

What affects Honey Bee Health? What do Honey Bees need?

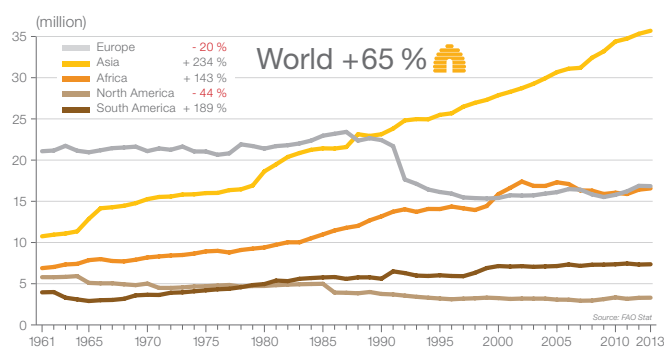
Introduction

For years, there have been reports in the media about excessive losses of, or declines in, bee colonies, even about a worldwide “bee-apocalypse”. In principle, we need to distinguish between a decline in bee colonies, indicating a decrease in the number of bee colonies over time, and bee colony losses. The term ‘colony loss’ describes the death of bee colonies in general, regardless of the causes or specific symptoms. In recent years, it has sometimes been observed that more bee colony losses occurred during overwintering – that is the period during the coldest months of the year when bees form a ball and huddle together in the middle of the beehive and don’t go outside. The reason for colony losses during this time results from the many problems that bees face, which can weaken the colony.

TASK 1

- a) Critically examine the statement “The number of honey bee colonies worldwide is decreasing” with the aid of the following three graphs, and work out whether a decline can really be seen.

The population trends of beekeeper-managed honey bee colonies are determined primarily by socio-economic factors.



1961: 49 million beehives

2013: 81 million beehives = 65 % more

Figure 1:
Number of bee colonies managed by beekeepers (1961-2013)

Data Source: Food and Agriculture Organization of the United Nations (FAO)
www.fao.org/faostat/en/#data/QA

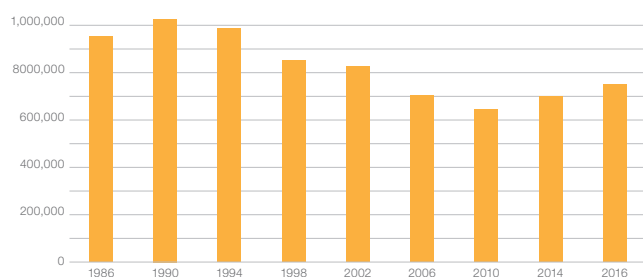


Figure 2:
Number of honey bee colonies in Germany

Data Source: German Beekeepers' Association
www.deutscherimkerbund.de/
161-Imkerei_in_Deutschland_Zahlen_Daten_Fakten

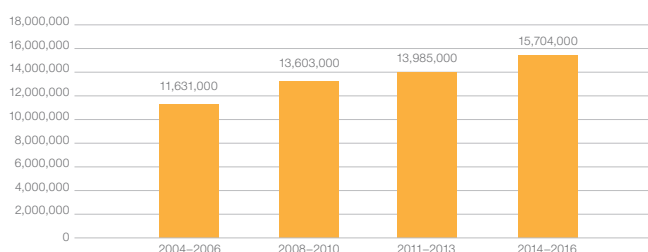


Figure 3:
Number of honey bee colonies in the European Union

Data Source: European Commission
www.ec.europa.eu/transparency/regdoc/rep/1/2016/EN/COM-2016-776-F1-EN-MAIN-PART-1.PDF (page 6)

