

United Nations Environment Programme (UNEP)

Mass extinction of insects



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Student Officer: *Natalia Laudańska*

Position: *President*

Introduction

Insects pose a vital role in our planet's biodiversity, for example being the feed to the bigger species or pollinating plants. Fundamentally, insects are "the little things that run the world", (E.O. Wilson, 1987) and this is why the current conversation about insect declines is so necessary. This group of arthropods are present in almost every biome and Earth's sphere. Some insects were treated as sacred in Ancient Egypt, as well as being treated as a delicacy.

The researchers found that 41% of the about 1,000,000 insect species included in their studies were in decline and 31% have declined to the point they're now under threat of extinction. Scientists also analysed the yearly rate of decline in insects, and they found an estimate of the loss of insect biomass to be 2.5% per annum. At face value this sounds modest, but cumulatively means a 20% loss of all insects in 10 years, 52% loss over 50 years and a 92% loss over 100 years.

Nowadays the opinion on insects is mostly negative and people often correlate vermicules with damages, squalor or health hazards. Their role in our ecosystem is frequently omitted in day-to-day conversations about climate change and bettering the Earth.

Definition of Key Terms

Insect:

any of a group of small and often winged animals that are arthropods having six jointed legs and a body formed of a head, thorax, and abdomen

Biodiversity:

the variety of plant and animal life in the world or in a particular habitat, a high level of which is usually considered to be important and desirable.

Pesticides:

a chemical substance used for destroying insects or other organisms harmful to cultivated plants or to animals.

Beehive:

in beekeeping, a construction, most often wooden, used for breeding and rearing bees; used for life, development of the colony and for gathering food supplies.

Pollination:

a process taking place in the flowers of seed plants, consisting in the transfer of pollen and its development, culminating in the fertilisation of the egg.

Herbivore:

an organism that feeds on plants or parts of plants (including seeds, fruits and dried plants stored by humans).

Fossil fuel:

a natural fuel such as coal or gas, formed in the geological past from the remains of living organisms.

Migration:

seasonal movement of animals from one region to another.

Complete transformation:

the type of metamorphosis of an insect larva into an adult, during which the pupal stage occurs. The larvae do not resemble mature specimens in appearance and lifestyle.

General Overview

Historical context

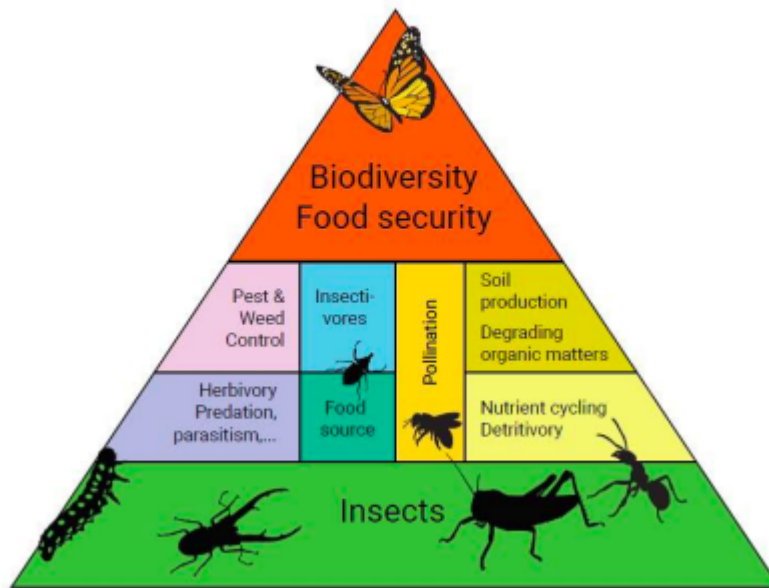
As the matter of insects and the rapid decline in the number of them is often neglected, there is very little information on when the issue was first considered as something to be concerned about. However, scholars from the UK have studied the plight of butterflies in their country. They have come to the conclusion the number of these species has fallen by 46% since the mid 1970s. In 2019, *Biological Conservation* reported that 40% of all insect species are declining globally and that a third of them are endangered.

For years agriculture has been using pesticides and other chemicals in order to protect or heal their crops without realising, or simply without caring about the detrimental effect it has on insects. The first natural pesticides in the form of tobacco infusions were used 200 years ago to kill aphids. The first synthetic pesticide (dinitroorthocresolate) was introduced in 1892. From the beginning of the 1940s to the 1960s, DDT - a pesticide that turned out to be very harmful to the environment - was in common use. It has been discontinued and its use prohibited, however its impact on the environment is perceptible to this day.

