Insect Decline — a Silent Crisis in India

Dr. K. Kavitha, Dr. V. Anitha and Dr. B. Pushpavathi

Agricultural College, Palem – 509215, Nagarkurnool Dist., Professor Jayashankar Telangana State Agricultural University, Hyderabad-30, Telangana

Corresponding Author: kosnampjtsau@gmail.com

Introduction

Insects are the most diverse and numerous animals on Earth. They play a key role in both land and freshwater ecosystems. Insects pollinate crops, recycle nutrients, improve soil fertility, and serve as food for many animals such as birds, reptiles, amphibians, and fish. They also help maintain clean soil and water systems. Despite their importance, insect populations are declining rapidly across the world, including in India. Because insects are small and often ignored, this problem has received limited attention. However, insect decline is a serious ecological crisis that threatens food production, ecosystem balance, and human wellbeing.

Evidence of Insect Decline - Global Scenario

Long-term scientific studies from different regions show a sharp decline in insect numbers and biomass. In many protected areas, insect populations have decreased by more than 70 % within the last two decades. Rising temperatures, habitat loss, and environmental changes are major reasons for this decline. Historical data also shows that in some regions insect populations have dropped by over 75% in less than 30 years.

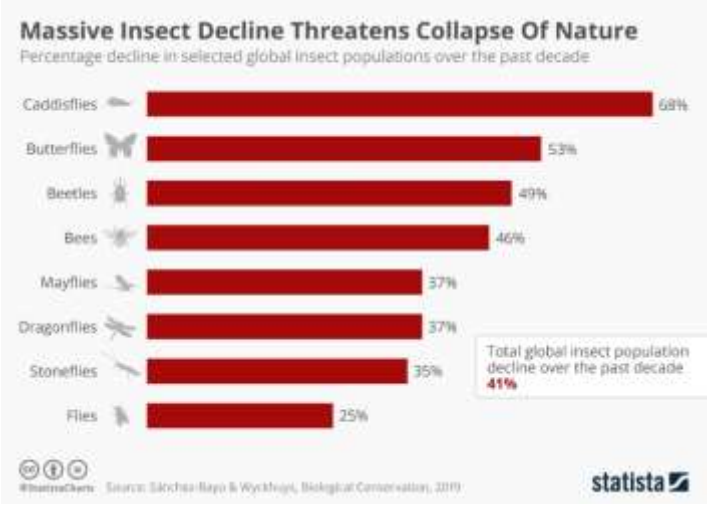

Fig 1: Percentage decline in selected global insect populations over the past decade

Indian Context

In India, large-scale data on insect decline is still limited, but available studies and field observations show worrying trends:

- Pollinators such as bees are declining due to habitat loss, excessive pesticide use, and climate stress. This silent crisis in pollination has given rise to a new business of assisted pollination. Renting out bees for pollination has become a profitable venture for beekeepers.
- Studies show that firefly populations have decreased by over 76 % in several regions due to habitat loss, light pollution, and environmental changes.
- Artificial lights in protected areas like Melghat Tiger Reserve attract insects and lead to their death, causing a yearly decline in insect populations. These findings suggest that insect decline is a growing problem in India.

Importance of Insects: Ecological and Economic Roles

Insects provide several essential ecosystem services:

1. **Pollination and Food Security:** Insects pollinate nearly 75 % of global food crops. In India, many fruits, vegetables, pulses, and oilseed crops depend on insect pollination. A decline in pollinators can reduce crop yields, increase food prices, and affect farmers' livelihoods.

