TINY MESSENGERS PRE-READ ARTICLE

Insects – Nature's Hidden Gems

From Frontiers for Young Minds

Insects are everywhere and they come in a variety of shapes, sizes, and colors that allow them to live in almost every habitat on earth. In the scheme that scientists use to group animals, insects belong to the class Insecta, the largest group of living organisms on Earth. There are over one million insect species described, and it is estimated that there are some 10 quintillion (10,000,000,000,000,000,000) individual insects alive at any time on our planet [1].

When the word "insects" is mentioned, you might think of those that are usually considered as pests, like mosquitoes and cockroaches. Most people are more aware of the few insects that cause problems to humans than they are of the majority of insects that benefit us and the rest of the natural world. The one million insect species that we know about is more than 15 times the number of all mammal, reptile, bird, amphibian, and fish species combined! Of the one million known species, 80% belong to the orders Coleoptera (beetles), Lepidoptera (butterflies and moths), Diptera (flies), and Hymenoptera (ants and bees); with the remaining 20% consisting of other insects such as grasshoppers, cockroaches, termites, cicadas, mantises, and more [2]. Still, scientists suggest that there may be as many as 5–10 million species still waiting to be discovered.

Insects and the Ecosystem

Insects are important to our ecosystems, and we heavily depend on the ecosystem services that they provide (Figure 1). Do you enjoy eating kiwis, cranberries, melons, or cherries? Well, the next time you do, remember honeybees—the primary pollinators that enable us to eat all these tasty fruits. Bees, wasps, and butterflies help to pollinate many flowering and crop plant species, which provides us with fruits, flowers, vegetables, and other products such as silk, honey, and wax. Insects are a part of nearly every food chain, meaning that they are a source of food for many larger animals such as birds, fish, reptiles, and mammals—which are in turn eaten by other predators. Without insects, our food chain would collapse, and most animals would not survive. Insects also feed on living and dead matter, helping to break down waste and speed up the recycling of nutrients in the environment. For example, dung beetles remove dung from the environment, bury it, and allow it to break down into nutrients that cycle through the ecosystem. Other insects act as pest controllers. Predatory ladybird beetles feed on agricultural pest species like mites and aphids, and

by doing so they help farmers to increase their crop yields and reduce the use of toxic pesticides. Ecosystem engineers, like termites and ants, improve the amount of water and nutrients in the soil through their tunneling behavior, helping to transform infertile lands where nothing can grow into fertile ones [4].

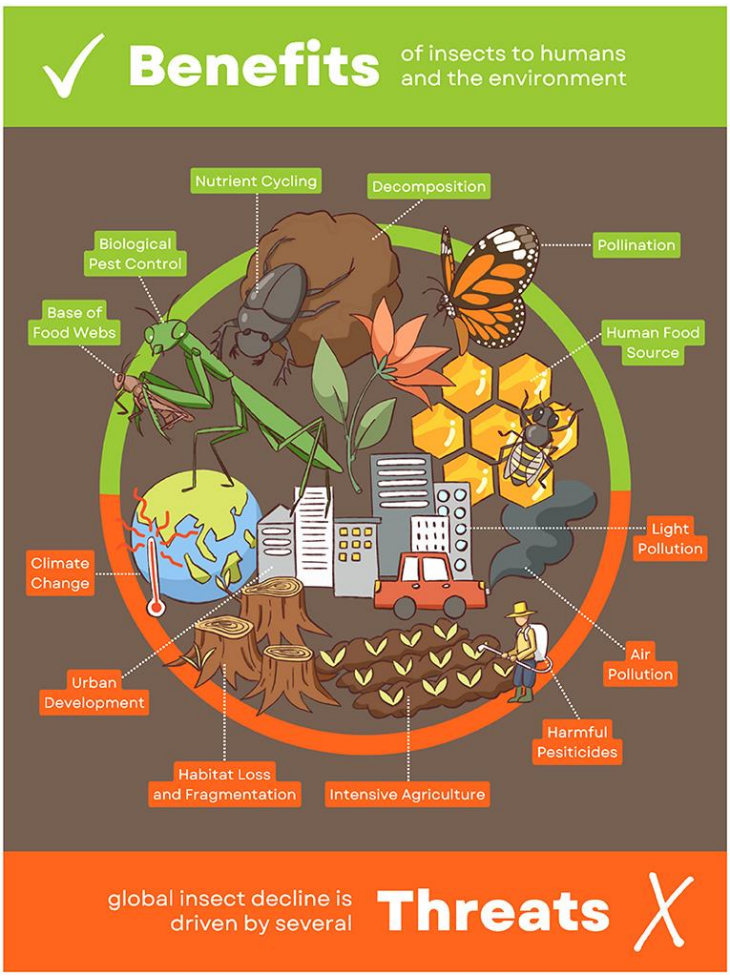

Figure 1 - Insects provide many benefits to humans and the environment, but at the same time they are threatened by many human activities. (Copyright: Alexis Goh, [3]).

