

SWEET AND SOUR

IN recent years, it's become clear that many bee species are in trouble, due to the increasing effect that humans are having on the environment. As well as providing us with honey, bees (and other insects) also pollinate most of the crops that the world relies on. Dr Martin Kunz is on the management committee of the International Bee Research Association (IBRA). He also keeps bees as a hobby, and he wrote this piece for us about the difficult challenges that these amazing creatures are faced with.



A European honeybee in its hive



These beehives are on the roof of a high-rise building in Manhattan, New York

COLLECTING NECTAR

To produce 1kg of honey, honeybees must collect nectar from four million flowers. So, obviously we need a lot of flowering plants if we want honey. Someone suggested that each person in London should plant one flower – but those nine million blossoms would only provide nectar for 2.5kg of honey, which isn't enough, even though each blossom is visited multiple times. Bees need meadows full of flowers, and in particular they need trees: I don't think anyone has ever estimated the number of blossoms on a chestnut or linden tree.

But it's not only a question of quantity [amount]. In spring, of course, all those fields with yellow flowers (from rapeseed plants) provide a lot of nectar, but once they're gone most of the countryside is like a food desert for bees for the rest of the year.

The second problem with such a mono-diet (eating just one thing) is that it is unhealthy. Imagine that you were only fed cheese on toast, day in and day out, for weeks. Not only would it be boring, but the chances are that you'd also feel or even get sick. It's the same for bees: they need a variety of food. Bees even self-medicate [treat themselves with medicine]: if they have an upset stomach (it happens!), they know which plants to visit. Although bees living in urban areas may have a wider choice of flowers, there are still not enough of them. It's estimated that there are around 5,000 bee colonies in London alone – and despite all the parks and gardens, there may simply not be enough food for them all.

UNDERSTANDING BEES

And that's just one of the problems bees face. Like humans, when too many things go wrong and don't work, they get stressed and can fall ill, and they may even die. When all the bees in a hive die, it's called a colony collapse.

When we try to understand bees, it's important to look not at one individual bee, but at a whole colony. In the summertime there is one queen and up to 50,000 worker bees, which are all female and do all the work, including raising the young, cleaning and defending the colony, and foraging. There are also a couple of hundred drones, which are males whose only purpose is to mate with a queen. This colony, a so-called 'super organism', acts like one animal. When apple and other trees are flowering, known as nectar flow, bees store as much food as possible. They also try to feed and raise as many young bees as they can. A summer bee usually only lives for six weeks, so there is a constant renewal, both of individual bees and colonies.

Remember, a colony acts like a single animal – and it gives birth to a new one. This is called swarming, and is very different from, say, a dog having a pup. You



Two European honeybees in the USA approach a stinging cactus

may have seen thousands of bees hanging from a branch – that is a swarm. What's interesting is that unlike humans, where the young generation usually moves out when finished with school and training, among bees it is the older bees that leave their hive. That way, they give the next generation a better chance to start the cycle all over again. A swarm only has two or three days in which to find a new home. After that, the honey they took with them in their stomachs runs out and they starve.

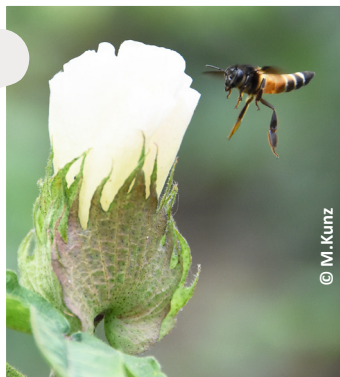
Increasingly, swarming bees find it hard to find suitable new homes. Before the human population became so large, bees had it much easier and could find an old tree with a nice hole, possibly made and left by a woodpecker. Nowadays, bees settle for gaps between wall insulation, for example. It's not good for them, and usually not good for the people living in that house either.



This swarm shut down a construction site. It needed to be pushed out of the pipe before it could be rehoused



Here you can see honey stores (top left: white already with a lid; bottom left: open) and cells with pollen (centre). The hexagonal structure provides maximum strength with the minimum of material



An *A dorsata* (a rock bee) on a cotton flower. The bee is the size of a European hornet

A stingless bee (bottom right) approaching an onion flower. Note how tiny it is!



PROBLEMS FOR BEES

Other problems bees face, apart from food and housing issues, are also related to the changing environment. Many farmers try to protect their crops from hungry insects that nibble, munch and suck, and many garden owners try to protect their flowers. To do this, they both spray pesticides, which do what they are supposed to do: they kill insects. To a farmer or a gardener, the bugs that eat their crops or garden plants are ‘pests’, but there are also beneficial insects like bees that have a good effect. It is becoming more and more obvious that these poisons also harm us humans when they end up in our water and our food.

