

„Satt und unzufrieden“ Dr. Willi Kremer-Schillings, Westend-Verlag 2023
Krefelder Studie

First of all about me: I am an agricultural engineer and was an agricultural advisor of the Chamber of Agriculture for the area of the city of Krefeld from 1986 to 1999. I have therefore known the Orbroich nature reserve and agriculture there for over 30 years. Since 2000 I have also been working as a consultant for nature conservation planning. I have also been a member of the NABU since last year.

I am "only" a trained farmer and not a "born farmer", but in a similar sense of the word a "born biologist". My parents were enthusiastic botanists, my father was a biology teacher and nature conservation officer in the former Rhine-Wupper district. Even as a teenager, I identified and prepared insects. It was a fascinating world under the binocular or the microscope. In agriculture I also got to know the less attractive side of insects. They are often considerable food competitors for mankind or are carriers of diseases not only for humans but also for important cultivated plants, which can not infrequently result in famine catastrophes. Even the Bible knew about the plagues of locusts

and mosquitoes. I therefore make a very clear distinction between harmful insects, which are also life-threatening for humans, and beneficial insects, such as bees,

that benefit humanity, and insects that at least are not recognisably neither harmful nor beneficial.

I am married to a specialist in the use of predatory or parasitic insects as beneficial insects to control harmful insects. At the same time, she is also responsible for pest control in vegetable growing on the Lower Rhine. Together we run an organic fruit and vegetable farm with the use of beneficial insects as a sideline. Insects and their population dynamics are therefore one of our daily topics of conversation.

Why I am speaking out: The media hype about the allegedly detected or predicted insect death/shv/and moves me to speak out a little more neutrally and objectively.

The central starting point is the publication of measurements of insect biomass by Krefeld entomologists in the Orbroich nature reserve in 1989 and 2013 (Ermittlung der Biomassen flugaktiver Insekten im Naturschutzgebiet Orbroicher Bruch mit Malaise-Fallen in den Jahren 1989 und 2013/Entomologischer Verein Krefeld. Sorg, M. et al.) These studies were later linked to other studies, statistically analysed and published on the internet platform PLOS ONE in October 2017."

The studies themselves were carried out with the best of my knowledge and conscience and with a high level of voluntary commitment and work. However, I am willing to discuss the interpretation of the results, as I am familiar with numerous environmental factors due to my private and professional background, and I would like to contribute to the interpretation here.

There are indeed serious changes in the insect world. However, the responsibility lies less with the farmers who are still active today. Over the last 40-50 years, the food retail trade and the accompanying politics have forced hundreds of thousands of farms in the formerly rather small-scale farming structure of the Federal Republic of Germany to give up farming. These effects are much more serious for our insect world than the use of pesticides. I would like to explain this in more detail using the example of Orbroich and the influences that have changed there over the decades.

The Krefeld investigations in the Orbroich nature reserve

The Orbroich nature reserve was placed under nature protection at the end of 1991 within the framework of the landscape plan of the city of Krefeld. The trap sites of the investigations of the Entomological Association and their further surroundings have been under my care since 1987 until today.

Before I do that, I first differentiate what one might actually mean by insect mortality/dwindling:

- Extinction of individual insect species?
- ^ Loss of biodiversity in an area?
- ^ Decline in the number of individuals of a species?
- Decrease in general insect biomass (as a food base for birds)?

In the way it was conducted, the Krefeld study is only concerned with the last point. The decline in trapped flying insect biomass in NaturSchutzgebiete, here especially in Natur-Orbroich conservation area, which revealed a considerable decline in the biomasses of insects caught.

For this purpose, some non-exhaustive environmental factors, which so far only have been discussed little or not at all and are known to very few people, dürfen:

Abandonment of livestock farms: Around 1989, about 12 to 15 farms with livestock and grazing still existed within a radius of about one kilometre around the trap sites. A good 50 % of the grassland in Orbroich was grazed. Today, there is only one dairy farm directly on the edge and another a good 1 km away. About half of the farms that have been closed down in the meantime were accompanied by me as a farm advisor. Of the 66 ha of grassland, only about 1 ha is grazed today. Of the original 18 ha of arable land, 9 ha have been converted into grassland.

Around 85% of the farms around the nature reserve gave up farming altogether or at least livestock farming between 1989 and 2013. The surrounding

Grassland areas around the insect traps were largely used for rearing young cattle or for dry standing cows in 1989, often with early grazing. Grazing in the vicinity of the traps and largely in the entire nature reserve did not exist in 2013.