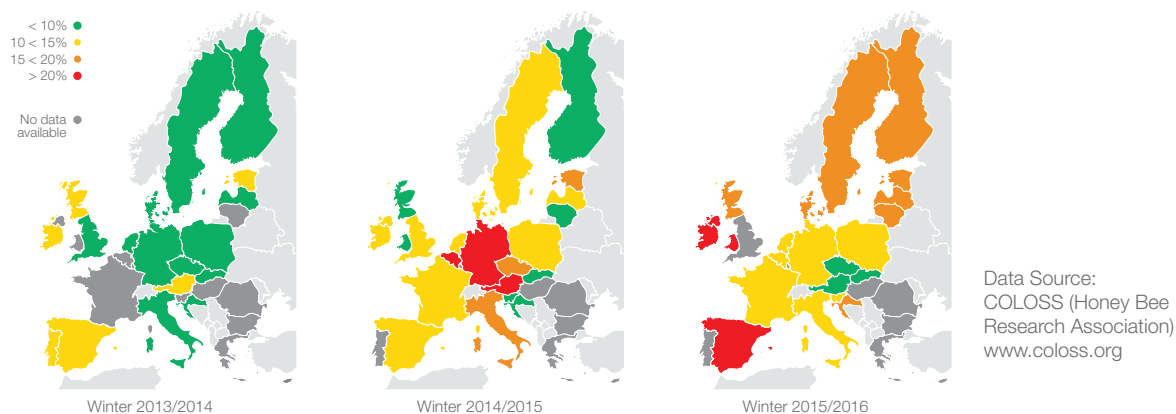
What affects Honey Bee Health? What do Honey Bees need?

Although the overall number of honey bee colonies worldwide is not decreasing, increased honey bee colony losses have been observed in various regions in recent years, particularly during overwintering (see Figure 4 for data on winter losses of honey bee colonies in Europe). The reasons for this are many and varied.

b) Consider various reasons for winter losses of honey bee colonies, first by yourself, then with a partner, and finally in your group.

Figure 4:

Comparative honey bee colony losses during winter in Europe (2013-2016)



c) Using the following webpages, inform yourself about honey bee colony losses and make your own notes.



- // www.efsa.europa.eu/en/topics/topic/bee-health
- // <https://beeinformed.org/results/honey-bee-colony-losses-2017-2018-preliminary-results/>
- // www.coloss.org/core-projects/colony-losses-monitoring/
- // https://ec.europa.eu/food/animals/live_animals/bees/study_on_mortality_en
- // www.bbka.org.uk/winter-honey-bee-losses-in-england
- // <https://downloads.usda.library.cornell.edu/usda-esmis/files/rn301137d/jq085n95f/mc87pt22m/BeeColonies-08-01-2018.pdf>
- // www.ncbi.nlm.nih.gov/pmc/articles/PMC3827320/



You don't always need all the information on each page. Read through the task description carefully, so that you know what you are looking for, and so that you can search specifically for this information in the text. Skimming the text for keywords will also help you filter out the answers.

What affects Honey Bee Health? What do Honey Bees need?

TASK

2

Introduction

A “bee-apocalypse”, decline in honey bee colony numbers, honey bee colony losses – what are we actually talking about for each of these?

Comment on this question with the aid of graphs and the information you have discovered.



Here you can choose between **alternative 1** and **alternative 2**:

TASK

3.1

ALTERNATIVE 1:

What do honey bees need to stay healthy?

Produce a concise diagram / flow chart to illustrate the issues that you have worked through.

TASK

3.2

ALTERNATIVE 2:

Using the information provided, write a

- // newspaper article or
- // an interview with a beekeeper or
- // a beekeeper's diary entry

on the problem “Overwintering losses of honey bee colonies in my region”.

The Needs of Bees and the Risks they face

A. Overview

There is a great variety of stress factors which can weaken bees. It is difficult to determine how much any one of these factors affects bee health. As you will see in the links listed below, there is no agreement about this in the current public debate. While loss of habitat is seen as the main factor for wild bees, the role of the *Varroa* mite as the main factor impacting the Western Honey Bee is undisputed among experts, there is controversy in the public debate around the influence of farming practices and the use of pesticides.

Therefore, if you are to form your own opinion, – with this topic as with any other topic – it is important to always challenge the source from which you obtain information: where does the information provided come from? Does the source cite the origin of this information? Does it quote any evidence (e.g. independent scientific studies) for this information?

A

TASK
1

Work out what needs bees have with respect to food and habitat, and what risks they face in this regard. In doing so, explore not only honey bees but also wild bee species.

