

# THREATS TO POLLINATORS



*The populations of pollinating insects are declining,  
both in number and in diversity of species.  
All the causes of this decline are associated with human activities:*



# USE OF PESTICIDES



## General Information

With intensive farming, pollinators are exposed to pesticides, also called phytosanitary or phytopharmaceutical products. These are substances which control, destroy or prevent the appearance of organisms that are considered harmful: insecticides, herbicides, etc. Pollinators fall victim to them via direct spraying, but also via the contamination of pollen, nectar, water or even of the materials used for their nests.



*The consequences are dire for the pollinators:*

- ✓ Heightened mortality, in some cases with an immediate lethal effect
- ✓ Greater sensitivity to diseases
- ✓ Changes in physiological functions: deformities, sterility, etc.
- ✓ Changes in behaviour: disorientation, feeding disorders, memory loss, etc.

## Curious fact

To be authorised in the European Union, pesticides are required to pass an assessment of the risks to health, which ignores the impact on wild pollinators. These assessments concentrate solely on the honeybee, without considering chronic exposure, mixes of pesticides, or the various exposure pathways. The homologation protocols are deficient, and do not measure the real risks for pollinators. What's more, even if a product is banned in the EU, the member states can grant derogations for use "in the event of emergency". Certain countries do not hold back in doing so, such as Bulgaria, Hungary, Lithuania and Romania in 2017, using insecticides classed as neonicotinoids.



## "Quote

«Future historians may well be amazed by our distorted sense of proportion. How could intelligent beings seek to control a few unwanted species by a method that contaminated the entire environment and brought the threat of disease and death even to their own kind?».

Rachel Carson (1907 - 1964)

## Quiz

How has the consumption of pesticides developed between 1990 and 2015 in Europe?

It has increased by 73%. On average, 3.2 kg of pesticides are used per hectare in 2021 in Europe. In Luxembourg, 51% of the surface area is taken up by agriculture, and 521 products containing at least one active substance have been authorised. Farming practices have a major impact on our regions!





# DESTRUCTION OF THEIR HABITATS AND SOURCES OF FOOD



## Ecology

Like us, pollinators need food, shelter and somewhere to nest.

Native plants, flowering throughout the year, guarantee them good food, and not just for pollen and nectar! At certain stages in life, pollinators sometimes eat other things, as caterpillars. For example, in Luxembourg the **caterpillar of the Old World swallowtail butterfly** is primarily dependent on certain plants in the Apiaceae family, such as the wild carrot or fennel. These plants, vital for its survival, are called plant hosts.

Chenille du papillon Machaon  
(jardin communautaire Kaltreis)



Andrène Vague  
(Saeul, Luxembourg)

When it comes to laying eggs, sheltering, or surviving the winter, the pollinators' preferences are similarly varied! A queen bumblebee can overwinter in an abandoned mouse burrow. The grey-backed mining-bee (*Andrena vage*) lays its eggs in the ground, while the Two-coloured mason-bee uses empty snail shells... Each natural element is precious: hedges, old trees, compost, etc.

### *Intensive farming practices are harmful to wild pollinators:*

- ✓ *Mowing before flowering*
- ✓ *Monocultures which do not satisfy their nutritional needs*
- ✓ *Herbicides eliminating field wildflowers (poppies, cornflowers, etc.)*
- ✓ *Loss of permanent pasture providing food and habitats. In Europe, the area of permanent pasture has reduced by 30% since 1960*
- ✓ *Absence of hedges*
- ✓ *Ploughing, compacted soil and bare soil destroy habitats. 70% of bee species nest in the soil*

## Quiz

*How many square metres are converted to artificial landscapes every day in Luxembourg?*

*5000 m<sup>2</sup> - almost as much as a football pitch. The artificial use of soils and urban development are destroying habitats and sources of food for pollinators. Even in our green spaces and private gardens, the welcome given to pollinators is often inadequate. A "tidy" garden is a maintained garden, with a short lawn (if it is not plastic, or covered in gravel). It is "sanitized", ultimately leaving little space for biodiversity: dead wood, dried vegetation, unmown grass, etc.*







# THE INTRODUCTION OF INVASIVE NON-NATIVE SPECIES, BREEDS OF ANIMAL AND DISEASES

## Ecology

For honey and to pollinate crops, pollinators are bred and kept, such as honeybees familiar from apiculture. These bred animals create direct competition with wild species for nectar and pollen. Moreover, the density of the bred pollinators encourages the propagation of diseases and parasites, such as the Varroa destructor mite, which are not necessarily present naturally and which can be transmitted to the wild populations. Ironically, this strategy aimed at boosting pollination can have the reverse effect, by further weakening local species.

In parallel with this, non-native species are introduced, often via worldwide trade. Their new environment is not adapted to their presence. These species become invasive when they cause imbalances, due to their rapid expansion and the absence of natural regulation (predators, diseases). They then compete for food resources and habitats, whilst sometimes being predators or parasites of the native pollinators.