The heemaugh fencing is now vedal, which means that all the insects that depend on the cow patties can no longer develop there. On each cowpat 200 g 300 g of insect mass can develop. With an average stocking rate of 3 livestock units per ha, 10 cow patties per livestock unit and day and a grazing season of 200 days, this results in 1.2 to 1.8 tonnes of insect mass per ha. In 1989, it is estimated that about 25-30 ha of grassland in the Orbroicher Bruch were still regularly grazed. In 2013, there was therefore a shortfall of 30-54 tonnes of insect biomass per year in the nature reserve compared to 1989.

Due to the abandonment of grazing between 1989 and 2013, 30 to 54 t of insect biomass specialised in the faeces of the formerly grazing cattle could no longer develop in the vicinity of the Fallen in 2013. On the remaining farms with livestock, the insect biomass does not look much better. The dung heaps have disappeared, the slurry tanks are covered and extensive hygiene concepts prevent the development of flies on a large scale. Even back in 1989, a considerable part of the grassland in Orbroich was used as 2-4 stubble meadows without grazing. Today this is only done exclusively. Probably the use of cuttings has also tended to increase to more like 3-4 uses. At the same time, some of the areas were only managed with 2 strokes in 2013 with extensification requirements. It is a fact that with every cut of grassland a considerable part of the insects and their food basis disappears. Grassland cuts, whether on extensive grassland or on intensively used grassland, significantly reduce the insect biomass on the grassland after each cut. Only a few years before the installation of the traps in 1989, several forest areas in the immediate vicinity and further afield were used as coppice. In the process, heavily shaded small water bodies in the forest were also exposed and reactivated. At the same time, considerable amounts of nutrients were released from the predominantly alder coppice forest. I am aware of studies on the remarkable diversity of insects after the use of coppice forest.

which should also be available to the city of Krefeld. Perhaps they were even the starting point for the first installation of the traps by the Entomological Association. There were serious changes in the immediate vicinity of the traps in 1989. Numerous insects were attracted by the use of the coppice forest a few years before 1989, found good development opportunities there and may have been increasingly caught in the traps as a result.

In 1989, about 400 m from the trap sites, a small vegetable farm was still operating predominantly under glass on its second farm. The city of Krefeld bought this farm together with its two sites and relocated it to the district of Kleve, mainly for urban planning reasons. Although this supported extensification to some extent, it was not the primary goal and, due to its small size, probably had little influence on the insect world. Another vegetable farm, which has since been abandoned, certainly had a much greater impact. It cultivated about 2 ha of arable land in the nature reserve only 100-250 m from the trap sites and another 8.5 ha of arable land 400-700 m to the south with a variety of fresh vegetables. The main crops were lettuce and various types of cabbage. The likelihood of individual sets on such areas being abandoned from time to time due to excessive pest infestation, or of foliar aphid populations, but also coleoptera, being found on the remnants, which sometimes remained for weeks, after the main harvest, was very high.

The number of butterflies that have developed to a considerable extent, such as white butterflies, European butterflies or other small butterflies like cabbage moths, is very large and could only be proven today by evaluating the trap catches. Some of the arable land near the traps was already converted into grassland before 2013. The remaining arable patches are now used normally for agriculture, largely without vegetables. The potential for the spread of open field vegetable cultivation in the immediate vicinity had largely disappeared by 2013. In the wider surroundings of 1-2 km, open field vegetables are still regularly cultivated today. It is rather unlikely that insecticidal effects from this vegetable cultivation reached the nature conservation area to any appreciable extent in 2013. Firstly, due to special requirements of the food retail trade, the use of insecticides on fresh vegetables is extremely cautious.

In the main wind direction, there is a forest belt a good 200 metres wide in between.

Insect species specialised in vegetable crops largely disappeared from the nature reserve and the surrounding area between 1989 and 2013. An evaluation of the trap catches and differentiation into insects harmful to vegetable cultivation and species typical of the nature conservation area would be helpful here.

Prohibition of liming on grassland in the case of mensuration requirements: The practice of grassland management in contractual nature conservation with a general ban on fertilisation, at most with manure, which is hardly available in the area, has not been discussed so far. Fatally, the fertiliser ban usually also includes liming. More and more, the areas are becoming soggy and the species of clover are disappearing. Clover depends on nodule bacteria, which absolutely need the trace element molybdenum. If the pH value drops too much, molybdenum is fixed in the soil and the nodule bacteria can no longer bind nitrogen. Gradually, the clover species disappear from slowly acidifying extensive grassland and with them many species of bumblebees and wild bees that often depend on the flowers of the clover species. The common practice of prohibiting liming on extensive grassland should be checked and, if necessary, adapted.