The following internet sources could be useful to you for this purpose:



// www.fsa.usda.gov/Assets/USDA-FSA-Public/usdfiles/FactSheets/2015/CRPPProgramsandInitiatives/Honey_Bee_Habitat_Initiative.pdf
 // <https://umaine.edu/beemapper/landscape-ecology-wild-bees/>
 // www.bumblebeeconservation.org/habitat/



You don't always need all the information on each page. Read through the following leading questions carefully, so that you know what you are looking for and so that you can search specifically for this information in the text. Skimming the text for keywords will also help you filter out the answers.

- // **Needs:** what are the main, basic needs of the honey bee?
- // **Food and habitat:** What are the needs of wild bee species with regard to their food supply and habitat? What factors reduce the food supply of bees?
What happens if honey bees find too little food?
- // **Weather:** What role does the weather play in the health of honey bees?
- // **Farming practices:** What risks for honey bees and other pollinators arise from certain farming practices?
- // **Pests and diseases:** Which pests and diseases are a threat to honey bees?
- // **Beekeeping practices:** What role does the beekeeper play in the health of honey bees?

The Needs of Bees and the Risks they face



**TASK
2**

Exchange your ideas and results with a partner; while doing so, try to clear up questions that may still remain unanswered.

After this, write a few sentences to summarize the needs of honey bees and wild bees, respectively, with regard to food and habitat, and what risks they face in this regard.

B. In-depth work: Pests and diseases

The *Varroa* mite represents a serious risk to the honey bee.

**TASK
1**

Create a fact file on the *Varroa* mite.
Explore the following aspects in particular:

- // Origin and distribution
- // Body structure
- // Sensory perception
- // Transmission of viruses
- // Reproduction and its effect on the bee and its brood
- // Control measures

For example, you can use the following webpages for research:



- // <http://beeaware.org.au/archive-pest/varroa-mites/#ad-image-0>
- // www.youtube.com/watch?v=wj-h5VJqaol
- // <https://beecare.bayer.com/what-to-know/bee-health/varroa>
- // www.nationalbeeunit.com/downloadDocument.cfm?id=16
- // www.cabi.org/isc/datasheet/107784
- // www.youtube.com/watch?v=XxKdSk4G7AU



You don't always need all the information on each page. Read through the task description carefully, so that you know what you are looking for, and so that you can search through the text for this specific information. Skimming the text for keywords will also help you filter out the answers.



**TASK
2**

Exchange your ideas and results with a partner; while doing so, try to clear up questions that may still remain unanswered.

After this, write a few sentences to summarize why the *Varroa* mite represents a serious risk to the honey bee.

The Needs of Bees and the Risks they face

C. Discussion: Crop protection

In public discussion, insecticides are often named as the main risk to bee health.



Based on the information that you have gathered regarding the needs of bees and the risks that they face, discuss to what extent this statement needs to be corrected or made more precise.

Problem-solving Approaches / Measures to boost Bee Health

TASK 1

You have now learned a lot about the needs of bees and the risks that they face. Now, consider the measures that could be taken to protect and boost the health of honey bees and wild bees. Make notes about this.

TASK 2

Check your own thoughts with the aid of the following web addresses and correct/supplement your notes, if necessary.

- // https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/409431/pb14221-national-pollinators-strategy.pdf
- // <https://honeybeehealthcoalition.org/how-we-help-bees/>
- // <https://beecare.bayer.com/what-we-do/ensuring-bee-safety>
- // www.gov.scot/binaries/content/documents/govscot/publications/publication/2010/06/honey-bee-health-strategy/documents/0100471-pdf/0100471-pdf/govscot%3Adocument



Here you can choose between **alternative 1** (this page), **alternative 2** or **alternative 3** (both on the next page):

TASK 3.1

ALTERNATIVE 1:

- a) Working on your own at first, and then with a partner, think about which statements might fit which person and match them up.

Beekeeper – Farmer – Urbanite / Consumer – Politician

“For some time now, I’ve been meaning to brighten up my balcony with flowers. And I’m also going to tell my neighbor to think of doing the same, right away!”

“Before I use a new crop protection product, I always read the instructions for use on the label very carefully, and ask my crop advisor for advice, to make sure that I am familiar with the guidelines about bee-friendly use.”

“These *Varroa* mites! I need to protect my bees better. I’ll have to ask around at the beekeepers’ association again, to see if there is anything new to control this destructive mite.”

