THE WORLD OF BEES

Index:

CHAPTER 1: BEES

1.1 Do you know bees?

Bees are among the key organisms in pollinating countless species of plants, from fruit trees and vegetables to a simple flower. It has recently been discovered that the oldest bee was found in Myanmar, inside an amber which was over 100 million years old! There is also an iconography discovered in the early 1900s depicting a bee nest and a honey hunter. The relationship between man and bees has existed for a very long time. Today, bees inhabit our entire planet. There are more than 20,000 species (foraging insects), ranging from the giant bee, 3 cm long, to the dwarf bee, just 2 mm long. Bees are commonly known for producing honey. Those that do are part of the Apis mellifera species, of which there are two main types: the Ligustica and the Carnica. However, let us focus on the most important activity carried out by all bees: pollination.

The transport of pollen allows the fertilisation of plants and flowers and the subsequent production of seeds and fruit. Much of the world's food production and biodiversity depends on this mechanism. As a result, these insects are crucial to the balance of the entire terrestrial ecosystem. Of course, they are not the only pollinators, but they are the main ones and the most efficient. Just think that 80% of this phenomenon depends solely and exclusively on bees. Their hairy bodies and the electrostatic charge they transmit allow pollen to adhere perfectly. Bees are herbivores and are able to store energy by exploiting the high sugar content in

nectar. These hymenopterous insects have organs, specifically their hind legs and abdomen, which facilitate pollination in different ways. The mouth also has an important function because it allows the nectar to be taken without damaging the flower. But how do they identify the 'good' flowers from the 'bad' ones? Their antennae act as an olfactory organ and, in combination with their ability to perceive ultraviolet light, allow them to identify flowers that still contain nectar.

1.2 The life of bees

On average, a bee colony contains between 50,000 and 60,000 bees. This number varies according to the season: in winter the minimum number of bees is reached while in summer this number increases up to 100,000. Bees are divided into three categories: the queen bee, the kelp and the worker bee. The queen bee is the only fertile female and differs from the worker bee in that her abdomen is more distended and massive. Its role is to lay the largest number of eggs. It has a maximum life span of 5 years. The kelp is the male and has no sting. Its task is to fertilize the queen and it lives for about one season because during the winter it is excluded from the hive. Consequently, during the winter period we will find a colony without kelps. The worker bee, on the other hand, is a sterile female. The worker bees are the most numerous in the hive; we can count tens of thousands of them. The worker bee's body is extremely versatile, enabling it to carry out all the jobs required within the hive during its life. Because of its high workload, it lives about 40 days in summer (and six months in autumn and winter).

1.3 Even bees sleep

Until a few decades ago it was thought that bees did not sleep. Actually it is not so. Many scholars in the late 1980s began to take an interest in this fact, especially by studying the life of worker bees.

The sleep of bees is very similar to that of mammals and birds. When they sleep they lose muscle tone, their reaction to stimuli is slower and less vigorous, their body temperature drops and they move less. Like us, they prefer to sleep in dark environments because it indirectly gives them a sense of security and protection, a way of sheltering themselves from predators (birds, reptiles, insects, etc.).

According to some researchers, however, sleep is not a key factor in the bee's energy recovery, but rather a tool for the proper performance of its physiological functions. One of these functions is the bee dance, a practice used to indicate a new food source. In this case, lack of sleep increases the inaccuracy with which the direction is communicated. This is due to the fact that this operation is tiring for the bee, which will be less precise if it has not slept well. On the other hand, lack of sleep does not affect the communication of the distance to the new food source.

1.4 The structure of the swarm

Swarm formation is a particular collective behaviour of certain animals and insects, whereby the species groups together with the aim of migrating in a well-defined direction.

In the case of bees, the term used is “swarming”. This type of behaviour does not belong to a central organizational unit, so there is no one in charge. Each individual unit simply adopts a series of behaviours which in turn influence the actions of the others and no one activates mechanisms to supervise them. This habit is adopted by bees for the birth of new colonies through the splitting of an existing family. It all starts with the queen bee leaving the hive and attracting a good number of worker bees. These will remain in a nearby tree for a couple of days to allow the others to find a suitable place to build a new colony.
If one or more queens are formed in the original hive, there will be a new swarming called secondary swarming which may be followed by a subsequent (tertiary) one. This is to the detriment of the original family which will be weakened by the flight of worker bees following the queen bee. Secondary and tertiary swarms are smaller than the primary one, partly because the queen of the first swarm is already fertilised and therefore able to give birth to a new queen bee. In this way, in the event of the queen's death, the colony does not risk extinction. This process usually takes place during the spring season due to the overcrowding of the hive or the birth of new queens.