The ecosystem

The ecosystem is the ecological system which includes the living and inanimate parts of a certain space of the natural environment. There are a number of relationships between organisms that inhabit a given environment, which allow them to function in harmony and balance. An ecosystem, also known as a biogeosystem or ecological system, is based on the flow and exchange of matter and energy between organisms that inhabit it and between organisms and their surroundings. Such cooperation is vital to keep every species highly functioning. Each and every element has its own unique purpose, and if one link is absent, it affects the rest and could cause an ecosystem's decay.

Insect Biodiversity and Ecosystem Services

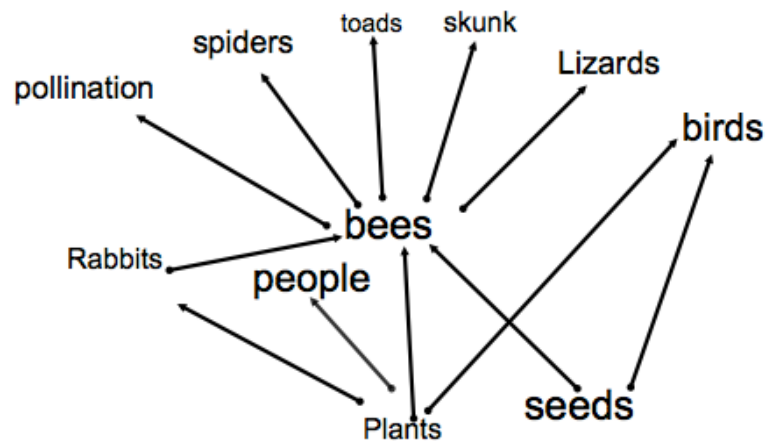


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Species and extinction

Bees

There are about 20.000 kinds of bees in the world, however one of the most important, yet endangered, species for humankind, is the honey bee. These bees are one of the most socially complex species of insects - a swarm of bees consists of a queen bee, workers and drones. Each family builds a nest of up to 50,000 individuals, every one of them having unique duties.



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Food chain that includes bees,

¹ *EcoStack Regulatory Workshop Materials*. 2021.

² "What Food Web or Chain Does Honey Belong To? - Quora." *Www.quora.com, www.quora.com/What-food-web-or-chain-does-honey-belong-to.*

Bees' specialisation in feeding on pollen and nectar makes them important pollinators of flowering plants - this provides food for the people as well as for other herbivores. Medicine also uses the favours bees give us - honey, bee pollen and beeswax, just to name a few. The discoveries of the last centuries have led to the creation of a new branch of natural medicine treating patients with bee products - apitherapy. Even bee venom has been found to have a beneficial effect on an organism that is not allergic to it. For many years it has been one of the main treatments for rheumatoid arthritis. Recently, science has also recognized the healing properties of propolis, pollen and bees' milk.

Ecologists' main concern regarding bees is Colony Collapse Disorder - a disease syndrome that occurs en masse in honey bee colonies, manifested by a rapid and massive loss of volatile bees outside the hive, and consequently the death of most of the sick colonies. Reports from Europe and America have been pouring in since 2003 about serious losses among bee colonies, and in the fall of 2006 the phenomenon was classified as a disease for the first time. The phenomenon of mass extinction of bees causes enormous economic losses in the production of oil plants, fruit and vegetables. This phenomenon also has a negative ecological aspect, due to the huge role that bees play in the reproduction of wild plants. Mass bee extinction syndrome is one of the causes of a global trend called the decline in pollinator numbers. In July 2009, the first annual report of the US Commission on the mass extinction of honeybees was published. The research has found that pesticides weaken bees' immune system and impair the natural navigation skills of bees, causing confusion and preventing bees from finding their way back to the hive.



³ "French Beekeepers Warn about "Catastrophic" Honey Harvest." Wwww.euractiv.com, 25 June 2019, www.euractiv.com/section/agriculture-food/news/french-beekeepers-warn-about-catastrophic-honey-harvest/. Accessed 18 Sept. 2022.

Intensive apiculture is another reason for honey bees' extinction. Bees are exploited, left without enough feed for themselves, proper care and killed immediately after they are no longer profitable.

