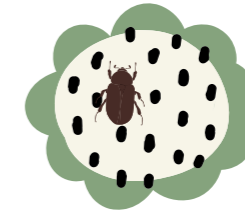
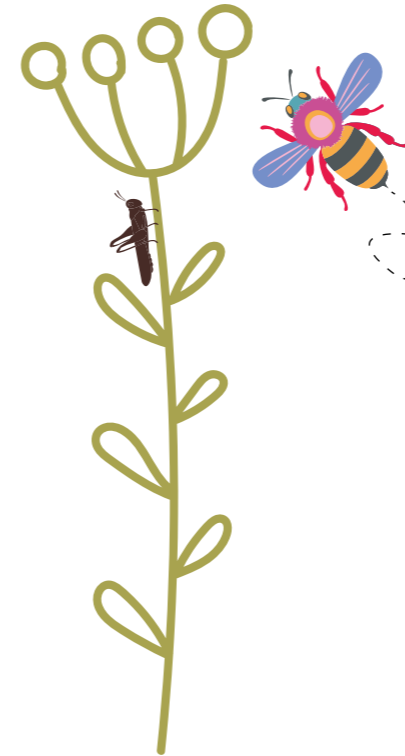
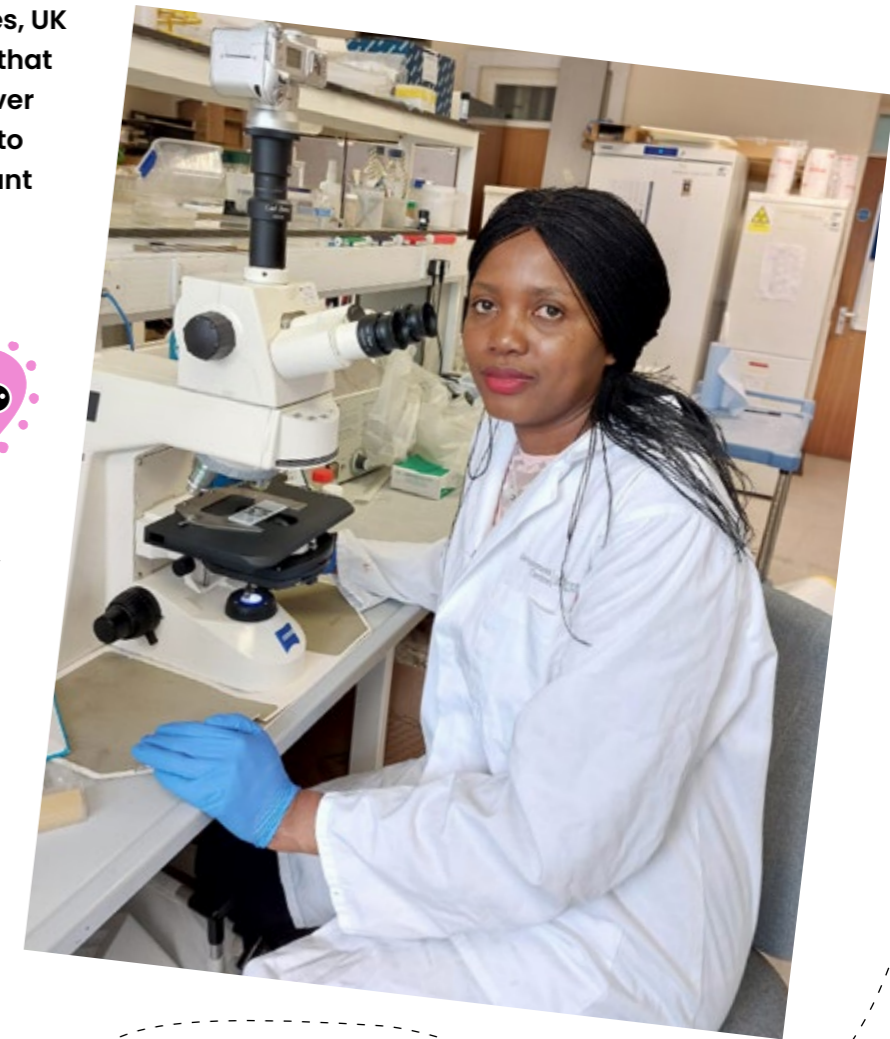
### **Buzzword: 'BACTERIA'**

Bacteria are tiny living things made of only one cell that are very different to animals, plants and fungi. Some cause disease but others are very important for keeping us alive!

After China, I moved to Swansea in Wales, UK where I worked on a fascinating project that used these bacteria from insects to deliver poisonous substances into insect pests to control them. This technology is important as it would allow farmers to kill only the problem insects without hurting all the other insects on the farmland too. Our studies found that it worked: the bacteria could only live inside the target insect and the poison only worked on the insect we wanted to control.



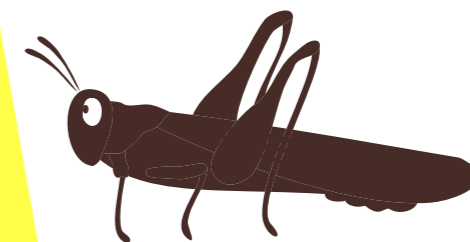
Currently, I work at Lancaster University, UK where I use insects as models (guinea-pigs) to understand the connections between the food we eat and health. The goal of my research is to understand how nutrition influences infection by disease-causing bacteria and disease development.