What Kinds of Threats Do Insects Face?

Humans have changed the natural environment so much in the past few centuries that many insects today are struggling for survival. From the use of pesticides and artificial fertilizers to light pollution, noise pollution, and habitat destruction, the survival of insects presently hangs in the balance (Figure 1) [5]. Next, we will tell you about three major threats: agriculture (farming), habitat destruction, and climate change.

In terms of agriculture, humans have already transformed more than half of the Earth's land surface into farmland, to support our growing demand for food. This intensive agriculture has led to the heavy use of chemical pesticides and fertilizers, as well as habitat fragmentation, where large and connected habitats are split into small and separated ones. While agricultural techniques like genetically modified foods and chemical fertilizers have greatly benefited society, they often kill other insects, as well as the pest species that they are targeted to kill. Chemical pesticides get washed into soils and waterways, affecting many generations of insects to come.

Habitat destruction is an increasing threat to insects. Clearing land to build cities and other spaces for humans also results in less available habitats for insects to seek shelter, find food, and reproduce. Pollinators are affected by the reduced numbers and diversity of plants that grow on cleared land, which impacts both the health of the pollinators and the survival of the plants that depend on them for reproduction. Decomposers like termites are affected by the loss of dead trees and by damaged soil, which impacts the recycling of nutrients in the ecosystem.

Climate change also affects insects. Plants are affected by changes in climate, which can then affect many of the helpful insects that are closely connected with those plants. For example, if spring flowers bloom earlier due to shorter winters—while pollinator insects are still in hibernation or immature—there will be no insects to pollinate the plants; and later, when the pollinators are ready to feed, their food will no longer be available. The increased occurrence of extreme weather events, like hurricanes, droughts, and wildfires, is also a great risk to insect life.

Ongoing Efforts

The expansion of agriculture to support the increasing amount of food needed by the growing human population has caused large losses of natural habitats that insects live in. However, with a little work, insects can be welcomed into these farming areas as alternative habitats. Banning the use of harmful chemicals and research on bug-friendly pesticides have been steps in the positive direction. However, despite our increased awareness of insects' importance and knowledge of how to save them, scientists urge that more needs to be done on a global level—countries need to work together to preserve insect populations.

Unfortunately, fewer and fewer kids are learning about natural history in school. Natural history teaches us about the natural world and the organisms that live in its various environments. Partly because fewer people are learning about insects, the number of experts who describe and identify insects is decreasing, too. This means that insects are in a very vulnerable position—we may not know enough about them or how to protect or save them, and we may not even realize the existence of some species before they become extinct. This means that we are unable to properly conserve and protect already threatened insect species. Unfortunately, most animal conservation research so far has focused on protecting charismatic species, "cute" species, such as mammals and birds. If we only focus our studies on charismatic species and neglect the smaller, perhaps less "cute" species such as insects, we will not be able to develop effective conservation plans that consider the importance of insects in keeping ecosystems in balance [6].

How Can You Support Insects?

Not all hope is lost—as the saying goes, the journey of a thousand miles begins with a single step. If *you* want to support insects, just remember these three simple steps!

Step 1: Create Insect-friendly Places in Your Home
Do you think it is really cool to see bees and butterflies flying just outside your window? By creating some insect-friendly places in your home, you can discover the kinds of insects that live around your neighborhood. Try growing some insect-attracting native plants in your backyard or balcony garden. Native plants, which are plants that are naturally found in your area, can serve as food sources and nesting sites for local insect species. Avoid using chemicals like pesticides and herbicides, as these will harm the insects. You can also build insect homes, such as bee hotels, that attract important pollinators like bees and wasps.

Step 2: Participate in Citizen Science Programs About Insects
You can learn tons of information about insects and get to know fellow insect lovers by participating in citizen science programs! These are programs in which the community takes part in scientific research through collecting and sharing useful data. Information collected through citizen science programs can provide a wealth of information on insect diversity and population trends, helping us to spot and understand global insect declines. Some programs are as simple as recording the insect species that you find indoors (Never Home Alone) or in your backyard (Bugs In Our Backyard). You can upload pictures of insects that you encounter on your own onto the iNaturalist app, and even help others to identify the insects around them.

Step 3: Become an Insect Ambassador
Best of all, be an Insect ambassador by sharing all the cool, fun, and important facts about insects with your family and friends. You can do this by posting amazing pictures and videos on your social media platforms, or you can make a picture collection of insects you encounter. Encourage your family and friends to participate in citizen science programs with you! As more people recognize how important insects are, they might choose to join in insect conservation efforts and help to protect these amazing, important creatures.

References

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