“This is on the agenda for our next meeting: How can we plan for more green spaces in our city? How can we encourage our citizens to plant more bee-friendly flowers in their gardens?”

- b) Now create a leaflet containing tips to boost bee health for:

- // Farmers
- // Beekeepers
- // Politicians
- // Urbanites / Consumers

Don’t forget to include the knowledge you have gained so far.

Problem-solving Approaches / Measures to boost Bee Health

TASK

3.2

ALTERNATIVE 2:

Produce a short video about a (fictitious) discussion between a beekeeper, a farmer, opponents of crop protection products (pesticides) and consumers, to include the knowledge you have gained so far.

TASK

3.3

ALTERNATIVE 3:

Write a letter to a government authority or to the mayor of a city and include the knowledge you have gained so far.

Wild Bees and the Bee Hotel

TASK

1

Based on the knowledge you have gained so far, once again note down the differences between various wild bees and the honey bee regarding their way of life and, therefore, their needs.

Work out possible measures that could be taken to protect wild bees and other pollinators, such as butterflies.



TASK

2

Working in groups of around four students, build an insect hotel or plant a bee-friendly (school) garden.

You can find instructions for an insect hotel at:



- // https://beecare.bayer.com/datafiles/pdf/Beecare_Building_Instruction_Insect_Hotel_2019.pdf
- // www.rspb.org.uk/get-involved/activities/give-nature-a-home-in-your-garden/garden-activities/buildabeebandb/
- // <https://cdn.friendsoftheearth.uk/sites/default/files/downloads/How%20to%20make%20a%20bee%20hotel.pdf>
- // www.gardenersworld.com/how-to/diy/how-to-make-a-bee-hotel/

You can find out how to plant a bee-friendly garden here:



- // <https://thehoneybeeconservancy.org/plant-a-bee-garden/>
- // <https://beecare.bayer.com/what-you-can-do/gardeners>
- // <https://honibe.com/plant-honeybee-friendly-garden/>
- // www.pinterest.co.uk/search/pins/?q=bee%20garde&rs=typed



What affects Honey Bee Health? What do Honey Bees need?

TASK

1

TASK

2

WORKSHEET 1 /// TASK 1 AND 2

The number of managed honey bee colonies has increased steadily over the past six decades, by more than 65 % since the 1960s, according to data from the Food and Agriculture Organization of the United Nations (FAO: <http://www.fao.org/faostat/en/#data/QA>).

Even in Europe and North America, where colony numbers have sometimes decreased in the past, the number of honey bee colonies has respectively risen or remained stable over the past ten years.

In principle, we need to distinguish between a decline in honey bee colony numbers, indicating an overall decrease in the number of bee colonies over time, and bee colony losses. The term “colony loss” describes the death of bee colonies in general, regardless of the causes or specific symptoms.

There is a wide variety of stress factors which can weaken a honey bee colony, and which may lead to the loss of a colony. Increased honey bee colony losses have been observed in various regions in recent years, particularly during overwintering. Honey bees face many challenges in much of the modern world and the colony may not make it through the winter if it is weakened by one or a combination of the following stress factors:

- // Increasing lack of vegetation and loss of flower-rich meadows and flora means that food collection becomes more difficult
- // Pests and diseases (the *Varroa* mite is the most important single factor responsible for colony losses in Europe and North America.)
- // Beekeeping practices
- // Weather
- // Genetic factors
- // Agricultural practices

Overall, however, we can conclude that the number of honey bee colonies globally is increasing, and that we cannot, therefore, say that bees are dying (out) worldwide.

Students will produce individual outcomes resulting from different considerations of the issues listed above.



What affects Honey Bee Health? What do Honey Bees need?



Here the students can choose between **alternative 1** and **alternative 2** with the corresponding tasks:

TASK
3.1

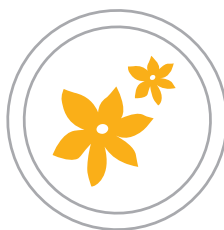
WORKSHEET 1 /// TASK 3 /// ALTERNATIVE 1

The needs of honey bees:

FOOD

(nectar, pollen and water)

- // carbohydrates
- // water
- // protein



SHELTER CONDITIONS

- // warm
- // dry
- // ventilation
- // space



BEEHIVE



SAFE ENVIRONMENT WITHOUT:

- // toxins
- // diseases
- // predators
- // parasites
- // vandalism



TASK
3.2

WORKSHEET 1 /// TASK 3 /// ALTERNATIVE 2

Individual solutions



The Needs of Bees and the Risks they face

There is a wide variety of stress factors which can weaken a honey bee colony. It is difficult to determine the extent to which any one of these factors affects bee health.

