

Didactical-methodical hints

Didactic and methodological notes on the teaching unit or on the "insect extinction" section

Insects play a central role within ecosystems.

They are food for numerous animals, for fish, amphibians, reptiles and birds, and in some cases also for mammals (see also the UE Birds), and through their ecosystem services of pollination they provide the basis for food chains.

Insects are also indispensable for human nutrition. With the decline of pollinators, there is a threat of significant crop losses. Insects also play a major role as destructors.

However, insects also occur as insect pests, the best-known example being the bark beetle. Here, there is generally no evidence of a decline. On the contrary, due to the damage to many forest stands, these insects find excellent feeding and reproduction conditions. This also seems to apply increasingly to (originally) exotic insects, see UE Invasive species.

In this unit, the learners should familiarize themselves with the importance of insects as well as with the current population situation. They should be able to name and analyze the causes of insect decline and learn about individual and political options for action. In this context, agricultural policy and industrial agriculture naturally play a major role. This aspect can already be dealt with here or as a separate unit after the various threat scenarios have been dealt with. (T3)

There are cross connections to the UE "Invasive species" and "Birds".

The unit has a hybrid structure. In addition to texts, videos and interactive pages are also available. For the texts it is possible to offer only a selection.

Subject area II Insect mortality

1. Watch the [video "Insect Extinction"](#) and reproduce the key messages of the video regarding the current situation of insects in English. Include figures 1, 2, and 3. Name orders that are particularly endangered. (Planet Knowledge 2020)
2. Enter in the table also the ecoservices of the insects listed in the film. You have a free choice of languages and are welcome to use, for example, your first language or another foreign language that you are currently learning.



Tip: [Here](#) you can find (interactive) further information! (NABU e.V. o.J.)



Development of insect mass since 1990:

Orders Particularly Affected:

Eco-services of insects:

Do you feel like creating a skit on the importance of insects?

Über 75 % Rückgang an Insekten in den letzten 25 Jahren

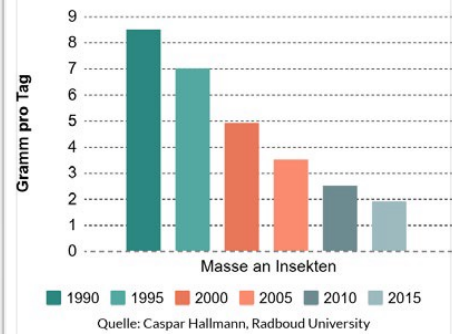
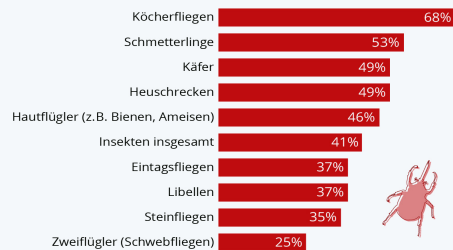


Fig. 1: Mahl 2018

Insektensterben: Nicht nur Bienen sind bedroht

Anteil rückläufiger Insektenarten im Jahr 2019



Quelle: Biological Conservation (2019), F. Sánchez-Bayo, K.A.G. Wyckhuys



statista

Info

Caddisflies, mayflies, stoneflies and dragonflies are insects that spend much of their lives as larvae in water.

Fig. 2: Biological Conservation 2019

Biomasse Insekten

(Seibold et al. 2019)

2008–2017 wurden Insekten in Schutzgebieten, land- und forstwirtschaftlichen Gebieten gesammelt. Ergebnisse:

Wiesen und Weiden:

Biomasse: -67 %

Individuen (= Abundanz): -78 %

Artenzahl: -34 %



Wälder:

Biomasse: -41 %

Individuen: (nicht signifikant)

Artenzahl: -36 %

Fig. 3: Seibold 2019 (in: Hagedorn et al 2019: 31)

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Development of insect mass since 1990:

- Steady decline in biomass to less than 25% (Fig. 1).
- Reduction of the number of species by about 1/3.
- Especially strong in meadows and pastures, but also in forests.

Caddisflies, butterflies, beetles, grasshoppers, (wild) bees, ants

Orders Particularly Affected:

Eco-services of insects:

- Pollination, thus securing human nutrition
- As destructors removal of carrion, dead wood, etc.
- Soil improvement
- Food base of many birds, fish, etc.

