

The Plight of the Bugs, and the Failure of the Laws of Humans



Craig M. Pease, PH.D., is a scientist who teaches at the Vermont Law School Environmental Law Center. He can be reached at cpease@vermontlaw.edu.

The thought of biodiversity typically conjures up images of bears and tigers, not bugs, mosquitoes, beetles, aphids, and caterpillars. With some justifiable reason, insects are widely regarded as annoying little critters that bite, transmit disease, and eat our crops. Superficially, butterflies appear to be the exception. Yet the insects we know as butterflies spend most all their life as caterpillars, a life form that seems to elicit an innate desire to pick the disgusting little thing off the plant, throw it on the ground, and stomp it.

Who cares about insects? I do — a whole lot. I am appalled, indeed scared, by what is happening to them. And you should be too.

In 2013, M. Sorg and colleagues placed standard Malaise insect traps on a German nature preserve, replicating a 1989 insect survey. As published in a *Report of The Krefeld Entomological Association*, they found that for every four pounds of insects present 25 years ago, only one pound now remains.

Their results are entirely consistent with Rudolpho Dirzo's 2014 *Science* paper showing the abundance of about 450 closely monitored insect species had decreased over the last 40 years by 45 percent. (It is telling that we have decent abundance data on less than .01 percent of the perhaps 5 million extant insect species, of which only a fifth or so have been described.) More colloquially, the bugs are getting hammered.

Too often our laws and policy discussions focus on proximate drivers of biodiversity loss, including habitat degradation, introduced species, and climate change. Yet the ultimate causes of biodiversity loss have long

been known: Too many people, leading too lavish a lifestyle.

As a scientist, I especially seek simple conceptual models. I abhor unnecessarily complex explanations, as such often obscure the truth, rather than explicating it.

One core model of environmental science simply and cleanly divides the Earth into two parts — the natural world, versus the world of humans and our economic, political, and social institutions. Peter Vitousek's seminal 1989 *Science* paper, and the literature it has spawned, show that by diverse measures (e.g., land use, net primary productivity, nitrogen fixation, etc.), humans now occupy roughly half the biosphere.

Over the last 40 years, human population size has grown from 4.2 billion to 7.4 billion, a 76 percent increase. As for the lavish lifestyle, there are compelling reasons, grounded in thermodynamics, as explained by Friedrich G. Juenger, Nicholas Georgescu-Roegen, Howard and Eugene Odum, Jing

Chin, and Vaclav Smil, to assess the impacts of all those people on the natural environment in terms of their per-capita energy use. Over the last 40 years, per-capita energy use worldwide has increased a seemingly modest 18 percent.

However, this per-capita energy use varies greatly across countries, and is orders of magnitude above the pre-industrial base level. In the United States, each person uses roughly 350 gigajoules each year. Agrarian, undeveloped countries such as Tajikistan and Senegal have annual per-capita energy use of 10 to 20 gigajoules. A true hunter-gather society (of which essentially none are left on Earth) with no access whatsoever to fossil fuels would use

Insects are declining in numbers and in species worldwide, a result of human profligacy

roughly 0.5 gigajoules per person, per year.

Adding the increase in human population to the increase in human per-capita energy, we find, over the last 40 years, a 100 percent increase in human society's total use of energy. It's a teeter-totter. The human biosphere doubles, and the natural biosphere gets reduced, as assayed by insect abundance, by half. Indeed, going back further in time, human population has doubled, and doubled, and doubled again (on which see Albert Bartlett's timeless YouTube videos on geometric growth). And human per-capita energy use is now well over 100 times higher than subsistence society levels. What exactly should we expect, if not utter devastation of the natural world?

Always and everywhere, the laws of nature trump the laws of humans, though it often takes considerable time for this to play out. Here the laws of nature pertaining to geometric growth and energy drive loss of biodiversity. The insects — what few remain of them — testify to the complete failure of the laws of humans that seek to protect biodiversity.

What hubris. What myopia. What moral bankruptcy. Herein our industrial, fossil-fuel-based society, and its laws, having itself existed a scant century, burns a vast, mostly unread, library that encodes billions of years of evolution, history, and knowledge.