There is little agreement about this in the current public debate. While loss of habitat is seen as a main factor for wild bees, the role of the *Varroa* mite as the main factor impacting the health of the Western Honey Bee is undisputed among bee experts. There is controversy in the public debate, however, around the influence of farming practices and the use of pesticides. When discussing the work outcomes in class (particularly those of Worksheet 2), this controversy will need to be considered and illustrated appropriately.

A

TASK
1

WORKSHEET 2A /// Overview

TASK A1



Please note: The answers will be more detailed or superficial, depending on the level of the class.

Needs:

See Worksheet 1, Task 3, Alternative 1.

Food and habitat:

- // Good nutrition throughout the season is a key factor in the health of honey bees: the availability of plants that bear flowers rich in nectar and pollen has a positive effect on the health of bees.
- // Wild bee species are frequently reliant on a particular habitat and on specific nesting sites. Many species collect their food from very specific plants.
- // As a result of more intensive farming in recent years, cultivated areas in many regions of Europe and North America now lack good nutrition for bees throughout the season. Furthermore, there are fewer landscape structures of the type that many wild bee species require for nesting.

Weather:

- // Changing weather conditions, milder winters, an early, wet spring or the sudden onset of winter can be a cause of stress for honey bees:
 - Direct effect:** The required temperature in the beehive cannot be maintained or bees swarm too early and cannot find food
 - Indirect effect:** Less nectar is available
- // Periods of unusually high rainfall or severe weather, flooding, storms, drought or sudden temperature extremes can adversely affect honey bees, one reason being that nectar production by plants is impaired.
- // Prolonged cold periods or a lot of rain during spring and summer can hamper flight activity and disrupt nectar and pollen collection for the bee colony.

Continuation next page



The Needs of Bees and the Risks they face

Continuation

WORKSHEET 2A /// Overview /// TASK A1

A

TASK

1

Agricultural practices:

- // As a result of more intensive farming over the years, many regions used for agriculture now lack good nutrition for bees throughout the season and there are hardly any landscape structures of the type which many wild bee species require for nesting.
- // Crop protection products (CPPs), also known as pesticides, help farmers throughout the world to control pests which would otherwise reduce the yield and quality of the harvest. In the public discussion, CPPs are commonly represented as one of the main factors for honey bee losses. In scientific discourse, while CPPs are not normally seen as the main cause for the loss of bee colonies, there is still a view that they can play a part in the loss of bee colonies, particularly in combination with other factors. This makes it all the more important for ongoing and clear information about the appropriate use of CPPs to be provided to both small- and large-scale users. The key factor here is the responsible use of CPPs which have been carefully tested for bee safety.

Pests and diseases:

The *Varroa* mite and honey bee viruses:

- // Bee experts throughout the world agree that *Varroa destructor* represents the greatest threat to the honey bee in Europe (see also page 6).
- // The mite weakens bees, for example, by transferring viruses that are normally harmless directly into the bees' hemolymph and / or fat body, this can then make these viruses deadly or cause the disease to become more virulent.

Other pests and diseases apart from the *Varroa* mite can also weaken bee colonies:

- // Other parasites (e.g. wax moth is a nest parasite)
- // Diseases (caused by fungi, bacteria, viruses)

Beekeeping practices:

- // It is important to keep bee colonies healthy and strong: weaker colonies are less likely to overwinter successfully. As such, beekeepers should regularly check the condition of their bee colonies (for *Varroa* infestation, diseases, food stores, strength of the colony).
- // Without the help of the beekeeper, honey bee colonies in Europe would hardly be viable these days. Colonies not looked after by beekeepers would normally die off after two to three years as a result of the *Varroa* mite and diseases it spreads.