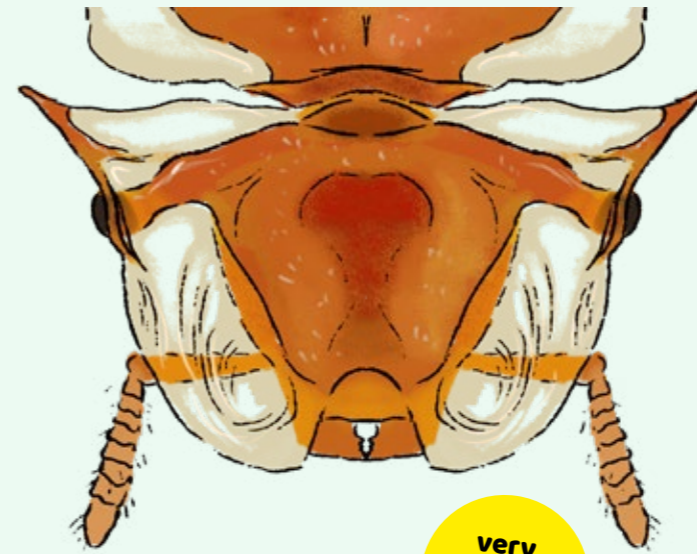


I have really enjoyed my career as a research scientist. It has taken me to several countries where I have learned about different lifestyles, cultures, and languages. As an entomologist, I have had a unique opportunity to gain lots of different skills in different areas of science and beyond. This means I have lots of options for what I might do for my job in the future. Most importantly, I have also had an amazing chance to contribute to science and towards developing pesticides that will help people around the world grow food without harming nature.

### **Buzzword: 'PESTICIDE'**

A pesticide is a substance designed to kill insects or other living things that cause problems for people growing plants or animals for food and other uses.





### Exploding ant

*Colobopsis explodens*

📍 Southeast Asia

These ants live amongst the leafy canopy of tropical trees and they have an unusual defence strategy. When they get into a serious fight with neighbouring ant colonies or predators, the workers explode themselves and cover their attackers in yellow goo to protect their colony! It is an extreme behaviour but helps ensure the colony has plenty of territory to forage for food.

### South American jumping ant

*Gigantiops destructor*

📍 Amazon  
- Northern South America

These insects have the largest eyes of any ant and are famously able to jump. The workers forage alone rather than alongside their nestmates, prowling and leaping across the forest floor looking for small insects and nectar. Their amazing eyesight makes it difficult for most entomologists to get close to them.

### Gliding ant

*Cephalotes clypeatus*

📍 South America

These ants live high in the tree-tops and have very grippy feet to help them climb. However, accidents happen and sometimes they still fall off which is when they use their superpower: gliding! These ants have flattened growths along their head and bodies which allow them to glide back towards the trunk of their tree and get home quickly.

### Trap-jawed ant

*Myrmoteras iriodum*

📍 Indonesia, Malaysia

These ants have large eyes and hunt using jaws which act as a trap. The spiky mandibles (jaws) are held wide open and almost behind the head and remain in place until their prey triggers special hairs then they immediately snap shut! They live in small colonies of around 20 ants in nests beneath rocks on the forest floor.

# AMAZING

Ants are tiny animals which many people completely ignore but look a little closer and there is an exciting world of diversity. Ants live in many different environments across the world and so have bodies with different adaptations depending on where they live. Let's meet some ants face-to-face and learn about who they are.

# ANTS

by Dominique Vassie

# AMAZING ANTS



move house often!

## Army ant

*Eciton burchellii*

Central America & Amazon rainforest

These ants come in many shapes and sizes depending on their role in the colony. The soldier ants are much larger and have huge curved jaws for defending their colony when foraging or moving house. Army ants move house often, usually at night, and are frequently found living in temporary nests with walls made from the living worker ants themselves.

These army ants are a truly important member of their forest home with over 500 different species found to associate with them, more than any other single species.



eats almost anything!

## Yellow Crazy Ant

*Anoplolepis gracilipes*

Native to Southeast Asia but invasive across the tropics

This light-coloured ant has a slender body with very long legs and antennae and is an effective scavenging-predator eating almost anything. Their large colony sizes and aggressive behaviour to other species makes them a particularly damaging invasive species in many regions. When they swarm in large numbers, they can take on prey much larger than themselves.

## Buzzword: 'EUSOCIAL'

Eusociality is when an animal lives in a special colony with overlapping generations where just one or two animals reproduce (such as a queen ant). The non-reproducing animals (such as worker ants) work together to care for the offspring.

## Green-head ant

*Rhytidoponera metallica*

Australia

These ants are a beautiful iridescent purple and green colour, are highly adaptable and can live in many different habitats. Their resilience makes them often one of the first insects to return to forage in an area destroyed by wildfires. They hunt during the daytime and help spread the seeds of certain plants, however can deliver a painful sting if feeling threatened!



help spread seeds!

## Northern Caribbean turtle ant

*Cephalotes varians*

Southern Florida and the Caribbean

These tree-dwelling ants live inside hollowed-out wood that is still standing, such as in the old burrows of wood-boring beetles. Some of the workers have disc-shaped head armour which perfectly plugs the entrance holes without exposing the insect's eyes, antennae or jaws to potential enemies. This way, they keep their homes hidden and defend themselves in a non-aggressive way.



Living doors!

# Backyard rhino research:

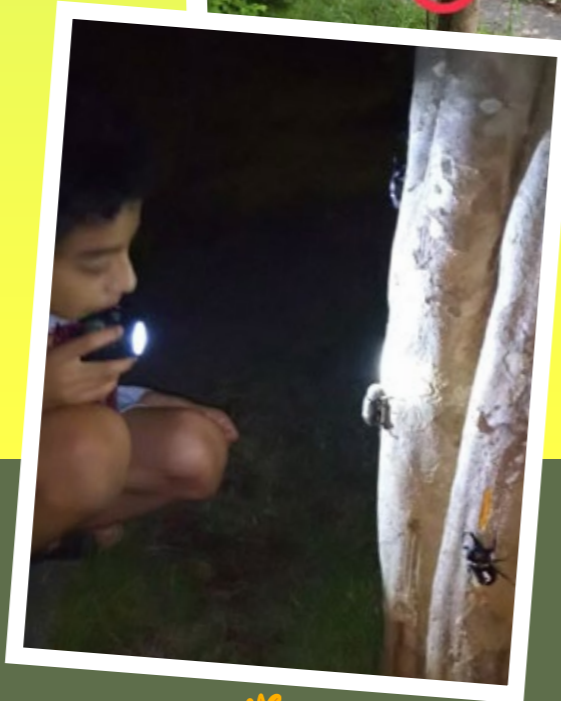
All photos are © Shibata Ryo

## one boy's journey from school summer project to scientific paper

By **Kumi Oda** (小田 くみ)  
Design researcher who makes films about insects

Japanese primary schools have a summer homework assignment called 'jiyū kenkyū' (自由研究) meaning 'free research'. During the month-long summer holidays, students are encouraged to work on a research topic of their own interest in any field.