1.4 Curiosities
Bees are known and appreciated for being tireless workers, but are you really sure you know every little detail about these cute little insects? Here's a series of interesting facts about bees that you might not know!
1
These sweet animals work non-stop and for a single flight, a bee is able to pollinate between 50 and 100 flowers. Just consider that to produce 1 kg of honey, it is estimated that a colony needs to pollinate around 1,737,500 flowers - quite an impressive number!
2
Did you know that all worker bees are female? Compared to the queen bee, they were born sterile which is why their purpose is to work all their lives. These bees perform various jobs. For example, the youngest bees typically take care of cell cleaning, while keeping and foraging are typical tasks of the older bees. They are undoubtedly the lifeblood of the hive. Without them, there would be no one to look after the queen, no one to produce honey or pollinate plants and flowers!
3
Static electricity helps bees to attract pollen. When they fly, the friction in the air rubs the electrons together, giving them a positive charge. Flowers, being negatively charged, when the bees are in close proximity to them, static electricity causes the pollen to be attracted and attaches itself to the bee. Quite a fascinating scene, isn't it?
4
It is a common fear to come across a swarm of bees, but in reality this is not dangerous at all! These insects, unlike wasps, are harmless and can only attack when they perceive a real danger or when they have already started to build their hive. In this case you must be very careful not to make them nervous so as not to get into serious trouble!

5. You know bees have five eyes? The two largest on the side consist of various lenses and detect colors, shapes and movements, while the three smaller eyes on the side simply detect light and help them with orientation. Despite this interesting feature, the bees unfortunately do not have a mouth and therefore they cannot bite, but only suck the liquids. When someone tells you that bees ruin vineyards by gnawing on grapes, tell them clearly that they are wrong: it is the wasps that bite the fruits, not the bees!

6. Although it is painful, not many people know that bee venom has therapeutic properties. In fact, it contains an important substance (bees toxin) that has many properties that can cure and reduce the negative effects of at least 500 human diseases, including Alzheimer's. There are even studies that suggest that the stings of these insects may be a treatment for AIDS.
7. In the past it was thought that these insects could only see in black and white. Actually, the bees can catch 4 chromatic shades: yellow, blue, ultraviolet and green, but they are absolutely not able to perceive the red color. Despite this, bees are still one step ahead of us humans because they can perceive ultraviolet rays, rays that we can only see through spectroscopy. This is an essential skill for these insects, as it allows them to notice the reflective surfaces of the ultraviolet light of the flowers. In this way, bees are able to identify plants in a simpler way and then devote themselves to pollination. Bees are able to recognize certain types of shapes, including the human face. In fact, they are able to distinguish one face from another, based on a set of features such as lines and points, remembering them even after a few days. In this regard, the University of Cambridge has demonstrated, in a concrete way, this discovery: the experiment consisted of storing the bees in the vicinity of four photos of different human faces and they were rewarded when they approached one of the photographs with a sugary substance. Once the reward was removed, the bees continued to approach the photo in question, demonstrating that they recognized the exact face eight times out of ten. An amazing skill that very few insects are able to use.

CHAPTER 2: HONEY

THE ORIGIN OF HONEY
2.1 The origins of honey are very ancient and date back to prehistory, more precisely to the Neolithic, where honey was simply sought and harvested. It is with the Egyptians that we find the first case of beehive farming and honey begins to be considered a luxury dish; it was then labelled as "nectar of the Gods" from the Greeks and Romans, convinced that it fell directly from heaven and that the bees simply took care of its collection. This idea of honey as "celestial" continued until the nineteenth century, when organic

chemistry provided an explanation of the phenomenon. Honey has always been used in food as a sweetener, condiment and preservative. However, being very versatile, it was used in various fields such as medicine, for the treatment of wounds or burns, and for problems related to digestion or cosmetics. It was only in the twentieth century that single-floral honey was considered and it was gradually given importance to the distinction of the various types of honey starting from the flower.
2.2 Honey is composed of 70-80% fructose and glucose. Food products with a long shelf life have countless properties. The most important is antibacterial and antibiotic, in fact it is recommended to treat problems related to the throat and respiratory tract, as well as being used to pimples and acne. It also has positive effects on insomnia. Concerning the digestive system, it stimulates the activity of the bacterial flora with its purifying effect; on the urinary tract it has anti-inflammatory and diuretic properties. It finally stimulates circulation and acts as a defense against anemia. A regular consumption of one spoon of honey per day can therefore bring benefits in terms of: - respiratory tract: calming action for cough; - liver: protective and detoxifying action; - kidney: diuretic action; - muscles: increased sports performance and resistance to fatigue; - blood: antianemic thanks to the iron content; - antibacterial and healing action.

2.3 Varieties of Honey

There are so many varieties of honey as there are so many variables that affect its production. The main one is certainly the plants and flowers from which the pollen is obtained, but geographical location also has an influence.