Breeding:

- // In the last few centuries, Western Honey Bees have been bred for their calm behavior, reduced swarming and increased honey production. On the other hand, this has led to the loss of certain characteristics and properties which make these bees more resistant to parasites and diseases.
- // Due to the high level of threat from pests, especially the *Varroa* mite, one solution may be to use selective breeding to strengthen those genetic traits in honey bees that are responsible for providing resistance to this mite.



The Needs of Bees and the Risks they face

WORKSHEET 2A /// Overview

TASK A2

Summary: Stress factors and risks

In large parts of the modern world, bees and other pollinators are exposed to numerous stress factors:

- // Decline in food sources which are necessary to assure a healthy and adequate diet of nectar and pollen.
- // The parasitic *Varroa* mite and the viruses that it transmits are considered to be a widespread and substantial risk to the honey bee, particularly in temperate zones of the northern hemisphere.
- // The loss of habitat is an important factor in the decline of wild pollinators.

The vast majority of bee researchers share these views.

There is no consensus about the relative significance of other potential factors and the interaction between them. For instance, the inappropriate use of crop protection products (CPPs) can also represent a risk. Therefore, the key factor here is the responsible use of CPPs which have been carefully tested for bee safety.

The combination of factors can differ from region to region.





The Needs of Bees and the Risks they face

WORKSHEET 2B /// In-depth work: Pests and diseases

TASK B1 and B2

Fact file on the *Varroa* mite

Where does the *Varroa* mite originate from?

// The *Varroa* mite is regarded as the greatest enemy of the Western Honey Bee (*Apis mellifera*). *Varroa destructor* originates from Asia, where it is a natural pest of the Eastern Honey Bee (*Apis cerana*). In that part of the world, the mite and the bee have adapted to one another during the course of their joint evolution.

// In the 20th century, the mite was introduced to Western Honey Bee colonies imported to Asia, and later brought into Europe in imported colonies in the 1960s. Twenty years later, it also spread to America. If left unattended, a mite-infested Western Honey Bee colony will die in around two years. As such, it is now regarded as one of the main reasons for honey bee colony mortality.

Distribution and effect on the honey bee

// This arachnid is barely more than one millimeter long, has four pairs of legs and piercing, sucking mouthparts.

// Its flattened shape and specialized suckers on its feet allow the *Varroa* mite to maintain a firm grip on the body of a bee. It then uses its mouthparts to pierce the bee's "skin" (cuticle) and feed on the blood-like fluid (hemolymph) and / or the fat body of adult bees and their brood. This weakens the bees in an infested hive, reducing their ability to function and shortening their lifespan.

// The mite predares individual bees and then spreads throughout the hive via the brood cells.

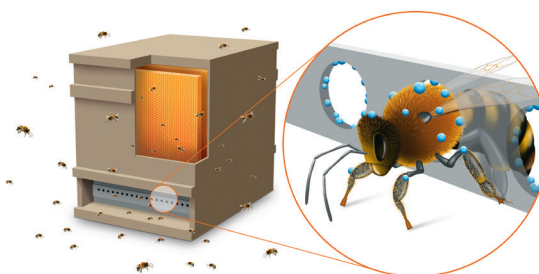
// Since the bees are already weakened, any diseases tend to have more serious effects, such as the Deformed Wing Virus (DWV), which is also transmitted by the mite. This can be present at every stage of the bee's development (egg, larva, pupa, adult bee).

Controlling the mite

// **Good beekeeping practice:** As a preventative measure, it is important for beekeepers to treat their hives effectively against mites before winter starts, to ensure the survival of as many winter bees as possible during the winter, so that they can form a strong colony again in the spring.

// **Chemical control:** Various chemical options are available to treat *Varroa* mites in the beehive. These involve evaporating organic acids in the beehive or hanging a plastic strip containing a synthetic substance between the honeycombs or at the entrance to the hive. Synthetic substances used for the control of *Varroa* mites are also known as varroacides.

Varroa Gate – a plastic strip containing an anti-mite agent:





The Needs of Bees and the Risks they face

Continuation

WORKSHEET 2B /// In-depth work: Pests and diseases

TASK B1 and B2

B

TASK
1

// **Biological control methods:** The consistent removal of the drone brood can greatly reduce the infestation of a beehive, as the mite multiplies particularly vigorously in the drone brood cells. Creating new, young colonies is another measure that can be used to reduce the number of *Varroa* mites in the mother colony. One way of doing this is to remove brood combs from the mother colony.