Ryo's Griffith's ash tree full of big rhino beetles.



Ryo inspecting the rhino beetles in his Tokyo garden

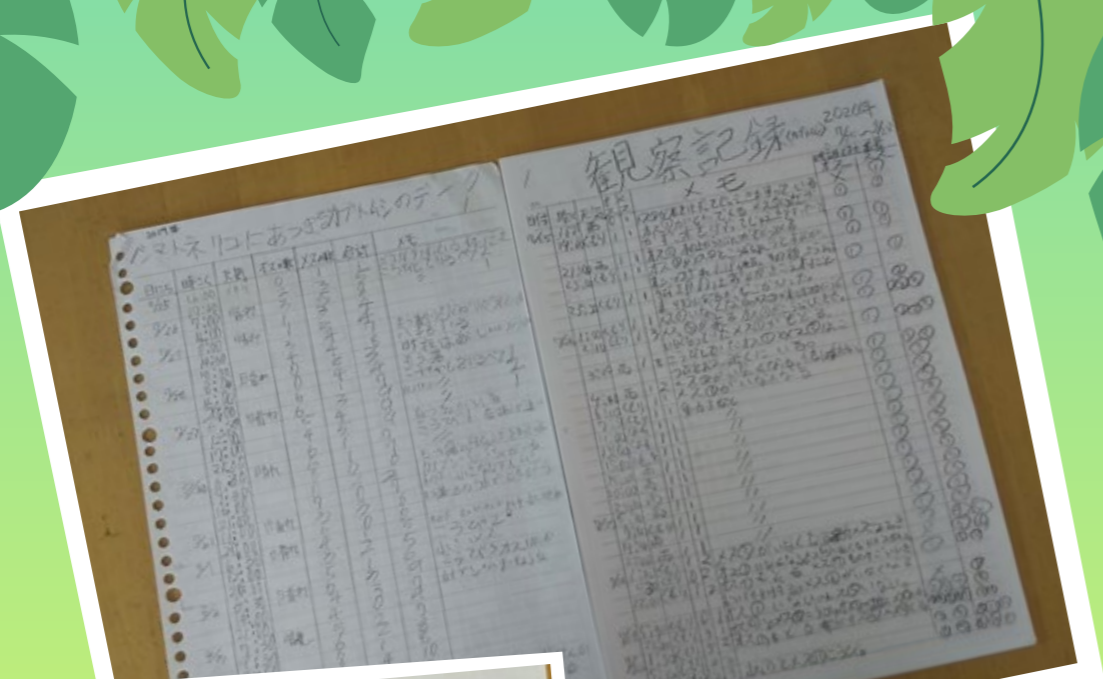


**Ryo Shibata** (柴田 亮), who lives in the suburbs of Tokyo, Japan, found a very unique research topic on his own. Ryo loves beetles. Every summer for the past four years, from the age of nine until now, he has been researching Japanese rhinoceros beetles that congregate in the Griffith's ash tree in his garden every summer. His summer research was published in the American journal 'ECOLOGY' with the help of a university researcher, Dr Wataru Kojima (小島 渉).



Rhinoceros beetles (*Trypoxylus dichotomus*) are a relatively common insect in natural areas in Japan and are popular with children because of their horns. In Japanese, they are called kabutomushi (カブトムシ), meaning helmet-bug. These rhinoceros beetles are known to be nocturnal insects, usually gathering at night to feed on the sap of trees such as the oak. But Ryo found the beetles gathering in a Griffith's ash tree (*Fraxinus griffithii*), which is a non-native plant, in his garden during the day. He wanted to know why, so he searched the internet and read all the books in the library that mentioned rhinoceros beetles in the title, but he didn't find the answer. He did, however, find a book that said "sometimes many beetles visit ash trees during the daytime" and decided to email the author, Dr Kojima, thinking he might have the answer to the mystery. Meanwhile, he started observing and recording the number and time of the beetles himself.

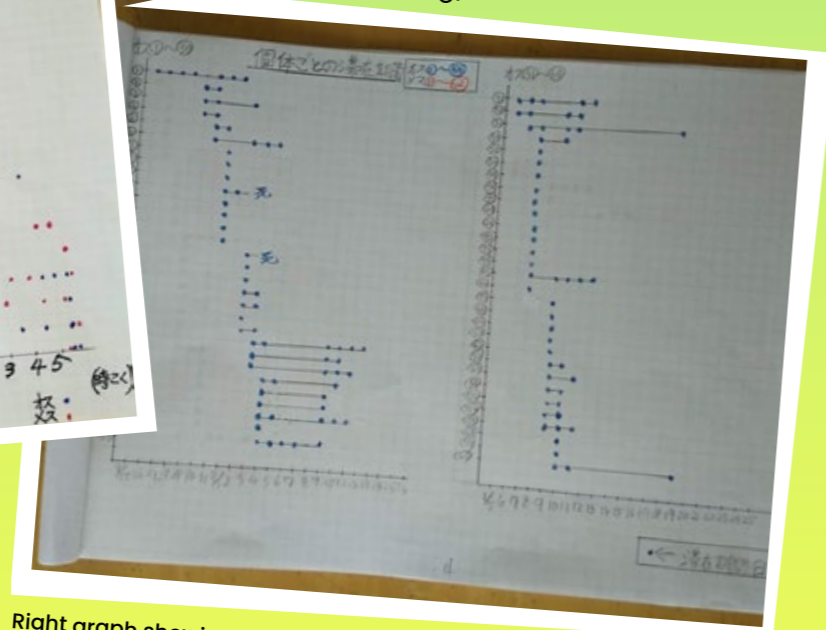




One of Ryo's data collection sheets



Left graph showing numbers of beetles he observed at different hours of the day.