WILDFLOWER HONEY

It is produced through the pollination of different plants and can vary in taste and appearance, depending on where the typical flowers are located. Nutritionally it is the most complete of all types of honey, rich in nutrients for all ages and an excellent supplement for athletes. It helps fight seasonal ailments, keeps the skin soft and nourishes the hair. It has a soft colour and quite a delicate taste, which is why it is particularly suitable for dissolving in camomile and tea.

HONEY OF SULLA

It is mainly produced in southern Italy, where the Sulla plant is widespread. Rich in vitamin A, B and C , as well as zinc, magnesium and iron, the honey has a delicate flavour and a soft colour, suitable for all uses.

HONEYDEW HONEY

It is collected from the leaves of trees, as honeybees suck the sap and transform it into honeydew. Traditionally consumed in Central and Eastern Europe and Asia, it has a strong nutritional content but is less sweet than normal honey.
It is recommended for people suffering from diabetes because of its low glucose content.

CHESTNUT HONEY
It is produced in the highlands of the Mediterranean countries and preserves the strong flavour of the forests from which it comes. It is especially suitable for accompanying meat and cheese. Dark amber in colour and with a viscous consistency, this honey is a very valid:
-antibacterial,
anti-inflammatory
-emollient
Useful for resolving dry and chesty coughs.

EUCALYPTUS HONEY
It comes from the flowers of the evergreen tree of the same name, which is widely distributed along the Tyrrhenian coast, in Sicily and Sardinia. The honey has an amber-coloured appearance and a rather compact consistency, which tends to crystallise. The flavour is intense, balsamic and moderately sweet. It is rich in antioxidants, particularly flavonoids, so it is particularly valuable in combating free radicals.

ONION HONEY
Originating in Asia, this product has a unique appearance and nutritional properties, with a characteristic aftertaste that can be traced back to the plant. Because of its characteristics, it is highly sought after, even though it is produced in low quantities and therefore difficult to find.

CITRUS FRUIT HONEY
It is made from the nectar collected from orange, bergamot, citron, lemon and mandarin trees. With a great aromatic intensity, between floral and fruity, it also has multiple benefits, making it an excellent:
- antioxidant
- anti-inflammatory
-relaxing and calming (recommended for relieving anxiety)

ORANGE HONEY
It is mainly produced in southern Italy, especially in Sicily where citrus fruit cultivation is highest. Rich in vitamins and antioxidants, it is used for curative purposes and is a good substitute for sucrose. This single-flower honey is immediately recognised by its intense smell of orange blossom, the flowers of the citrus fruit from which it is obtained.

SUNFLOWER HONEY
It is mainly produced in central Italy where sunflowers are more widespread. It is rich in fructose and is therefore a good sweetener. It has an aftertaste reminiscent of the flavours of the countryside and the flowers from which it comes. In recent years, thanks to important awards, this honey is being considered as one of the best foods for physical well-being.

ACACIA HONEY
It is produced throughout Italy with flowering in May. It is a monofloral, a very pale yellow colour and has a liquid consistency with a slightly bitter aftertaste. Its aroma and flavour are delicate and it is seen as an energizer as well as being suitable for diabetes, thanks to its high digestibility. It also has a cleansing effect on the liver and improves intestinal balance.

MEDICAL GRASS HONEY
It comes from Medicago sativa, a forage plant of the leguminous and is widespread in Italy, where the largest producer is the Po Valley. It crystallises spontaneously a few months after being collected. It is light-coloured or amber-coloured, its scent is slightly floral with some hint of hay. It has a delicate flavour, sometimes acidulous and slightly spicy in the throat.
In purity, it does not contain gluten.

2.4 Other hive products
ROYAL JELLY
It is produced by special glands in the young bees and is used to feed the larvae in the first days of life and to feed the queen throughout her life cycle. It has a yellowish-ivory-white colour and an acidic but sugary taste. It is harvested by beekeepers at certain times of the year and stored in the refrigerator. When consumed, it should be taken by placing the indicated daily dose under the tongue, which allows the body to assimilate it before it is attacked by saliva. It is advisable to do this a few minutes before breakfast.

PROPOLIS
It is recovered from outside the hive, mainly from plant buds, as the resin is produced to protect the buds from external bacterial attack. Bees spread it on the inner surfaces of the hive as a disinfectant, exploiting its antibiotic properties. Over time, humans have learned to use this product for the same reason. Harvesting is done inside the hive using grids and is prepared mainly in mother tincture or in hydroalcoholic tincture or in a hydroalcoholic solution.

WAX
Wax is also produced by glands on the abdomen of bees. It is used to build the internal architecture of the hive. It is not normally eaten as a foodstuff but is used in hand creams or for protective waxes for wood and furniture, due to its excellent properties. It is also used as a base for the production of fine candles, as it does not produce the classic 'black smoke' when lit.

MEAD
It is produced by the fermentation of honey and is thought to be the oldest fermented beverage in the world, so much so that in antiquity it was called 'the drink of the gods'.