B

TASK
2

When this is done, the remaining mites are easier to kill in the brood-free young colony, for example with lactic acid – ensuring that the mites can no longer multiply in the mother colony.

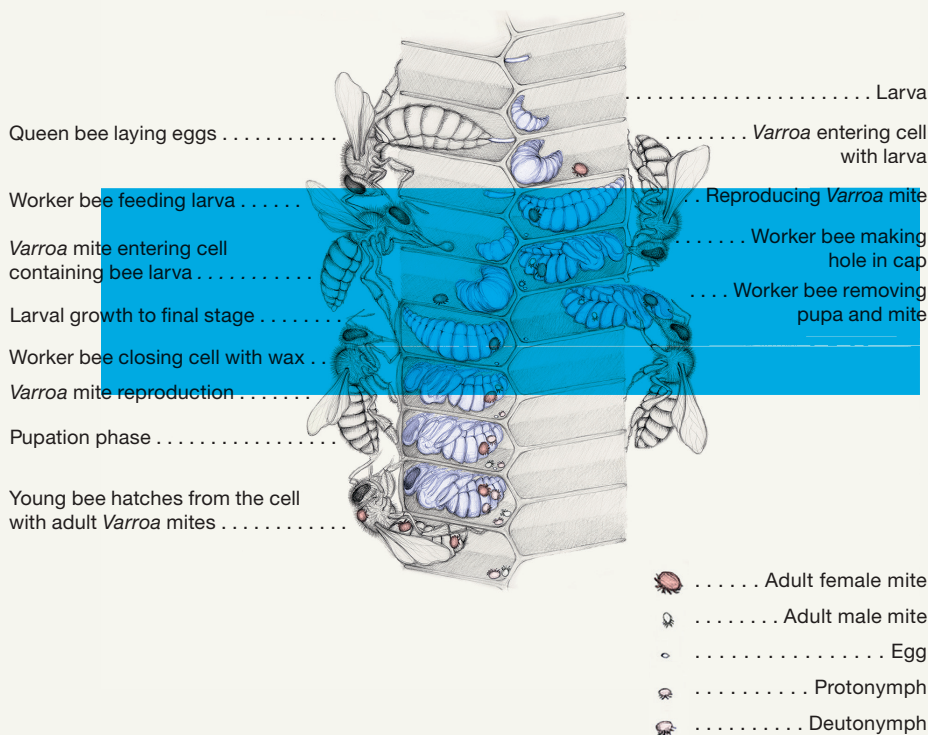
// **Long-term control:** Breeding *Varroa*-resistant bee colonies. A few colonies already show the first signs of resistance: honey bees that show the behavioral trait called “*Varroa*-sensitive hygiene” detect *Varroa* mite infestation in capped brood cells and remove the infected bee pupa together with the parasite.

Honey bee *Apis mellifera*

Development from egg to adult
with *Varroa* mite

Varroa-resistant honey bee

Varroa-sensitive hygiene behavior



Source: Arista Bee Research Foundation, slightly adapted illustration



The Needs of Bees and the Risks they face

Continuation

WORKSHEET 2B /// In-depth work: Pests and diseases /// TASK B1 and B2



More detailed background information on the *Varroa* mite:

Reproduction / effect on bee and brood:

- // *Varroa* mites reproduce in the sealed bee brood cells. They have ideally adapted to life in the beehive in order to feed and reproduce. Thus, the level of infestation with the parasite can double every three to four weeks during the honey bee breeding season.
- // A mite lives for two to three months in the summer, and for six to eight months in the winter. Without adult honey bees and their brood, the mite only survives for a maximum of seven days.