Influence of migratory butterflies: So far, the migrant butterflies have not been taken into account, as they come here from time to time from the Mediterranean region in more or less large swarms. Gamma owls and cabbage white butterflies are also caught with the traps. Since they can appear in large masses, it is to be expected that in years with considerable influx they can also have a considerable influence on the biomass in the insect traps. For example, the past year 2018 was a year with a mass migratory flight of cabbage white butterflies. Whether migratory butterflies had a significant influence in 1989 and/or 2013 should be investigated further. When interpreting the trap length, a clearer differentiation should be made between the biomass of the migratory butterflies and that of the native insect world.

Extensive elimination of substances can reduce the reproduction rates of invertebrates.

reduce insects: Insects are even more dependent on nitrogen in their food chain than humans, birds and mammals. Besides the

In addition to the nitrogen required for their proteins, which is essential for all living organisms, insects also require additional nitrogen for their chitin. Therefore, sucking insects such as aphids and scale insects filter the nitrogenous substances out of the sap of their host plants and excrete the excess sugar substances as honeydew. As a rule, nitrogen is a scarce commodity for insects. Consequence: If you reduce the nitrogen supply in a nature reserve, you not only reduce the nutrient base for plants and increase diversity, but at the same time you also reduce the available nitrogen for insects, thus reducing their reproduction rates and preventing mass reproduction and the formation of insect biomass. 1989 was an exceptional year due to the mass occurrence of grain bugs, ladybirds, hoverflies and lacewings: The year 1990 is known in Rhineland agriculture as the year in which the Lanči farmers only "threshed straw" in barley! This means that yields of 60% and more occurred there. This was preceded by two very mild winters (1988/89 and 1989/90). Many cereal aphids overwintered alive without changing hosts and multiplied explosively in the spring of 1989 and then also in the spring of 1990. At the same time, they transmitted the yellow dwarf virus mainly to barley, which then led to the yield losses that threatened the existence of the crop. The year 1989 is known in the literature as a year of mass reproduction of aphids and their predators (DUNK, K.V.D. (1989), *Das Jahr der Marienkäfer, Gallenfliegen, Nürnberg*). Ladybirds, lacewings and hoverflies can only multiply en masse if their hosts, the aphids, have multiplied en masse beforehand. The mass occurrence of aphids and their predators in the year 1989 can certainly also be found in the trap catches of 1989. What needs to be discussed here is the comparability of the exceptional year 1989 for the following years.

Mass change of insect pests, especially aphids, in cereals in connection with the use of insecticides: Due to the use of insecticides increasingly oriented towards damage thresholds and the selection of agents that are gentle on beneficial insects, agriculture today is increasingly succeeding in avoiding mass occurrences of aphids in cereals with relatively small amounts of insecticides. The early use of insecticides in cereals in autumn or early spring did not increase until after the catastrophe in 1990.

with the yellow dwarf virus entered the practice. Until then, a slight infestation of aphids was tolerated, as even small positive increases in yield could be expected. With the early control of cereal aphids that is common today, no mass changes of cereal aphids and thus also of the ladybirds or hoverflies benefiting from them are to be expected over large areas as in 1990. In the Federal Republic, about 20% of the total land area is cultivated with cereals. This used to be a gigantic potential for insect biomass. Large-scale mass changes of cereal aphids are no longer to be expected today. Organic farming also benefits from this, even if it does not use insecticides. On about 90 % of the cereal areas, the total populations of cereal aphids are kept at a low level, even with a higher infection potential for the virus. Large-scale control of cereal aphids with their infection potential for the virus is not yet possible without insecticides and only with the help of the control mechanisms of beneficial insect promotion, variety selection, etc. of organic farming.

Plant and insect diversity in nature reserves not only stabilises predator-prey relationships, but also the insect biomass at a low level: the reduction of uniform crop stands in nature reserves, e.g. through the abandonment of arable farming, considerably reduces the occurrence of regular mass reproductions of individual insect species. One of the central goals of the development of nature reserves is the creation of stable ecosystems. This also stabilises the predator/prey relationships between the primarily biting insects such as bluebugs and caterpillars and their predators such as ladybirds and spiders or parasites such as ichneumon flies. A balance develops, albeit at a low level. The deliberate diversity of different plants in nature reserves automatically results in a relatively high diversity of species. Since no single plant species dominates the area, there is no potential for mass reproduction of the insects that specialise in it.