Right graph showing how many days each beetle stayed on the tree.

Dr Kojima is a researcher at Yamaguchi University in Japan who studies insect ecology. He wrote back to Ryo: "I don't know why, but you are investigating something very interesting, so please keep up the good work". Ryo found that even the experts didn't have the answer, but instead of giving up, he decided to find out for himself and investigate!

Dr Kojima gave him advice on how to carry out his research. The following summer Ryo marked individual rhino beetles so he could see which ones came to the Griffith's ash tree and when, and took data several times a day, every day during the summer holidays. The total number of beetles reached 162. When Dr Kojima saw the data, he thought it was amazing and

quite valuable - it would be a pity to let it be buried as free research for primary school homework, and that it would be better to publish it as a paper. At the time, Ryo had no idea what a paper would be like and thought it would be written by someone like a great professor, so he was surprised when he was expected to write the paper!



Ryo collecting data from the rhino beetles at home.



Ryo presents his research after being chosen to represent his school.

The data Ryo collected proved that the beetles are not nocturnal, but are also active during the day, but why they alter their activity patterns only when they feed on the introduced ash tree remains as a question. Ryo says there are still many mysteries that he would love to unravel!



### Ryo's message to other children around the world who like insects:

"I think there are many wonders hidden in familiar insects and other living things, and everyone has a chance to do research. It would be really interesting to actually investigate things you are curious about. In my research, I was sometimes ridiculed for measuring the weight of beetles, because people wondered if it was possible to measure such

minute changes in weight, but I was able to collect some pretty good data as a result. So I think it's important to try things that you think of, even if people make fun of you, just go for it!"

In recent years, with the widespread use of the Internet, it has become easier for even children to contact insect researchers and experts. As we live in an age where anyone with the motivation can potentially do research with experts, we may see more research by children being published in academic journals in the future, Dr. Kojima said.

# Finding Magical Moths

by Roxanne Vassie, Natural England apprentice

Photos © Roxanne Vassie

There are so many different kinds of moth around us but because they are mostly active at night, and very well camouflaged by day, it can be hard to see them. Moth traps let us get closer look at the moths around us and work by attracting moths to a light or food source.

There are several ways that you can set up a moth trap:

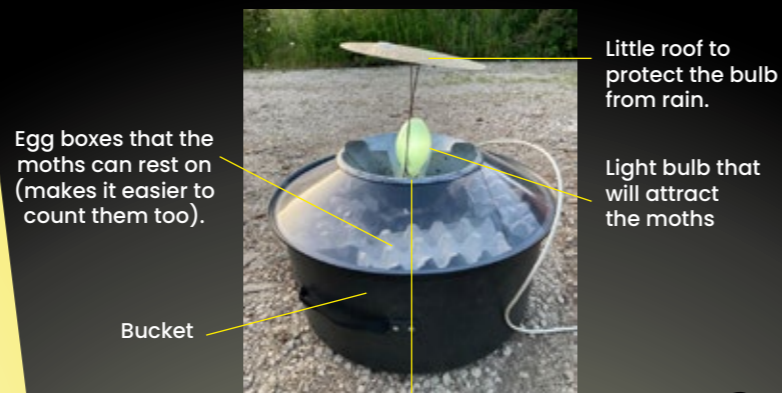
1. Buy or create a bucket moth trap.
2. Make a light trap by hanging a white sheet up and shining a bright light on it.
3. Create a sugar trap using sugar, wine (ask a grown up), and cloth then hang it up on branches and wait.

## Moth trapping on a nature reserve

I work on a nature reserve near York called the Lower Derwent Valley and we run moth traps from April-November. We always see a huge variety of moths of different colours and sizes!

We use a big bucket moth trap as it means we can leave it all night and check it in the morning. This type of trap has a big light bulb sitting on top of the bucket above a funnel. The bright light makes it hard for the moths to fly causing them to come in close to the light and fall through the funnel. Once inside the trap, it is hard for them to find the narrow funnel entrance and so they are stuck inside until morning when we come to find them. We fill the bucket with egg boxes to give the moths lots of places to hide and rest.

Here is the trap we use on our nature reserve:

