

ENTOMOLOGICAL EMERGENCY

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That we are in the midst of an anthropogenic era of extinction of life on Earth is now widely accepted and in no domain is it more apparent than entomology. We no longer have to wipe all the bugs off our windscreens when we return from a drive, many of us have remarked that there are fewer bees and other pollinators in our gardens, the familiar summer bluebottles and house flies have all but disappeared from our homes, and those of us who study and record insects such as moths and butterflies have observed alarming declines in both numbers and species-richness. The reductions and extinctions stretch across the world of invertebrates – but we can do something about it.

Let's consider the causes of this catastrophe. There are several and this list is not exhaustive:

- habitat degradation, pollution & destruction;
- pesticides and herbicides;
- light pollution;
- climate change;
- invasive species;
- disease.

Habitats are being lost and ecosystems degraded almost everywhere outside those nature reserves managed by dedicated people guided by biologists and ecological scientists. Even supposedly protected areas such as SSSIs are often in a poor and neglected state, the more so since the government's failure to finance and operate agencies such as Natural England adequately. Walk in almost any green space and you will find the land strewn with litter and dog mess, abandoned shopping trollies, polluted ponds and waterways, kilometres of invasive species such as Indian balsam *Impatiens glandulifera*, dumped rubble and goodness knows what else, plus botanically species-poor areas of close-mown grass, flailed hedgerows and manicured landscape display-beds of alien shrubs and exotic plants of little use to our native insects. Whilst invertebrates can and do exploit some of these situations, the general result is a decline in entomological representation of insect and other invertebrate diversity, especially of formerly common and cornerstone species such as bees and other pollinators. The clouds of mayflies along streams and rivers in early summer, the nets full of wriggly biota when we dipped ponds, the masses of creatures under stones in streams, the swarms of moths around our porch lights, the gangs of wasps at a picnic, pesky though they were, all the butterflies that flocked around us when we walked through a meadow, the vast numbers of arachnids from mites to field species strewn tracts of grassland with a gossamer carpet on a dewy morning, to big house spiders, the hordes of creepy-crawlies under dead bark and in rotting wood. All these and other examples of former bio-abundance have noticeably declined or, in some areas, even completely disappeared, and with them many of their predators, the insectivorous birds, mammals, fish, amphibians, reptiles, parasites and detritivores that assure the functioning of healthy ecosystems. Sewage pollution of our waterways, beaches and inshore waters is extremely damaging to aquatic invertebrates and has become a national disgrace. Exacerbated by low water levels resulting from prolonged drought, the released raw sewage concentrates the pollution levels which the government at Westminster that is so obviously not fit for purpose actually allows to be dumped in our rivers, killing aquatic wildlife!



Ornamental exotic may be aesthetically pleasing and do provide sources of pollen and nectar but they are not as good for native insect species as wild indigenous flowers.

Pesticides and the widespread use of chemicals and equipment such as electric fly killers (which kill many other phototactic invertebrates as well) are indiscriminately slaughtering vast numbers of invertebrates across our farmland, in our gardens, and in our ponds, lakes and waterways as they wash off the land, and sometimes they drift onto our gardens and adjacent habitats when insufficient care is taken in to avoid windy conditions. Washing out sprayers into ditches and streams by those flouting the law makes matters worse. Yes, some of the most harmful substances have been withdrawn, but land and crops are still routinely and regularly sprayed with these chemicals. Herbicides are also used with abandon across our land, yet they kill many plants that are vital for insects and other invertebrates for food. Ill-conceived human campaigns against nettles *Urtica dioica*, thistles *Cirsium* spp & relatives, common ragwort *Jacobaea vulgaris* and other so-called “noxious weeds” also do untold damage to the populations of many species of ecologically important insects that feed on them.

Spillage of light at night and artificial illumination generally are not only the bane of astronomers and all of us who are star gazers in awe of the night sky, but they have an adverse impact on moths and other nocturnal invertebrates. External nocturnal light sources along our roads, in our gardens and for security around our dwellings and other buildings pull photophilous insects away from their natural habitat, disrupt their normal behaviour and artificially augment the attraction and feeding of their insectivorous predators such as bats. Research¹ has also revealed that street lighting, by reducing the number of moths at ground level and increasing flying activity at the level of the lights, results in moths transporting less pollen.