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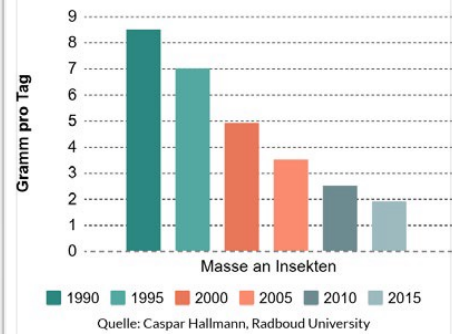
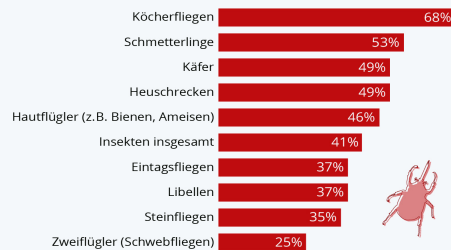


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Subject area II

Insect mortality - life without insects?

Compile what effects an even more massive decline of insects would have on ecosystems and human nutrition and economy. Also include the text below, the illustration, and the text from Nabu (next page). You have the free choice of languages.

Researchers at the University of Jena have studied how the decline in insect numbers affects vegetation and found that the lack of pollination affects the flowering behavior of plants.

[iDiv Halle-Jena-Leipzig 2020](#)

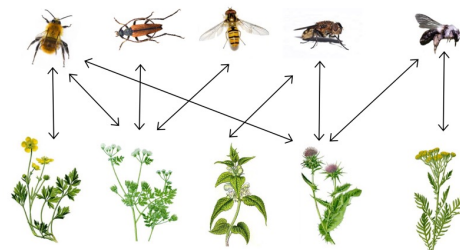


Temporal discrepancy between plant and animal life

Ulrich and her colleagues found that the lower insect population causes a species shift among the plants. In particular, the frequency of the dominant plant species, e.g., meadow clover, increases. Flower development also changed with decreasing insect density. Some of the plants studied flowered earlier, others later. "These changes can cause a temporal mismatch between plant and animal species. This results in negative consequences for the ecosystem," said Ulrich, the study's lead author. Examples include insect food supply and pollination success. This degradation of ecosystem function could result in further species loss of insects and plants. Another consequence could be increased pest infestation of plants. Due to the decreasing number of insects that feed on aphids, among other things, these could spread unhindered.

[Text 1: iDiv Halle-Jena-Leipzig 2020](#)

Warum brauchen wir Artenvielfalt?



Viele Pflanzenarten sind auf bestimmte Bestäuber spezialisiert.
 → Wenn die Insekten verschwinden, verschwinden auch die Pflanzen.

Fig. 1: Weiner et al. 2014; Blüthgen & Klein 2011; Biesmeijer et al. 2006

Consequences of insect mortality

Welche Folgen hat das für uns Menschen? Und für das Funktionieren von Ökosystemen?



Fig. 2: Sufeldt et al. 2013; Wahl et al. 2015



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Consequences of insect mortality

If insects fall away, many plants can no longer be pollinated and therefore cannot produce fruit, which can lead to their extinction (Fig. 1). This can lead to especially rare species being endangered. If insects are absent, the flowering period may also change and there may be a mismatch between flowering and insects and possibly increased pest infestation. (Text 1) Ecosystems can be disturbed in their function (Fig. 2), this concerns material cycles (decomposition of biomass) as well as the disturbance of the food web (see previous page) Food production would be massively affected by the loss of pollinating insects.

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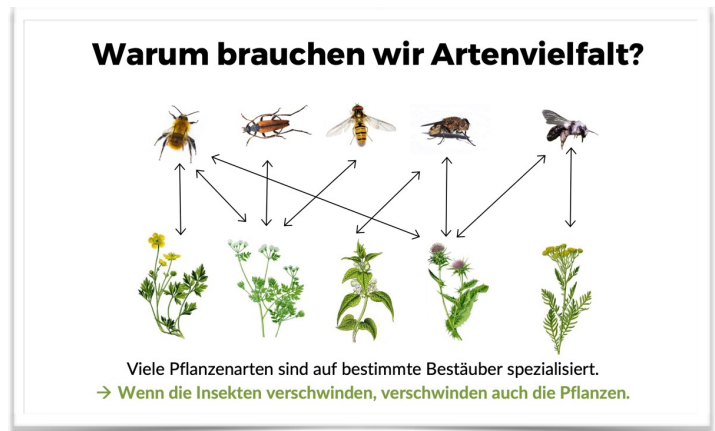


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Fig. 2: Sufeldt et al. 2013; Wahl et al. 2015

Subject area II

Text on the importance of insects

Small animals with great performance

Why insect pollination is vital

Almost all wild and cultivated plants are pollinated by insects. This makes them irreplaceable for our ecosystems. On top of that, they provide indispensable services for us humans.