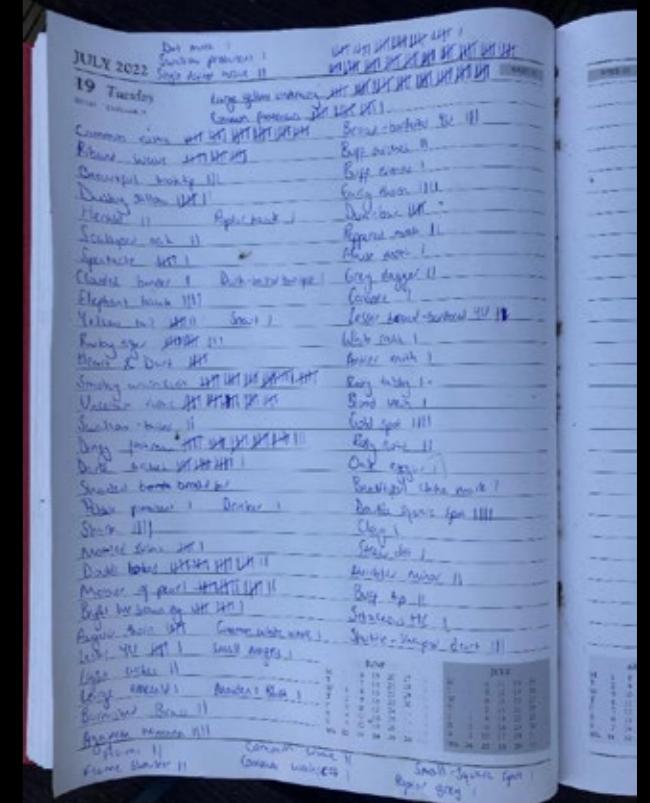


## TOP TIPS

- Choose a warm night with little breeze.
- Cloudy nights are good for extra darkness to make your light trap seem even brighter.
- To attract more moths, try planting more tasty food-plants such as jasmine, honeysuckle, buddleia and fuschia.
- Avoid touching the moth's wings – they are very delicate.
- Avoid trapping in the same location several nights in a row because moths need time to feed and mate.
- Put the trap out in an open space so more moths can see it.



Once the moths are all identified and counted, the numbers are recorded so we can compare how many of each species we caught across different years. This lets us know if any species are doing well or badly. Here's an example of a list from July 2022 – try and count how many moths we caught on this one night!



## MYTHBUSTERS

### MYTH: All moths are brown

**False.** Although there are plenty of small brown moths, there are many colourful ones too! For example, the blood vein, eyed hawk, merveille du jour and elephant hawk (from top left clockwise).



### MYTH: Moths only fly at night

**Not true.** Many moths do fly at night, however, there are moths that fly in the day too. Here is an example of two UK species that fly during the day – the mother Shipton moth and the six-spot burnet.



Many of the brown moths are found in autumn and early spring so are perfectly camouflaged to their surroundings!

### MYTH: All moths eat clothes

**Wrong again!** There are only a small handful of species out of the 2,500 species of moths that live in the UK that eat clothes. Their favourite clothes to eat are made from wool because in the wild these moths are usually found feeding on the rodent hair in owl pellets.



# Fashion in the insect world



by **Alicia Hayden**

wildlife artist, filmmaker, writer, animator and photographer  
- working at the BBC Natural History Unit



**Invertebrates are all around us.**

Peeking out of your window, or walking in your local park, you might notice the grass moving slightly as ants, beetles, and flies move through their forest.

These small worlds underneath our feet contain some of the most bizarre, and fabulously dressed characters on Earth.



**And it's time to meet some of them!**



## Dylan, the Diabolical Ironclad Beetle

A fitting name for an armoured insect, described as a "tiny tank on legs". This flightless beetle has some of the toughest body armour in the animal



kingdom, able to withstand forces up to 39,000 times its body weight. Instead of flying, this armoured beetle has evolved crush-resistant forewings (elytra) which protect it from bird predation. The secret of the beetle's armour comes from interlocking joints, acting like plates in a suit of armour.

For this character design, I wanted to make the beetle look friendly but intimidating. I chose to make him deep purple, as if you look closely at photos of the Diabolical Ironclad Beetle, you can see hues of blue, purple, and green (black is so much more than just black!). His body posture conveys his strength, and makes him look like a feisty, powerful beetle!

## Lula, the Lacewing

So-called because of their elegant, transparent wings which resemble lace. Lacewings are a lesser-known predator of aphids, just like ladybirds, helping keep aphid populations in-check so they don't devour plants. When creating our lacewing character, I wanted to showcase their beauty: the blue-green iridescence of the wings, and giving the lacewing a bit of personality with a sassy pose!



## Heather, the Honey Pot Ant

Honey pot ants have swollen abdomens (up to the size of a small grape) which are filled with honey - created from the nectar of flowers of the Mulga tree in Australia. These honey pot ants are also called "rotunds", due to their round appearance, and act as stores of food for the ant colony to feed off during times with a lack of food. Designing this character was a lot of fun - honey pot ants are so colourful, so I leant into their bright orange/golden colouration, embellishing this individual with a sash and some eyelashes!



## Steve, the Snake-Mimic Caterpillar (*Hermeroplanes triptolemus*)

Caterpillars make an easy meal for birds, mammals, reptiles, and amphibians alike - so to avoid being eaten, many caterpillars have evolved unique ways to trick would-be predators into thinking twice before having a snack. The snake-mimic caterpillar is a particularly eye-catching example of mimicry. In this case, the caterpillar resembles the head of a snake, such as a vine snake, dissuading potential predators who themselves want to avoid becoming a snake's lunch.

For this character, I wanted to stay true to the unusual appearance of such a bizarre insect, layering colours around the back of the caterpillar to give it depth. I also added a tiny little zip at the "front" of the caterpillar, indicating that this is all a clever disguise!



## Patricia, the Painted Lady

Painted lady butterflies have been suffering a decline in the UK over recent years, likely because of climate change. However, every 10 years, there is a boom of migratory painted lady butterflies, who fly across the UK and Europe, dubbed a "painted lady year". The most recent painted lady year was in 2019, and saw almost half a million migratory butterflies.

For this character, I wanted to play with the butterfly's artistic namesake, depicting the butterfly holding a little tin of paint, as if they've been painting on the beautiful, abstract colours found on their wings!



Illustrations © Alicia Hayden

## Wilf, the Water boatman

Water boatmen are often found in streams, rivers, and ponds. They have long, chunky hind legs which are used as paddles to help the boatmen swim – hunting for food, and escaping predators. Male water boatmen attract females by rubbing their front legs against a ridge on their head, in a romantic, underwater song. When designing this character, I wanted to show off the extraordinary paddle hindlegs, as well as drawing attention to the ridge on the boatman's back. By giving this little boatman a hat, and make his eyes more like goggles, I wanted to call up nautical and captain imagery.



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Now it's your turn: take inspiration from Alicia's fashionable insect characters and try designing some of your own! Here are some interesting insects which may inspire you.