All of us who have been regularly observing and studying nature in the field over a number of years, in my case more than seven decades in several countries but particularly the UK and France, are acutely aware of the effects of climate change. Latest data reveal that the last eight years have been the hottest since records began. We are seeing formally austral species becoming more boreal (some particularly damagingly invasive – see below), more extreme weather events such as droughts, wildfires, storms and floods, precocious and irregular flowering and fruiting of wild plants, environmental acidification, *etc.* All of these have negative impacts on invertebrates. The global climate crisis will cause (is already beginning to cause) huge and irreversible global catastrophes if it continues to be ignored and played down by politicians, amongst whom the Brexit far right cabal of climate crisis deniers in Britain and Trump and his followers in the USA are some of the worst offenders. It does not help when fossil fuel producers understate their releases of greenhouse gases (<https://bit.ly/ghousegasreleases>).

There has been a significant increase in IAS (invasive alien species, sometimes called invasive exotics or invasive non-natives). There are many examples across the spectrum of animals, plants, fungi and micro-organisms. They



Three invasive species causing concern in the UK: colonial web of larvae of the pine tree processionary moth, the box tree moth and the signal crayfish.

may out-compete native species, prey on them, introduce disease or contain novel toxins. Some entomological examples causing concern for various reasons include the Asian hornet *Vespa velutina*, harlequin ladybird *Harmonia axyridis*, pine and oak processionary moths *Thaumetopoea pityocampa* and *T. processionea*, box tree moth *Cydalima perspectalis*, brown marmorated stink bug *Halyomorpha halys*, signal crayfish *Pacifastacus leniusculus*, killer shrimp *Dikerogammarus villosus*, noble false widow spider *Steatoda nobilis*, and Obama flatworm *Obama nungara*.

¹ Macgregor, C.J., Evans, D.M., Fox, R. & Pocock, M.J.O. (2016) The dark side of street lighting: impacts on moths and evidence for the disruption of nocturnal pollen transport. *Global Change Biology*. DOI: 10.1111/gcb.13371.



Typical early symptoms of ash dieback disease showing necrosis of terminal branches.

Insects and other invertebrates suffer diseases just like almost all life but global warming and IAS have exacerbated the situation. One you may come across is deformed wing virus (one of the RNA iflaviruses) that affects bumblebees and other bees including the honey bee. Also, plant diseases such as ash dieback caused by the fungal pathogen *Hymenoscyphus fraxineus*, sudden oak death caused by the protist oomycete *Phytophthora ramorum* (which also kills other tree and shrub species) and honey fungus *Armillaria* spp. Outbreaks of these diseases seem to have become more common and widespread. It is true that the dead wood they leave behind encourages saproxylic invertebrate populations but the reduction of populations of affected trees and other plants means less food for the invertebrates that rely on them and serious disturbance to healthy ecosystems.

Given all the above, it is hardly surprising that our once thriving invertebrate populations are in a state of collapse. Species once common are now much less frequently seen. Amongst moths for example, which I study and record, the formerly common garden tiger *Arctia caja* and its “woolly bear” caterpillars have disappeared from many sites. Conversely, southern species I never used to see such as the Clifden nonpareil *Catocala fraxini* and hummingbird hawk-moth *Macroglossum stellatarum* are now regularly recorded.



Garden tiger moths and hummingbird hawk-moth

So what can be done? Well, first of all, if you don't like insects, please take a little time to learn more about them, how fascinating and often very beautiful they are, and how they are fundamental to healthy, well-functioning ecosystems on Earth. Invertebrates are crucial to life on our planet but are far too often treated as a nuisance and even reviled. Ignorance, apathy and, shamefully in our supposedly modern society, far too little scientific education and understanding typify the attitude of many towards “creepy-crawlies”. This applies even more to the myriads of micro-organisms populating almost every part of the Earth's land, water and air.