Insects seek out flowering plants primarily to collect their nectar and pollen. By touching them, they pollinate the female flower organ with the collected pollen. A seemingly small and simple process with a big impact: this ensures the sexual reproduction of about 88 percent of all plants worldwide - in tropical regions it is even more than 90 percent and in the temperate zone about 80 percent of all plants. Although there are other animals such as bats, birds and reptiles that contribute to plant pollination, insects play the decisive role. Wild bees and honey bees are of great importance, but butterflies, flies, wasps and beetles also make their contribution.

Securing ecosystems

The industrious insects and their pollination work not only ensure that the plant world continues to exist and its diversity is maintained. Pollinators also make it possible for numerous creatures that depend on meadows, hedges or trees to have habitats for cover, reproduction and food. Take birds as an example: a considerable proportion of native songbird species depend on seeds, nuts or fruit - products that mostly owe their origin to pollination by insects. In general, it can be said that herbivorous animal species account for a significant proportion of the Earth's biodiversity - and thus depend directly on pollination. Humans also depend on pollinating insects. Of the 107 most commonly grown crops worldwide, 91 are pollinated to varying degrees. Strawberries and cherries, canola, coffee or watermelons produce particularly rich yields when pollinated by wild bees or other insects. It is estimated that a total loss of pollinators would result in crop losses of up to 90 percent. The supply of proteins, vitamins or iron would be massively endangered.

Without pollinators, we would have to do without many types of fruit and vegetables.

This impressively shows how important pollinating insects are for human nutrition. Expressed in monetary terms, this means that the annual market value generated by the production of pollinator-dependent crops is up to 500 billion euros. This value is likely to rise in the future, as the cultivation of pollinator-dependent crops has increased by more than 300 percent worldwide in the last 50 years alone.

Alarming condition

All the more worrying is the fact that, on a global scale, many pollinator groups such as bees or butterflies are declining in both abundance and diversity. Often, over 40 percent of species are considered threatened.

Especially in highly industrialized regions such as Europe, a downward trend has been emerging for decades - here, nine percent of all butterflies and wild bees are already threatened, and their populations are showing declines of over 30 percent. In Germany, the situation for wild bees is even more dramatic: Of the 560 species recorded here, over 50 percent are threatened. Almost five percent are even threatened with extinction. Only 37 percent of the species are currently not considered endangered.

The main cause of this dramatic decline is industrial agriculture and the associated loss of food sources and nesting sites.

[\(NABU e.V. o.J.b\)](#)



You can find more information here:

Links to English language videos:



[Carrington 2021](#)



[Schmidt 2019](#)



[Bird 2017](#)



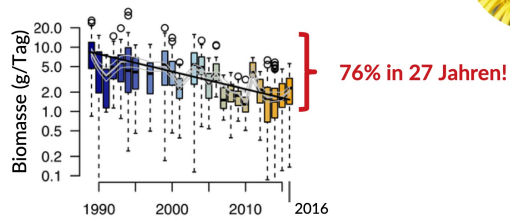
[DW Documentary 2019](#)



Die gute Nachricht zuerst: Die Honigbiene ist nicht gefährdet!

Die schlechte Nachricht:

Die Wildbienen schon – und viele andere Insekten auch.



Hallmann et al. 2017

[Hallmann et al. 2017](#)

2008-2017: Artenzahlen haben um ein Drittel abgenommen

2008-2017	Abnahme: Artenzahl	Abnahme: Biomasse	Abnahme: Individuenzahl
Grasland	34 %	67 %	78 %
Wald	37 %	41 %	17 %

Rote Listen:

Fast die Hälfte aller 560 Wildbienenarten ist ausgestorben oder gefährdet.

- Ähnliche Zahlen für die anderen Insektengruppen
- Aber: auch häufige Arten nehmen massiv ab!

[Seibold et. al. 2019](#)

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