# FIG WORLD

BY DOMINIQUE VASSIE




IF YOU HAVE EVER LIVED CLOSE TO A FIG TREE, YOU MAY HAVE WONDERED WHY YOU HAVE NEVER SEEN A FIG FLOWER.


WE ARE FAMILIAR WITH CHERRY BLOSSOM, APPLE BLOSSOM AND ORANGE BLOSSOM BUT FIGS SEEM TO APPEAR OUT OF NOWHERE.

THIS IS BECAUSE A FIG IS A SPECIAL KIND OF FRUIT CALLED A **SYCONIUM**.

A SYCONIUM IS A HOLLOW, FLESHY STRUCTURE WITH HUNDREDS OF WEIRD TINY FLOWERS ON THE INSIDE.




UNRIPE



RIPE

LIKE OTHER FLOWERS, FIG FLOWERS NEED TO BE POLLINATED TO MAKE SEEDS, BUT ONLY ONE INSECT IS ABLE TO REACH THEM:

**FIG WASPS!**



1-2mm LONG




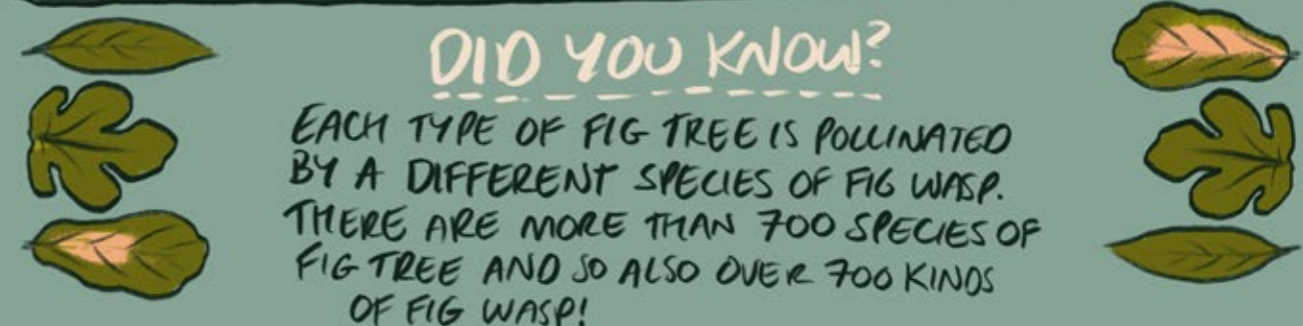
FIG FLOWERS



WHEN THE FLOWERS ARE BLOOMING, THE FIG TREES ATTRACT SPECIFIC SPECIES OF FIG WASP BY RELEASING AN IRRESISTABLE SCENT THAT ONLY THE RIGHT WASPS WILL COME TO.

**DID YOU KNOW?**

EACH TYPE OF FIG TREE IS POLLINATED BY A DIFFERENT SPECIES OF FIG WASP. THERE ARE MORE THAN 700 SPECIES OF FIG TREE AND SO ALSO OVER 700 KINDS OF FIG WASP!





A TINY FEMALE FIG WASP ARRIVES ON A FIG AND FINDS THE LITTLE HOLE AT THE END OF THE FRUIT. IT'S A SQUEEZE, BUT THE ONLY WAY TO REACH THE FLOWERS IS THROUGH THIS ENTRANCE. AS SHE PUSHES BETWEEN THE SMALL LEAVES GUARDING THE OPENING, HER WINGS AND ANTENNAE ARE BROKEN OFF HER BODY!



ONCE INSIDE THE FIG, SHE POLLINATES THE FIG FLOWERS AROUND HER. THIS IS GOOD FOR THE FIG TREE AS NOW IT CAN MAKE SEEDS.

HOWEVER, THE FIG WASP HAS BUSINESS OF HER OWN TOO. THIS FIG WILL BE HER CHILDREN'S NURSERY AND SO SHE BEGINS TO LAY HER EGGS.

**PARTS OF A FIG FLOWER**

STYLE - LONG TUBE WITH A STICKY TOP TO CATCH POLLEN

OVARY - THE FIG SEEDS GROW HERE (UNLESS A BABY FIG WASP EATS IT!).



THE FIG TREE DOESN'T MIND SOME OF ITS SEEDS BECOMING WASPS INSTEAD AS IT NEEDS THE WASPS FOR POLLINATION. HOWEVER, IT MAKES SURE THAT SOME SEEDS RIPEN BY HAVING FLOWERS WITH STYLES OF DIFFERENT LENGTHS. THIS MAKES SURE THAT THE MOTHER WASP CANNOT LAY AN EGG IN EVERY OVARY AS HER OVIPOSITOR IS NOT LONG ENOUGH.

USING A LONG TUBE CALLED AN OVIPOSITOR, SHE LAYS EGGS INSIDE THE FLOWER OVARIES. HERE, HER BABIES CAN GROW SAFELY EATING THE FOOD THAT WAS MEANT TO FEED THE FIG SEEDS.

FEMALE FIG WASPS ONLY LIVE 1-2 DAYS AS ADULTS. THEIR ONLY GOAL IS TO FIND A NEW FIG FOR THEIR CHILDREN. WHEN SHE HAS LAID ALL OF HER EGGS, SHE DIES IN THE SAFE SOFT WORLD OF A FIG, EXACTLY WHERE HER LIFE BEGAN.



← WASP COMING OUT OF A FIG FLOWER GALL

HERE INSIDE THE FIG, HER BABIES HATCH FROM THEIR EGGS AS LITTLE GRUBS AND SLOWLY GROW AS THEY EAT THE INSIDES OF THE FLOWERS. THE FIG MAKES OVAL-SHAPED STRUCTURES CALLED GALLS INSIDE WHICH EACH WASP LIVES AS IT GROWS. BEFORE LONG, THE LARVAE PUPATE AND BEGIN TO CHANGE INTO ADULT WASPS THROUGH THE PROCESS CALLED COMPLETE METAMORPHOSIS.

