



An ecological apocalypse²

A friend asked me recently - "*Where have all the insects gone?*" I must admit that I had not noticed their slow disappearance over recent decades. But her enquiry provoked long unconsidered memories. As a young man in the 1970's on undertaking any long drive I carried a bottle of water and a rag in my car to clean the windscreen every few hours. Some four decades ago it would have been covered in splattered insects. Today I don't carry any such equipment - I rarely need to clean the windscreen.

"Insects are by far the most species-rich taxonomic group on Earth.

To date 950,000 insect species have been described and many millions of others await discovery."³

Insects first appeared on the land nearly 400 million years ago. By the Carboniferous period, 100 million years later, they had evolved into the many diverse species we see today.⁴

There may be 30 million or perhaps 50 million or more species of insects on Earth.⁵ Scientists do not know the true number. It is strange to realise that only in recent decades has humanity taken any account of this keystone genus and made any assessment of their populations.

Insects are the most species rich group on Earth and play numerous crucial roles within the Earth's ecosystems.⁶

It is only recently that we have discovered the shocking decline in their abundance⁷ - discovered that their very existence is threatened!



"Loss of insect diversity and abundance is expected to provoke cascading effects on food webs and to jeopardize ecosystem services."⁸

We all too often regard insects as insignificant creepy crawlies – too small to be considered important. But insects constitute the world's most abundant animal group⁹ and perform three key functions in the Earth's ecosystems. They act as eliminators, facilitators and providers.¹⁰ Insects act as eliminators in ecosystems by removing waste products and dead organisms. Herbivores consume and recycle plant material and carnivores eat other animals. Insects also act as facilitators by performing pollination, seed dispersal and microhabitat development.¹⁰ For example 80% of wild plants are estimated to depend on insects for pollination.¹¹ Insects are providers in ecosystems by acting as food for a range of other animals and some plants.¹⁰

They form the base of many food chains and without them many other species would not survive, including many birds, fish, reptiles and mammals.¹²



The cumulative biomass of insects is likely to represent a small fraction of the total biomass in most systems - estimated at 1.0% to 5.2%. However, insects have large effects and should be recognised as important drivers of ecosystem processes.¹³ Thus, the presence of insects is important to the distribution, abundance and diversity of many plants and animals¹⁰ and are fundamental to all ecosystems – they are life-sustaining.⁴

If the insect population is severely reduced productivity drops and nutrient cycles are clogged. As the best adapted pollinators such as bees become extinct less competent species take over. The result is fewer seeds are formed and fewer seedlings sprout. In consequence herbivores and the animals that prey upon them decline.⁴

"The actual structural and functional collapse of the natural systems which have supported life on Earth for the last 400 million years."¹²

The extinction of say 50% or more insect species would mean that our generation will participate in an extinction process involving 15 to 25 million species. The actual number is not important - *"it is a massive destruction of the biological richness of Earth."*¹⁵ Thus the result of a massive loss of Earth's insects or *"insectageddon"*¹ would be a cascading catastrophic failure of the planet's ecosystems- and the really scary fact is that without urgent action to save them we may well experience this in our lifetime.¹²



"Our generation is presiding over an ecological apocalypse."²

Such population declines imply not only less abundance but also represent the first step towards extinction.¹⁴ Only now are global declines in insects attracting wide interest from scientists. The significant loss of insects across Europe is now a proven fact and should give rise to serious concern among politicians and public alike.⁸

Certainly, scientists are now starting to pay attention to the issue but as a species humanity needs to "rise above profit and greed"¹⁵ and make fundamental changes to how we treat Nature. Only then maybe - just maybe - this crisis to the biodiversity of Earth can be avoided.

Dean

- 1 Monbiot.G (2017)
Insectageddon: farming is more catastrophic than climate breakdown
The Guardian (20/10/2017)
- 2 Pachem.C (2018) In McKie.R (2018)
Where have all the insects gone?
The Guardian (17/06/2018)
- 3 Groombridge.B (1992)
Global biodiversity: Status of the Earths living resources.
Chapman and Hall: London
- 4 Wilson.E (1992)
The Diversity of Life
Penguin Books
- 5 Erwin.T (1988)
The tropical forest canopy.
In *Biodiversity* Wilson.E and Peter.F (Eds)
National Academy Press
- 6 Zou.Y, Sang.W, Feng.J and Dayuan.X (2011)
Insect diversity: Addressing an important but strongly neglected research topic in China.
Journal of Resources and Ecology 2011 2(4) 380-384
- 7 Parker.S (1982)
Synopsis and Classification of living organisms.
Mc Graw-Hill. New York
- 8 Caspar A. Hallmann.C, Sorg.M, Jongejans.E, Siepel. H, Nick Hofland.N, Schwan. H, Stenmans.W, Müller. A, Sumser.H, Hörren.T, Goulson.D, de Kroon. H (2017)
More than 75 percent decline over 27 years in total flying insect biomass in protected areas.
PLOS One – 18 October 2017
- 9 Lister.B and Garcia.A (2018)
Climate driven declines in arthropod abundance restructure a rainforest food web.
PNAS October 30, 2018 115 (44) E10397-E10406
- 10 Miller.J (1993)
Insect natural history: Multi-species interactions and biodiversity in ecosystems.
Biodiversity and conservation 2. 233-241
- 11 Ollerton.J, Winfree.R, Tarrant.S(2011)
How many flowing plants are pollinated by animals?
OIKOS 21 Volume120, Issue3 321-326
- 12 Kiedaisch.J (2019)
The staggering worldwide decline of insects is a warning of ecosystem collapse
Popular Mechanics (13/02/2019)
- 13 Seastedt.T and Tate.C (1981)
Decomposition rates and nutrient contents of arthropod remains in forest litter.
Ecology 62, 13-19
- 14 Sanchez-Bayo.F and Wyckhuys.K (2019)
Worldwide decline of the entomofauna: a review of its drivers.
Biological Conservation 232(2019) 8-27