Transmission of viruses:

- // *Varroa destructor* moves from hive to hive via the honey bees, as bees from different colonies continuously fly into the wrong beehives during their search for food, even hives that are several kilometers away from their own can become infested. As a result, even bee colonies that have been treated against *Varroa* mites are exposed to the threat of infestation by bees from untreated colonies and, as such, can become re-infested. A high density of bees in some areas favors the spread of mites even further.
- // One of the main causes of this transmission is probably robbery: when food sources become scarcer during late summer and into autumn, honey bees begin to rob the winter stores of weaker colonies – which may, for example, be infested particularly heavily with *Varroa* mites. The mites also find less and less food in these weakened colonies and, therefore, move onto the invading bees. Thus, the robber bees not only bring stolen food back to their own colony, but also new parasites. Robbing is even more dangerous for the bees that are left behind. In the worst-case scenario, the bee colony either dies, or the bees leave the hive together with their queen in search of a new home; this type of “emergency swarming” is called absconding.

Infection:

- // Rather like a tick, a *Varroa* mite transmits diseases which often turn out to be fatal for bees and their offspring. The affected bees are weakened by mites sucking on their hemolymph and fat bodies. Their ability to function and their lifespan are reduced. In addition, when a mite sucks on the bee larvae, it transfers deadly viruses directly into the larval hemolymph.
- // Deformed Wing Virus (DWV), for example, is widespread. In directly-infected adult bees, the infection has no symptoms; but if the parasite transmits the virus into a bee pupa, the bee offspring develop deformed wings. The young bees cannot fly and have a shorter lifespan.
- // Furthermore, the mite also transmits Acute Bee Paralysis Virus (ABPV), for example, which can affect both adult bees and larvae and is transmitted directly into the hemolymph of the bee. From there, it moves into the vital organs: in the brain, for instance, it triggers disturbances in behavior, orientation and development – these consequences are fatal for the bee. ABPV infection is particularly critical in winter bees: the chances of survival during winter are sharply reduced.



WORKSHEET 2C /// Discussion: Crop protection

TASK C1

Individual solutions



Problem-solving Approaches / Measures to boost Bee Health

TASK

1

WORKSHEET 3 /// TASK 1 AND 2

Boosting bee health and bee protection by:

- // Better protection against parasites and pathogens (e.g. bacteria, viruses)
- // Mindful use of plant protection products, carefully following the user instructions
- // Providing more areas of habitat with flowering plants, hedges and shrubs, to increase food supply and provide wild bee nesting sites
- // Planting flower strips
- // Flower diversity at home in the garden / on the balcony
- // "Urban gardening"
- // Improved communication between beekeepers, farmers, ...



Here the students can choose between alternative 1, alternative 2 and alternative 3 with the corresponding tasks:

TASK

3.1

WORKSHEET 3 /// TASK 3 /// ALTERNATIVE 1

1a) Urbanite / consumer

"For some time now, I've been meaning to brighten up my balcony with flowers. And I'm also going to tell my neighbor to think of doing the same, right away!"

Farmer

"Before I use a new crop protection product, I always read the instructions for use on the label very carefully, and ask my crop advisor for advice, to make sure that I am familiar with the guidelines about bee-friendly use."

Beekeeper

"These *Varroa* mites! I need to protect my bees better. I'll have to ask around at the beekeepers' association again, to see if there is anything new to control this destructive mite."

Politician

"This is on the agenda for our next meeting: How can we plan for more green spaces in our city? How can we encourage our citizens to plant more bee-friendly flowers in their gardens?"

1b) Individual solutions

TASK

3.2

WORKSHEET 3 /// TASK 3 /// ALTERNATIVE 2 AND 3

Individual solutions

TASK

3.3



Wild Bees and the Bee Hotel

TASK

1

WORKSHEET 4 /// TASK 1

There are numerous wild bee species (more than 550 species in Germany; more than 20,000 species worldwide), which can differ greatly with respect to their appearance and needs.

Wild bees	Honey bees
Mostly solitary	Live in colonies
Nest in the ground, in dead wood, in plant stems – varies depending on the species	Nest in beehives
Some wild bee species have specialized and require particular plant species to survive	Food generalists (don't depend on particular plant species)
Food search generally within a radius of less than two kilometers, considerably less in most cases	Food search within a radius of maximally five to ten kilometers
In order to live, wild bees need specific nesting sites and sometimes particular plants. That means that sufficient flowering plants, hedges and shrubs need to be present, and also structures that are suitable for nesting, e.g. dead wood, sunny, open ground, dry plant stems (depending on the species).	



TASK

2

WORKSHEET 4 /// TASK 2

Project