**MALE FIG WASP**

THE ADULT MALE WASPS ARE THE FIRST TO APPEAR FROM THEIR GALLS AND LOOK VERY DIFFERENT TO THE FEMALES. THEY ARE A PALER COLOUR, HAVE NO WINGS AND SOMETIMES NO EYES!

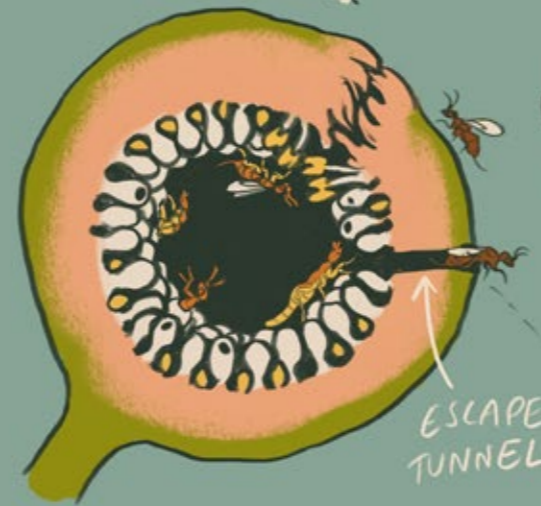
AS THEY WALK AROUND INSIDE THE FIG, THE MALE FIG WASPS BITE HOLES IN THE GALLS OF THE FEMALE WASPS AND MATE WITH THEM. THEN THEY GET TO WORK USING THEIR STRONG JAWS TO CHEW AN EXIT TUNNEL OUT OF THE FIG FOR THE FEMALE WASPS TO ESCAPE THROUGH.



← AFTER MATING FROM THEIR GALLS, THE FEMALES GATHER POLLEN FROM FLOWERS INSIDE THE FIG TO TAKE WITH THEM ON THEIR JOURNEY TO A NEW TREE.



USING THE ESCAPE ROUTE MADE BY THE MALE WASPS, THE FEMALES LEAVE THE FIG AND SQUEEZE OUT INTO THE BIG WIDE WORLD. CARRYING THEIR EGGS AND POLLEN, THEY SET OUT TO FIND A NEW FIG TO START THE CYCLE ONCE MORE. SOME FIG WASPS TRAVEL UP TO 150KM TO FIND A NEW HOME FOR THEIR CHILDREN!



ESCAPE TUNNEL

**BUZZWORD**  
**GALL**  
A GALL IS AN UNUSUAL STRUCTURE ON A PLANT THAT IS MADE IN RESPONSE TO IRRITATION FROM ANOTHER LIVING THING. OFTEN THIS IS ANNOYING INSECTS EATING OR LAYING EGGS IN THE PLANT!



Peppered moth - Ben Sale (CC BY 2.0 licence)



Buff tip moth - Gail Hampshire (CC BY 2.0 licence)

# CLEVER COLOURATION

By Fleur Brown, marine bird/mammal surveyor and hobby entomologist

**Insects show an enormous range of different colours and patterns, from metallic ground beetles to iridescent dragonflies and multi-coloured butterflies. But have you ever wondered why insects have evolved their colouration? Why do ladybirds have spots, and why do many moths look dull brown or grey? Insect colour is not just for looks; it can be an important defence against hungry predators like birds and reptiles. Let's look at the clever ways insects use colouration to avoid becoming tasty snacks!**

**The peppered moth (*Biston betularia*) (left) has a cryptic lichen-like pattern, and the buff-tip moth (*Phalera bucephala*) (right) looks like a broken silver birch twig.**

## Crypsis

Crypsis, also called camouflage, helps some insects blend into their habitat and stay hidden from predators. Cryptic colours are often brown, green or grey, similar to vegetation or the ground. These insects may also have disruptive patterns, including spots, stripes and patches that help break up their outline and make them harder to spot. Some insects are even more well-camouflaged, with both colouration and body shapes that make them look like leaves or twigs.

## Buzzword: 'EVOLVE'

Evolution is how living things change over time and can sometimes even split into new species. This happens because of a process called natural selection which is when the living things with the best features for surviving in a habitat, such as a longer beak or warmer fur, are more likely to live long enough to have offspring and pass on those features. For example, the ancestors of the hornet-mimic hoverflies who looked most like hornets were more likely to not be eaten and lay eggs than those who didn't look as scary!



## APOSEMATISM !!

Aposematic insects have striking colour patterns, often combining black and red, yellow, white or orange. Also known as warning colours, this tells predators that these insects can defend themselves with stings, bites or toxic chemicals. Any predator that attacks is punished in some way, through a nasty sting or a foul taste for example, and learns to avoid insects with this pattern in the future.

The bold stripes on the abdomens of some bees and wasps signal that they can give painful stings. The bright spotted patterns on many ladybirds warn predators that these beetles have a chemical defence. If you have ever handled a ladybird, you may have noticed that they produce a bright orange liquid. This is haemolymph (blood), which tastes nasty to predators. Yuck!

Ladybird - Dariusz Baużys (CC BY 3.0 licence)



**The bright colours of seven spot ladybirds (*Coccinella septempunctata*) (left) and common wasps (*Vespa vulgaris*) (below left) tell predators that they aren't an easy meal.**



Wasp - Frank Vassen (CC BY 2.0 licence)

**This marmalade hoverfly (*Episyrphus balteatus*) cannot bite or sting but avoids predators by mimicking a wasp.**



Rui Andrade (CC BY 4.0 licence)

## Mimicry

Some sneaky insects have evolved to look or behave like different insects, this is called mimicry. The best-studied types are known in science as Batesian mimics. Batesian mimics are animals which are harmless but avoid predators by looking like a harmful species. Predators that have learnt to avoid a dangerous species, such as stinging hornets, also steer clear of their mimics, such as harmless hornet moths. The most familiar mimics in our gardens are hoverflies. Adult hoverflies are harmless, but many have striped patterns that resemble the warning colours of stinging wasps and bees.