The decline in trapped insect biomass in a well-developed development of a natural conservation area is a key indicator of the successful

development towards more species diversity and, conversely, is precisely not worrying. At the same time, high species diversity in space almost inevitably means a relatively low number of individuals of the individual species. This means that the insect biomass in well-developed nature conservation areas inevitably decreases with the increase in species diversity. The more successful the development efforts of a nature reserve have been, the lower trap catches can be expected. This is not a reason to dramatise changes, in this case the decline in insect biomass, but rather a reason to congratulate the nature conservation administration and the local nature conservation organisations involved. The extensification concepts have worked.

This exemplary compilation of some of the numerous influencing factors and their possible interactions make it clear that it is not individual factors that have an outstanding influence on the insect decline that can be seen in many places, but that a multitude of factors and their interactions are causal. Not one single factor is responsible, but the often mutually influencing positive or negative interactions make up the overall picture.

Admittedly, for birdwatchers who are also observing the decline of insect-eating birds, this is a rather unsatisfactory realisation. They are no different from all the former dairy farms that used to exist around the Orbroich nature reserve. In the context of farm closures, the saying "And when the last cow leaves the farm, the swallows leave too!"

I hope that these remarks will provoke some reflection. Banning insecticides or herbicides will certainly not bring back the swallows and other insectivorous birds. The structural change caused by the numerous farms that have closed down, with their formerly widely distributed livestock holdings, is much more serious. The constant demands for additional requirements and bans, whether for nature conservation, water protection, hygiene, consumer protection or animal welfare, only fuel the structural change towards ever larger farm units. Which smaller farm still in existence today with nutritious animals can still meet the demands of the

How can a farm meet the requirements of hygiene, storage capacity and a ban on spreading, as well as restrictions on the amount of fertiliser it can apply to its land? There is **simply** no capital, no optimism and no confidence that the farm can be carried over to the next generation with any certainty. The constant demands that "agriculture must change" actually leads to change, but turned 180 degrees instead of in the intended direction.

The **smaller** farms are giving up, as they have for more than 50 years already do, and the remaining ones are forced to grow. See the Mansholt Plan of 1968 on the "Grow or Weichen". Although it was officially rejected at the time, it has been structurally but has been implemented structurally step by step for more than 50 years.

Even as an organic farmer, I am convinced that the call for organic farming will not help much. Organic farming is already increasingly becoming the focus of the largely commercially oriented food retail trade (LEH). Stinginess seems to be the order of the day in Germany. As always, the concentrated food retailers are calling for uniform large batches of rake-less goods, preferably with an organic label. Organic farming can only achieve this with ever larger farm structures. The path is mapped out. Smaller farms are only a nuisance and would be pushed to the brink of survival and forced to give up their livelihoods for a long time without mercy via complaints about trivialities or prices that no longer cover costs, unless other solidarity-based ways can be found regionally/locally that bypass previous structures. And without insecticides or fungicides. And without insecticides or fungicides, "flawless" is not possible either. The only difference is that the active ingredients come from nature itself and not from chemical retorts. In organic farming, too, uniformly large, immaculate batches can only be produced in larger monocultures and usually only with the **use of** organic pesticides, even if they are **used** more in circular production systems. and tries to be very consciously considerate of the environment.

to take. There will not be much room for insects in most organic farming systems - if there is, it will only be controlled by beneficial insects at a low level. And if the biological balance between prey and predator can be achieved, there will not be much insect biomass left, as described above.

I am convinced that insecticides are not the problem of today's perceived serious changes in the insect world, even though individual insecticides may have exceeded their target areas and targets. organisms, such as some neonicotinoid active substances.

The creeping abandonment of small-scale farming structures by our society and the constant increase in demands, commandments and prohibitions are the real problem. I will not even go into the effects of light pollution or petrified front gardens here.

A personal note on the side- I would have thought it fairer towards politics, the media and agriculture if they had been a little more restrained with the statement that the Krefeld study published in PLOS ONE is said to have attracted a worldwide attention of more than half a million readers. The Ro-Bot network around the internet platform Hacker News had already taken up the article within minutes of its first publication and generated several hundred thousand exclusively automated digital accesses with robot programmes within a few hours, suggesting an apparently extremely high level of public attention. The robot programmes documented their activities on Twitter (<https://www.altmetric.com/details/27610705/twitter>).

In this sense, I advocate a fair approach to agriculture on the part of society, the media and nature conservation. We all bear the responsibility for the socially enforced change in agriculture.