Traditionally, in many parts of Europe, many newly married couples were given a month's supply of mead. It is no coincidence that the term 'honeymoon' is derived from the fact that for the duration of a honeymoon, the couple could enjoy drinking this delicious drink. The basic recipe calls for honey, water and yeast, but there are countless variations, such as those with honey and malt, honey and fruit or even a combination of honey and spices.

HONEY VINEGAR
It is produced by the fermentation of mead, and is therefore considered the oldest vinegar in the world. In Egyptian times it was used as a disinfectant and as a thirst-quenching drink, mixed with water. In recent years, however, this foodstuff has become increasingly popular, both as a condiment and as a cosmetic. In the kitchen, it can be used to season vegetables, salads, fruit salads or to prepare accompanying sauces, to enhance its unmistakable flavour.

CHAPTER 3: APICULTURE

3.1 Apiculture
Apiculture is the keeping of bees for the production and trade of honey and other products of the hive (beehive).
Originally, before the modern technique of keeping bees in hives was developed, honey was obtained either naturally in the hives or by recreating 'artificial' hives, which could be simple hollow logs or cork bark.
Since ancient times, the use and breeding of bees was common to many cultures, from the Egyptians, who depicted them in tomb decorations, to the Greeks and Romans, who had already recognised the precious properties of honey. The Greeks themselves revolutionised beekeeping, with their beehive, also known as the "bugno villico". It was made up of four planks placed to form a vaguely pyramidal parallelepiped with an opening slightly smaller than the bottom.
The latter was closed by a removable flap.
The revolution in the field of beekeeping, however, came in the 19th century. In 1851, Lorenzo Langstroth invented the mobile honeycomb. From that moment on, there was a swarm of hypotheses and inventions, most of which were abandoned, but others, in just a few years, led to an authentic revolution that would result in the modern beehive. The latter differs from the ancient hive in its structure, which consists of a basic module containing mobile combs for the harvesting period.

3.2 Types of beehives
DADANT BLATT HIVE
The Dadant Blatt hive is the most widely used in Italy. It is based on that of Langstroth, but with some modifications. It has the characteristic of having the size of the nest, where the family develops, higher than the honeycomb. The main variants have 10 or 12 frames.

LANGSTROTH HIVE
This is, as we saw earlier, the first rational hive to be invented. Rational hives are those with a mobile frame, i.e. those that allow inspection without destroying the honeycomb. It has the characteristic of being modular, as the nest and the honeycomb are the same size, so they only carry one type of frame.
TOP BAR HIVE
Also known as the "Kenyan beehive", for a long time left in oblivion. For some time now it has become popular in Italy, although it still remains a niche.
This type of hive differs from the others in that it has a horizontal development. Its shape is believed to help the natural development of the family.

B-BOX by BEEING
B-BOX is an Italian hive, designed for urban beekeepers who are at the beginning of their experience. Like all beehives, it requires skills but has the particularity of being suitable for educational contexts due to the transparent walls that allow you to observe the bees without disturbing them and the "chimney" that makes it safe by moving the bee entrance upwards.

3.3 Who is the beekeeper?
His role is to take care of his bees by trying to help them grow, and causing them as little disturbance and upset as possible. In other words, the beekeeper's mission is to understand the bees' behavior, respecting them and helping them to stay healthy. This is a job that requires a great deal of meticulousness and a very high level of knowledge and respect for the insect. If the work is done well, the bees will produce between 20 and 60 kilos more honey than is consumed by the insects themselves (and therefore available to humans).

3.4 Urban beekeeping in the world
Beekeeping is a booming activity in urban areas, as it enables people to produce good, healthy honey at home. Many studies on bee depopulation have shown that there is a much lower concentration of pesticides in cities than in the countryside, where they are still widely used. In addition, bees have a kind of sixth sense, which allows them to rely only on healthy flowers and to omit flowers that are contaminated and therefore harmful to them. All this also gives urban honey a very good quality.
In addition, the management of beehives in urban areas helps to educate and raise public awareness of the importance of protecting bees and respecting biodiversity.

Honey at the city gates
Urban beekeeping is now a reality in many cities and metropolises around the world, such as Tokyo, New York, Copenhagen, Berlin and London. In Italy too, it is gaining popularity in cities such as Bologna, Rome, Milan, Turin and Udine.
The success of the project is linked to the growing worldwide awareness of the role of bees and the effects of human actions on this insect species, whose survival is now considered to be at risk.

Urban beekeepers generally have a limited number of hives (two or three) and their aim is to bring biodiversity into the urban environment rather than to produce honey. Obviously, beekeeping in the city also requires adequate preparation of beekeeping skills: knowledge of bees, training courses, understanding bees and learning how to manage them in the most appropriate way, to respect and protect them.