Climate change, too, makes the life of bees harder. With spring beginning earlier, plants may flower earlier than before, when bees may not be ready yet. After all, they had to huddle in their hives for months over the cold season. In winter, a colony usually has fewer than 10,000 workers and just one queen but no drones, as they all get kicked out of their hives before the end of the summer. When days get longer, it takes time to grow the colony to its full summer size, and if the blossoms are finished before the colony has achieved full strength, it may starve.

Then there are a growing number of pests and diseases that increasingly make life difficult for our bees. You may have heard of the Asian hornet, one of which can easily eat dozens of honeybees. Imagine what a colony of those can do in an afternoon to a hive of honeybees. These threats reach us as a result of internationally-traded goods and because of climate change.

Fortunately, when we look at the number of honeybee colonies in the world, we see their numbers are increasing. That’s because they are so resilient and because there are still plenty of areas where there aren’t so many people, and where agriculture is not as industrialised as in Europe.



Until the middle of the 19th century, bees were mostly kept in woven skeps, sometimes with mud covers. When it’s too hot, bees form a ‘fan’ outside and use their wings to blow cool air into their hive

BEES AROUND THE WORLD

We’ve only talked about one honeybee species – *Apis mellifera*, the European honeybee. There are about a dozen other types of *Apis* honeybees, all of which live only in Asia, and all of which are in serious decline because their habitats are under threat.

And don’t get me started on bumblebees and the solitary bees (which do not form colonies). All in

all, scientists count some 25,000 bee species globally. While very little detail is known about most of them, what is increasingly clear is that their numbers are declining as a result of human activities. So, if we want to help not just our honeybees, but bees, insects and animals in general, we need to protect trees, plants and rivers. In short, we need to protect OUR planet.



GLOSSARY

pollinate – To take pollen from one plant to another

to allow fertilisation

urban areas – Relating to a town or city

industrialised – In this context, it means that the agriculture involves intensive production of crops

and animals and the use of chemical fertilisers

queen bee – An adult, mated female that lives in a honeybee colony or hive. The primary function of a queen bee is to reproduce

woven skeps – Large, woven, round wicker baskets with handles



Special Report: Sweet and Sour

Part A: Finding the facts

A1. Choose **four** statements below that are **true**. Tick the box next to each **true** statement.

<i>To produce 1kg of honey, honeybees must collect nectar from four million flowers.</i>	<input type="checkbox"/>
<i>If each person in London planted one flower – it would provide eight million blossoms for bees.</i>	<input type="checkbox"/>
<i>Bees need meadows full of flowers, and in particular they need trees.</i>	<input type="checkbox"/>
<i>In spring, all those yellow flowers (from rapeseed plants) provide a lot of nectar.</i>	<input type="checkbox"/>
<i>Rapeseed plants are available for bees all year round.</i>	<input type="checkbox"/>
<i>Once rapeseed plants are gone, most of the countryside is like a food desert for bees for the rest of the year.</i>	<input type="checkbox"/>
<i>Bees living in urban areas don't have a very wide choice of flowers.</i>	<input type="checkbox"/>
<i>Bees thrive on a mono-diet.</i>	<input type="checkbox"/>

A2. What is a colony collapse?

A3. Complete the table with the correct information about the different bees in a colony.

<i>Type of bee</i>	<i>Gender</i>	<i>Number</i>	<i>Role</i>
Queen			
Worker			
Drone			

A4. Why is a bee colony a so-called 'super organism'?

A5. How many bee species are there globally?

Part B: Deduce and infer information

B1. When a bee colony produces another colony, it is called swarming. What is interesting about how bees swarm?

B2. Why are swarming bees finding it increasingly difficult to find suitable new homes?

B3. How are the actions of some farmers and garden owners affecting bees?

B4. How is climate change affecting bees?

B5. Is there any positive news for bees?

Part C: Analyse the writing and presentation

C1. There are a lot of pictures and captions with this report. What is the purpose of them?

C2. Why is an analogy drawn between bees having to survive on rapeseed plants and readers only being fed cheese on toast for weeks?

Part D: Writing task

Write an open letter to farmers and garden owners in which you try to persuade them to stop using pesticides in order to protect bee populations.