Please support all those who are working to halt global warming. We can all help by burning less fossil fuel, and converting to using renewable energy in all we do. Unpopular though it may be, we can all eat much less meat: stock farming is a major source of greenhouse gas. Halting the warming of the planet is looking less and less feasible as governments dither. As I write this at the time of COP27, it still looks perhaps just about attainable but we are dangerously near a tipping point after which catastrophic warming will be impossible to avert.

Specifically to help insects and other invertebrates, there is much we can do:

- Protect, restore and enhance semi-natural habitats in all types of landscapes and avoid shorn grass, manicured hedges/shrubberies and lollipop trees in gardens. Plant native species and flowers for pollinators (ones that have single blossoms, not doubles). If there is new development near you, make sure the developers and the Planning Authority have built in wildlife corridor links (streams/wide & tall hedgerows, *etc.*), stepping-stone habitats, green roofs & walls, and plenty of varied semi-natural, native-planted greenspace that is not over-manicured. See if you can install your own green roof and plant lots of climbers on your exterior walls. Let wild flowers grow in your lawn and allow an area to become a meadow, cutting only after the seeds have dropped in late summer. If you don't have a pond, make one, even if it is small. Erect one or two insect boxes which are now widely available and contain micro-habitats for several species as well as tubes for masonry bees. Don't be too tidy – let some old stems and piles of leaves be, as they are good sheltering habitat for invertebrates – and have a compost heap.
- If you see pollution, report it to your Local Authority and the Environment Agency. If it continues, bring it to the attention of your MP. Make a fuss.

- If you must use outside lights, fit downlighters, cowls and timers that switch off after just a brief time. Join a wildlife society and an astronomy group; you will have a stronger voice against excessive nocturnal illumination. Ask to see a lighting plan for any new development and have it checked by an expert.
- Stop using pesticides and herbicides. Control pests by organic gardening and farming. There is much help on the internet, for example at <https://www.gardenorganic.org.uk/> and <https://www.soilassociation.org/>.
- Keep an eye out for invasive species. If you find any, talk to your local Wildlife Trust and Local Authority. Don't attempt to interfere with or eradicate IAS without expert input.
- If you notice insects (or any other animals) dying in large numbers or, for example, bees with deformed wings or other species with abnormal growth, behaviour or morphology, take a photograph if possible and inform your local Wildlife Trust and Local Authority.

One of the most useful, and rewarding things you can do is to record the invertebrates you see. Take a photo and record the time, date, habitat and any other relevant information such as foodplant or prey. Join iRecord (<https://irecord.org.uk/>) and send interesting observations to your local Biological Records Centre (see <https://www.brc.ac.uk/home>).

It is not all doom and gloom. On the sites we own and manage which are mainly in the Midlands and North of England, we always promote habitats for invertebrates and proscribe harmful pesticides and herbicides. We also ensure that all the sites we survey which is almost entirely because of a desire by the owners for land-use change requiring planning consent, we prescribe measures to support invertebrates. These include :

- Checking over the site before any development work begins so that invertebrate habitat is retained, relocated or replacement created;
- Creating new invertebrate habitat within the plans for the site;
- Installing insect habitat boxes;
- Appointing a qualified ecologist to oversee works throughout development /change of land-use projects in which we are involved;
- Establishing green roofs and walls;
- Employing native and pollinator-supporting nectar-rich planting;
- Ensuring ecological linkage through, out from and into the site;
- Providing information to encourage invertebrates and biodiversity to new residents/occupiers of the site and visitors to it;
- Planting new native trees and retaining existing trees and hedgerows with any dead wood;
- Managing balancing ponds for aquatic invertebrates and biodiversity;
- Establishing monitoring and recording of invertebrates following our in-house protocols;
- Writing and applying a permanent biodiversity management plan for sites.



Anthills of the yellow meadow ant *Lasius flavus* restored on unimproved grassland that had suffered neglect following cessation of grazing.



“I’ll be watching you!”. This is the spectacle moth *Abrostola tripartita*.