Asian Hornet  
(Shek Kong, Hong Kong)

## Curious fact

Faced with the collapse in insect populations and with the growing need for pollination, the breeding of pollinators is expanding.



Hives of honeybees are transported by van from field to field.

Other species of bees, bumblebees, hoverflies and even wasps are bred. The hoverflies and wasps tend to be bred to protect crops, since their larvae feed on insects which can sometimes devastate crops (aphids, caterpillars, thrips, etc.). For many crops, such as watermelon, cherries or coffee, wild pollinators are still more efficient or absolutely indispensable.

## Quiz



Where does the Asian hornet come from?

*Vespa velutina*, originally from South-East Asia (China, India, Indonesia), was accidentally introduced into Europe in the 2000s, probably via containers imported from China. Since then, it has spread throughout Europe. In ecosystems where it is non-native, this hornet becomes invasive due to the absence of disease, natural predators and co-evolution with local species. In Europe, it is particularly known for its hunting of honeybees. In Asia, its presence is beneficial. It contributes to maintaining the ecological balance by regulating certain insect populations, like the European hornet in Europe.



# CLIMATE CHANGE



## Ecology

Climate change is a serious threat to pollinators, by disturbing their habitats and their lifecycles. Changes in temperature or rainfall can shift flowering and foraging periods, which makes feeding and pollination more difficult.

In parallel with this, changes in the climate (temperature, rainfall, humidity, etc.) upset habitats favourable to insects and plants. Faced with these changes, the species concerned are forced to migrate. This migration is not always rewarded by success, and some species die out as a result.

*Extreme events, becoming ever more frequent, such as giant wildfires and droughts, also destroy habitats and cause the death of insect populations. Mason-bees like those in the Osmia genus sometimes try to adapt by bringing forward their nesting period, but this strategy also involves risks: if the bees then emerge too early, they may not be able to find enough flowers to feed themselves!*



*Cruciferous Andrena  
(Urban Garden  
NeiSchmelz  
Dudelange)*



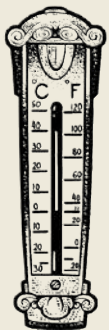
*Scabious Sweat Bee  
(Cents, Luxembourg)*



## Quiz

*Which species are most vulnerable to climate change?*

*Specialised pollinators have co-evolved over centuries with specific plants, like the Violet-winged mining-bee with the Brassicaceae family (cabbage, mustard...). If the flowering period and the bees' active period drift apart, their survival is compromised because they are unable to feed or to feed their larvae. Unlike generalist pollinators, who adapt more easily to environmental changes, the specialists are particularly at risk from climate disruption, as it increases the risk of extinction and of homogenisation of species. These multiple environmental interactions, however, are all essential to the balance of ecosystems, which makes their loss concerning.*



## Curious fact

Insects are unable to regulate their temperature! A spike of hot or cold weather, however short, can be fatal to an entire population. In parallel with this, the quantity and quality of a flower's resources is also dependent on climatic conditions: too much or not enough rain, too hot or too cold... often means less nectar! Our ecosystems are based on sensitive and subtle balances.



# SYNERGY EFFECTS AND CASCADE EFFECTS



## Ecology

The decline in pollinators is caused by several factors: climate change, pesticides, invasive non-native species, artificial use of soils, intensive farming, etc. The combined effects of multiple threats, called **synergy effects**, are more serious than the simple sum of the individual effects.

*Each disturbance aggravates the others. For instance, a pollinator that is already weakened by pesticides may also have to cope with flowers becoming less common. The destruction and fragmentation of habitats reduces genetic mixing, increasing the vulnerability of the insects to diseases and other threats. The introduction of non-native species increases competition, but the use of pesticides to limit their spread put the ecosystem even more at risk. It's a vicious circle.*



## Curious fact

A curious effect due to the synergy and cascade effects of the decline in pollinators could be the unexpected appearance of destructive "super-insects". With fewer pollinators to maintain the ecological balance, certain species of pests that were previously naturally controlled might proliferate en masse, leading to massive invasions of crops. These super-insects might develop a heightened resistance to traditional methods of control, thus making managing them even more difficult. This shows how the disappearance of one species can indirectly promote unforeseen consequences that are difficult to manage.



40 years ago



today

## Quiz

*In 40 years, by how much have the numbers of birds in farming environments dropped in Europe?*

*57%: out of 100 birds in the fields, today there are only 43. The decline in pollinators causes a reduction in the diversity and abundance of flowers. There is then less fruit and seeds, and thus fewer food resources for birds that feed on seeds or fruit. Insect-eating birds are similarly dependent on pollinators to feed themselves. The predators disappear at the same time as their prey. Without the birds, certain crop-devastating insects multiply and impact food production. These **cascade effects** show the importance of the interactions, and how an initial environmental change can put the whole ecosystem at risk, bringing about a series of other consequences. If these disruptions accumulate, we risk reaching a point of no return, with an irreversible imbalance and a functional collapse of the environment.*