GLOSSARY

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Special Report: Sweet and Sour

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<i>Once rapeseed plants are gone, most of the countryside is like a food desert for bees for the rest of the year.</i>	<input type="checkbox"/>
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B3. How are the actions of some farmers and garden owners affecting bees?

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Teacher Answers

AIM OF THE NEWS COMPREHENSIONS: News reports are unique non-fiction texts. Being real, they naturally engage students, and with the range of topics that are covered, help to develop pupils' knowledge and understanding of the wider world outside the classroom. The reports are ideal for short, focused comprehension or discussion activities. Along with the opportunity to find fascinating facts and appreciate the opinions of those involved, there is plenty to be inferred and deduced to understand in more depth what is being reported. Like authors, journalists play with language, so news 'stories' are rich nuggets of text to investigate and provide the opportunity for literacy programmes.

TEACHER ANSWER GUIDE: The teacher answers are intended to provide a guide to the reading skill each question is practising. Suggestions are given for a starting point for responses that students would be expected to give at the start of KS3. Further suggestions then give fuller, more developed responses that students will work towards by the end of KS3, in preparation for the non-fiction elements of GCSE English language.

Part A: Finding the facts

A1. Choose four statements below that are true. Tick the box next to each true statement.

READING SKILL — Find and explain information

Possible answer

Expected response

<i>To produce 1kg of honey, honeybees must collect nectar from four million flowers.</i>	✓
<i>If each person in London planted one flower – it would provide eight million blossoms for bees.</i>	☐
<i>Bees need meadows full of flowers, and in particular they need trees.</i>	✓
<i>In spring, all those yellow flowers (from rapeseed plants) provide a lot of nectar.</i>	✓
<i>Rapeseed plants are available for bees all year round.</i>	☐
<i>Once rapeseed plants are gone, most of the countryside is like a food desert for bees for the rest of the year.</i>	✓
<i>Bees living in urban areas don't have a very wide choice of flowers.</i>	☐
<i>Bees thrive on a mono-diet.</i>	☐

A2. What is a colony collapse?

READING SKILL — Find and explain information

Possible answer

Starting point

- It is when all of the bees in a hive die.

Development

- Bees are like humans in that if too many things go wrong, they get stressed and can fall ill. This can even cause them to die.

A3. Complete the table with the correct information about the different bees in a colony.

READING SKILL — Find and explain information

Possible answer

Starting point – some information correctly identified

Developed response – information correctly identified and explained

<i>Type of bee</i>	<i>Gender</i>	<i>Number</i>	<i>Role</i>
Queen	Female	Usually just one	To reproduce
Worker	Female	Up to 50,000 in summer	To do all the work, including raising the young, cleaning and defending the colony, and foraging
Drone	Male	A couple of hundred	To mate with the queen

A4. Why is a bee colony a so-called ‘super organism’?

READING SKILL — Find and explain information

Possible answer**Starting point**

- It is called a super organism because the colony acts like a single animal.

Development

- The queen, the worker bees and the drones all have to fulfil their roles and work together for the colony to survive.

A5. How many bee species are there globally?

READING SKILL — Find and explain information

Possible answer**Starting point**

- There are some 25,000 bee species globally.

Development

- This report talks a lot about the European honeybee – *Apis mellifera*. However, there are about a dozen other types of *Apis* honeybees, all of which live only in Asia. There are also bumblebees and solitary bees to consider. We know very little about most species of bee, but it is becoming increasingly clear that their numbers are declining as a result of human activities.

Part B: Deduce and infer information**B1. When a bee colony produces another colony, it is called swarming. What is interesting about how bees swarm?**

READING SKILL — Infer information and justify with evidence from the text

Possible answer**Starting point**

- What is interesting is that unlike humans, it is the older bees that leave their hive.

Development

- With humans, the young generation usually remains at home until they have finished their school and training, but then they move out to start their new life and family, while the older generation remain in the family home. With bees, the older bees swarm to find a new home and the younger bees stay in the hive. That way, they give the next generation a better chance to start the cycle all over again. A swarm only has two or three days in which to find a new home before they starve. Sadly, an increasing number of swarming bees are finding it hard to find anywhere suitable.

B2. Why are swarming bees finding it increasingly difficult to find suitable new homes?

READING SKILL — Infer information and justify with evidence from the text

Possible answer**Starting point**

- Swarming bees are finding it increasingly difficult to find suitable new homes because of the growth of the human population.

Development

- There used to be more areas where they could find an old tree to settle in, but these days human habitats take up a lot of space. Consequently, bees sometimes even end up resorting to the gaps between wall insulation, which is not good for them or for the house owners.