**This mimicry works on us too. To many people, a hornet-mimic hoverfly can be just as scary as a real hornet if they cannot tell the difference between the harmless insect and the potentially dangerous one!**

## Startle Colouration

Some cryptic insects have hidden areas of bright colour that they can suddenly reveal when disturbed. This can scare a predator away or confuse it, allowing the insect to escape. Many butterfly and moth species are cryptic when resting with closed wings, but when frightened, they can show striking eyelike patterns called eyespots.

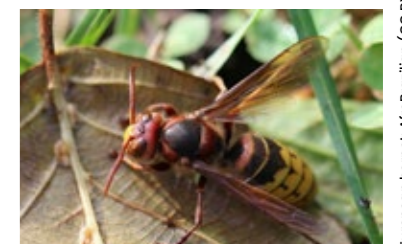
Wings open - S Rae (CC BY 2.0 licence)



Wings closed - CT Johansson (CC BY 3.0 licence)

**Peacock butterflies (*Aglais io*) can startle predators by opening their wings and displaying colourful eyespots.**

Hoverfly on flower: A.JCI (CC BY-SA 2.0)



European hornet: AfroBrazilian (CC BY-SA 4.0)

**Hornet-mimic hoverflies (left) copy the colours of a real European hornet (right) for protection. Look closely, can you tell them apart?**

# What's the point of wasps?

by Joshua Sammy, Vera Kaunath, Gaia Mortier PhD students in the Royal Entomological Society

These days, if you talk to most people about bees, they know their worth. Bees are pollinators, we need them to make sure our crops continue to grow, and honey bees give us honey. And bees are nowadays even considered cute - we love the bee aesthetic, you can find them as a pattern on bags, clothes, blankets, mugs, and much more. Even if they can sting, and this can be scary, we know the importance of bees and have found the beauty within them.

♥ This love is not shared with all yellow and black, stripy animals - let's look at wasps, the sisters of bees. When it comes to wasps, people are quick to ask: "What's the point of them? What is their value?" Which is a real shame, because wasps are incredibly important and beautiful animals.

Wasps are an enormous group of animals in the insect family Hymenoptera, which have been around for 280 million years, three times earlier than the T. rex! Ants and bees are insects that branch off from this tree - so you could consider both to be types of wasps. The black and yellow animals you see are usually the common wasp - *Vespula vulgaris*, only one species over one hundred thousand others.



Mike Pennington (CC BY-SA 2.0 licence).

🔍 If you look closely, some wasps have beautiful metallic colours like this ruby-tailed wasp.



Illustrations © Joshua Sammy



♥ Common wasps are often misunderstood, can we see them in a different way?

- predators ✓
- pest control ✓

One of the most valuable roles wasps play is as predators, and as pest control. In the same way that we know spiders keep pests down inside our houses, wasps control pests in the places we grow crops. Some species target very particular pests, such as *Aphidius ervi*, which lays its eggs in aphids. Aphids are a major pest of crops - you might know them as greenfly, whitefly or blackfly - and **without wasps they would certainly overrun what we grow.**

One of the things that makes these wasps such good predators is that they reproduce so quickly. Parasitoid wasps such as *Aphidius ervi* can go from an egg to an adult laying its own egg within a couple of weeks - and a rapid reproductive cycle is necessary to keep up with the rate that aphids, which can sometimes be born pregnant, reproduce!

Some wasps are less specialised predators - and that's where species like the common wasp come in. As top predators, common wasps will eat a range of prey, including caterpillars, flies and spiders.



Some wasps eat other insects, such as cockroaches, and help keep a balance in the environment.

Revital S (CC BY 3.0 licence)

**On top of their massive importance as predators, wasps, like bees, hoverflies, butterflies and lots of other species, are also pollinators! As with predation, some of them are specialists, pollinating particular plants, while others are generalists and pollinate lots of different species.**



Rhododendrites  
(CC BY-SA 4.0 licence)

The great golden digger wasp feeds on flower nectar and is an important pollinator found across the Americas.



Illustration © Joshua Sammy

**So next time you see a wasp, remember how important they are!**

Being afraid is completely fine – but they do have a value, just like bees and other insects. Watch a wasp clean herself, or pollinate a plant. Think about the food you like next time you're in the supermarket, and thank the wasp somewhere out there that helped it get to you.

Take a moment to think about the wasps who help us grow our food, we'd struggle without them!



# Ento Info

Tansy Beetle

## Tansy Beetle

**Common name:** Tansy beetle

**Scientific name:** *Chrysolina graminis*

**Order:** Coleoptera

**Where:** Widespread across Europe and Asia.

**Habitat:** Wetlands, river banks and floodplains.

**Favourite food:** Tansy plants are their preferred food but these herbivorous beetles also eat other plants such as water mint.

## FACTS !!!



- In the UK, the tansy beetle is rare and limited to just two areas: the River Ouse in York and a site in Cambridgeshire.
- In York, there is a big mural of a tansy beetle painted on a wall.
- Tansy beetles move by walking, not flying. They can only walk up to around 200m so struggle to move to new places if they can't walk between food plants.



Jerzy Strzelecki (CC BY-SA 3.0 licence)

Hawkmoths are important pollinators, transferring pollen on their long tongues!

## Buzzword: 'POLLINATION'

Pollination is how plants reproduce. Pollen has to be carried from one plant to another so that the plants can make seeds which then grow into new plants. Pollen is usually transferred by the wind or animals. Insects such as bees, flies, wasps and butterflies, are very important pollinators for so many plants and transfer pollen as they move from flower to flower to find food.



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