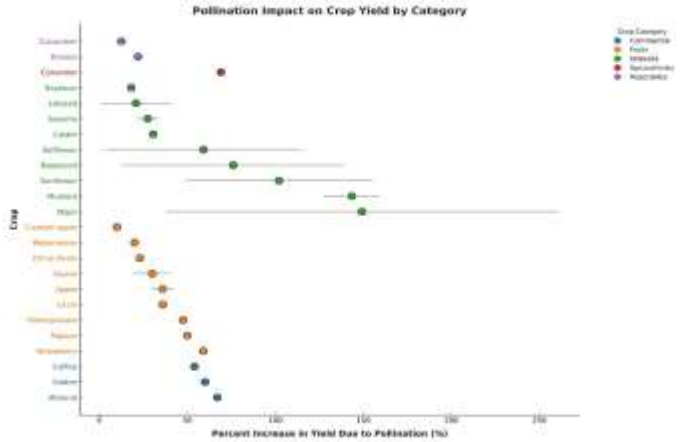

Fig 2: Impact of pollination on different crop yield. Each dot shows the average yield increase, and the horizontal line shows the min-max range. Data source: Nath *et al.* 2023; Chavhan *et al.* 2024

2. **Nutrient Cycling and Soil Health:** Insects such as beetles and ants break down dead plants and animals. This process returns nutrients to the soil, improves soil fertility, and supports healthy plant growth.
3. **Role in Food Webs:** Insects are a primary food source for birds, amphibians, reptiles, and fish. A

decline in insects affects the entire food chain and can lead to wider biodiversity loss.

4. **Natural Pest Control:** Many insects act as natural predators of crop pests. Their decline increases dependence on chemical pesticides.

Causes of Insect Decline

Insect populations are declining due to several interconnected factors:

1. **Habitat Loss and Fragmentation:** Urbanization, deforestation, and intensive agriculture destroy natural insect habitats. Monoculture farming reduces plant diversity and nesting sites needed by insects.
2. **Pesticides and Agrochemicals:** Excessive use of pesticides, especially systemic and neonicotinoid insecticides, kills both harmful and beneficial insects. These chemicals also affect insect reproduction and immunity.
3. **Climate Change:** Rising temperatures, irregular rainfall, heatwaves, and changing seasons disturb insect life cycles, breeding, and migration. In some cities, warmer winters favor pests while reducing beneficial insect species.
4. **Light and Chemical Pollution:** Artificial lighting in cities, tourist areas, and forests attracts nocturnal insects and leads to exhaustion and death. Pollution of air and water further damages insect habitats.
5. **Lack of Data and Awareness:** Many insect species in India are poorly studied or undocumented. Limited monitoring and low public awareness make conservation efforts difficult.

Consequences of Insect Decline

1. **Risk to Food Production:** Reduced pollination threatens crop yields and food security, affecting millions of farmers and rural communities.
2. **Loss of Biodiversity:** As insects form the base of many food webs, their decline leads to population loss in birds, reptiles, amphibians, and mammals.
3. **Economic Loss:** Ecosystem services provided by insects—such as pollination, pest control, and soil formation—have high economic value. Their loss increases agricultural costs and reduces productivity.
4. **Reduced Ecosystem Resilience:** Healthy ecosystems can withstand floods, droughts, and climate stress. Declining insect populations weaken this resilience, making ecosystems more vulnerable.

Solutions and Conservation Strategies

To address insect decline, coordinated efforts are required:

1. **Habitat Protection and Restoration:** Protect natural habitats, restore degraded lands, and maintain plant diversity in agricultural and urban areas.
2. **Reduced Use of Chemicals:** Promote organic farming, integrated pest management (IPM), and responsible pesticide use.
3. **Sustainable Planning:** Reduce habitat fragmentation, protect green spaces, and limit artificial lighting near sensitive ecosystems.
4. **Monitoring and Research:** Develop national insect monitoring programs and support research on insect diversity and population trends.
5. **Awareness and Policy Support:** Increase public awareness, include insect conservation in education, and strengthen laws regulating pesticides and land use.

Conclusion

Insect decline in India is a serious but often unnoticed environmental crisis. Evidence shows clear reductions in pollinators and other insect groups, which threatens ecosystems, agriculture, and human wellbeing. Immediate and collective action is needed to conserve insect populations. Although insects are small, their loss could cause the collapse of ecosystems that support life on Earth.

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