B3. How are the actions of some farmers and garden owners affecting bees?

READING SKILL — Infer information and justify with evidence from the text

Possible answer**Starting point**

- The actions of some farmers and garden owners are having a negative impact on bees because of their use of pesticides.

Development

- Some farmers and garden owners use pesticides to prevent insects from destroying their crops or flowers. Unfortunately, as well as killing the insects or ‘pests’ that they are targeting, the sprays can also harm beneficial insects like bees. Indeed, evidence is starting to suggest that pesticides are also poisoning humans when they end up in our food and water.

B4. How is climate change affecting bees?

READING SKILL — Infer information and justify with evidence from the text

Possible answer**Starting point**

- Climate change is another factor that is making the lives of bees harder.

Development

- Climate change is causing spring to start earlier, which means that plants may flower earlier. This causes a problem for the bees because their hive is not at capacity during the winter and usually has fewer than 10,000 workers and no drones. It takes time to grow the hive to its full summer size, so if the blossoms are finished before the colony has achieved its full strength then there won't be enough food sources left and it will starve.
- Climate change is also causing a growing number of pests and diseases that threaten bees. One Asian hornet can easily eat dozens of honeybees, so a whole colony could devastate a honeybee hive.

B5. Is there any positive news for bees?

READING SKILL — Infer information and justify with evidence from the text

Possible answer**Starting point**

- The good news is that honeybees are very resilient and the number of honeybee colonies in the world is actually increasing.

Development

- This is because, fortunately, there are still areas in the world that aren't densely populated and where there is less reliance on pesticides in agriculture.
- There is also hope for bees because people (especially young people) are more aware of the need to address environmental issues due to the work of environmental campaigners such as Greta Thunberg. If we take care of our trees, plants and rivers and protect our planet, then bees should be able to thrive again.

Part C: Analyse the writing and presentation**C1. There are a lot of pictures and captions with this report. What is the purpose of them?**

READING SKILL — Identify benefits of text organisation and presentation

Possible answer**Starting point**

- The pictures and captions are informative.

Development

- Sometimes pictures and captions are used to illustrate what is in the text. This is the case with the picture of the beehives and the picture of the honeybees approaching a cactus in the USA. However, some of the pictures and captions actually add additional factual information or anecdotes. For example, there is the picture and caption about the swarm that closed down a construction site and the picture and caption giving information about the honey stores and pollen cells. Different species of bee are also pictured and there are some pictures with information about how bees were kept until the middle of the 19th century and how bees keep their hives cool.
- Had this information been included in the main body text then it might have been rather overwhelming. However, the pictures add interest and draw the reader to the captions. This is effective because it makes the information seem more interesting and accessible.

C2. Why is an analogy drawn between bees having to survive on rapeseed plants and readers only being fed cheese on toast for weeks?

READING SKILL — Recognise effect of language choices

Possible answer**Starting point**

- The analogy is drawn to help readers to understand that although rapeseed plants provide a lot of nectar, it is not good for bees if they have a mono-diet.

Development

- As readers would be unlikely to just want to eat cheese on toast for weeks, the analogy illustrates how bad it is for bees if a wide choice of flowers are not available for them. People might assume that it is the quantity of nectar available that is important, but that is not the full picture. The use of the comparison makes the point that bees need a variety of food and it makes the point in a way that readers will be able to relate to.

Part D: Writing task

Write an open letter to farmers and garden owners in which you try to persuade them to stop using pesticides in order to protect bee populations.

READING SKILL — Develop personal ideas from reading news stories

Possible answer

Open letter to farmers and gardeners using pesticides.

July 2020.

Dear Sir/Madam,

I am writing to urge you to stop spraying pesticides on your crops and gardens because the chemicals are having a seriously detrimental effect on our bee populations.

I completely understand that you want to rid your crops and plants of the pests that destroy them, but there has to be another way. Bees may be insects, but they are not pests. They provide us with honey and also pollinate most of the crops that we rely on. Indeed, they pollinate 70 of the 100 crops that feed 90% of the world. Therefore, if you kill off all the bees with your pesticides then you will have few crops left to protect anyway!

Furthermore, evidence is starting to suggest that pesticides are dangerous to humans too. Pesticides are poisons and when they end up in our water and our food they harm us. Added to the concerns about bees, surely this makes you want to rethink your farming and gardening techniques? Why not try some natural alternatives to pesticides such as plant-derived products?

Bees are brilliant! Please don't banish them. We need bees for our own good and for the good of the planet.

Yours faithfully,

Amelia Jessop