It is estimated that when the bees become extinct, humans will become extinct only 4 years after them. As this species is responsible for pollinating, therefore enabling to bloom and give fruit about 84 percent out of 264 plant species cultivated in Europe, we might not have enough food and resources. Without bees we are at a risk of world famine, economic crisis and devastating biodiversity.

Butterflies and moths

Butterflies (scalloped) are the second biggest insect group, right after beetles. The oldest fossil butterflies come from the Triassic. Butterflies are among the most advanced insects in evolution. Their body, consisting of segments, is protected by the chitinous cuticle. Individual segments connected by membranous joints allow the freedom of movement. The cuticle is covered with a layer of fine scales.

Moths are called "night butterflies" as they lead a nocturnal lifestyle.

Most adult butterflies feed on the nectar of flowers and pollinate them in the process. The most famous product made by butterflies, which led to the development of the great civilizations of Asia, is silk. Silk is a protein fibre produced by the caterpillars of the mulberry silkworm (*Bombyx mori*) to protect the pupa. Inside the cocoon, the complete transformation of the insect takes place. Silk fibres for the production of textiles were first used by the Chinese 2700 years BC.

A specific kind of moth is *Xanthopan morgani* - Madagascar-inhabiting insect with an unusually long sucker, reaching almost 35 centimetres. It was first discovered, or rather suspected to exist, by Charles Darwin in 1862. The naturalist put forward the supposition that there must be an as yet undiscovered species of moth whose proboscis may reach the bottom of the spur of an orchid *Angraecum sesquipedale*. After his death not only the existence of such a moth was proven by Walter Rothschild, but also a fact that the flower would not be able to survive without *Xanthopan morgani*.

The examples above validate the importance of butterflies and moths in the ecosystem. These insects contribute to the production of materials used for i.e. our clothing and help to protect biodiversity and support the survival of unique species. The lack of insects might result in serious damages in our ecosystem (i.e. infringement of biodiversity) and impact the economy in developing countries relying on agriculture or textiles).



What also causes a disturbance are butterfly gardens, where people can visit and interact with the insects. It might not seem like a danger, however not everyone has the knowledge on how to treat these creatures, especially kids, who are the main target of this type of attraction. Visitors frequently get the wind up and try to get the insect off of them, therefore touching butterflies' wings, which causes them harm and in some cases makes them unable to fly. Some gardens may not provide an adequate habitat for the butterflies and make them suffer purely for the profit.

The population of monarch butterflies in North America has declined between 22% and 72% over 10 years, depending on the measurement method. Forest-clearing to harvest timber and to make space for farms and homes is devastating to the natural monarch's habitat. Pesticides and herbicides threaten not only the insect itself but also milkweed, which monarch larvae need to live. Climate change, triggered by the burning of fossil fuels and other human activity, is making recovery harder as drought scorches areas along the monarch's migration routes and as storms strike its overwintering spots

Past Attempts to Solve the Issue

Aside from restriction of some pesticides and herbicides, there were not any actions taken in order to prevent mass extinction of the insects. To many countries this is still not the top priority and the insects' wellbeing gets lost in day-to-day struggles of the inhabitants or political conflicts.

⁴ Motylarnia - Niechorze - Ośrodek Wypoczynkowy „Przystań”. www.osrodekprzystan.pl/motylarnia-niechorze/. Accessed 18 Sept. 2022.

Possible Solutions

Planting more flowers

Creating areas of wildflowers can be an action everyone can take. It is as simple as letting a patch of lawn grow, or by planting up a window box or patio tub. It's important to think about providing year round flowering, as climate change means many pollinators are no longer able to hibernate through the winter. Spring bulbs such as crocus and snowdrops can be very beneficial in the winter months. Most herbs also provide great flowers for pollinators as well as a handy source of seasoning for food.

Reducing carbon footprint

It is a known fact that burning of coal increases the carbon dioxide concentration in the atmosphere, which contributes to the deterioration of Earth's climate on many levels. Climate change is a growing threat to a wide range of wildlife, including insects. Choosing more environmentally-friendly options, such as public communication instead of a car or saving water and electricity, will help reduce an individual's carbon footprint and positively impact the planet's condition.

Sustainable agriculture

Chemicals are one of the biggest enemies of insects. Limiting the use of pesticides, herbicides, and other runoff from agricultural sites and moving towards organic farming and agroforestry practices that keep pesticides at a minimum and out of watersheds are very much recommended.

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