

The Great Extinction Crisis

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Life evolved 3.8 billion years ago and changed Earth from a barren inhospitable rock to a planet with incredible biodiversity. A study from the University of Hawaii (1) estimates that we share Earth, and its finite resources, with 8.7 million living species and the countless genetic variations within each. Humans account for only .01% of living biomass (2), yet are punching far above our weight in terms of impact on the earth systems. Human society, although dependent upon biodiversity for survival, has ushered in the 6th mass extinction of Earth's history.

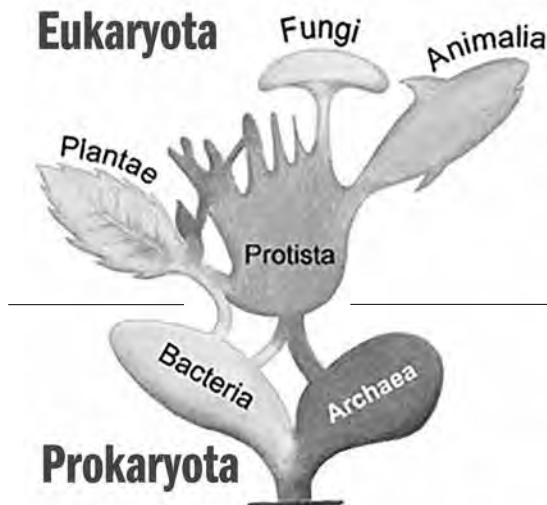


Figure 1: The 5 Kingdoms of Life: Bacteria, Fungi, Protozoa, Plants and Animals (3)

Extinction

Some extinction is natural. Species evolve to a particular niche and are lost if out-competed and replaced by another species more fit for their environment at that particular time. Problems arise when the environmental changes are too rapid and too extreme to allow adaptation (evolution) and species are simply lost. The fossil record shows five prior mass extinctions (defined as the loss of 75% of living species) caused by natural catastrophes: ice ages, de-oxygenation of the oceans, cataclysmic volcanic eruptions and asteroid impacts (4). The Cretaceous-Tertiary (KT) extinction of 65 million years ago is infamous for killing off the dinosaurs. These five events affected Earth so drastically that they are taken as the markers of geological eras. The current extinction rate is so high (10,000 to 100,000 times higher than the natural rate equating to a loss of approximately 20 species per day) (5), that scientists are calling for a new geological era to be recognised: the Anthropocene.

Human social and economic systems have become the primary emergent force affecting the future of the Earth Systems: the interacting physical, chemical, geological and biological processes which shape the planet. (6)

Are humans naturally/inherently destructive?

While our ancestors doubtless played a role in the extinction of Europe's mega-fauna (the Quaternary Megafauna Extinction between $\approx 50,000$ and $\approx 3,000$ years ago, which claimed around half of the large (>40 kg) land mammal species) (2) the fatalistic suggestion that we are a purely or inevitably destructive force is

false. For 200,000 years *Homo sapiens* have, in our quest for survival, manipulated biodiversity to our own benefit and need, but only recently has this had drastic consequences for biodiversity. (7)

Where did this crisis come from?

Human society's negative impact on biodiversity (7) is often described using the mnemonic HIPPO.

- **Habitat Destruction:** >50% of the biosphere has been converted to agriculture (9)
- **Invasive species:** introducing new predators and competitors to a habitat.
- **Pollution:** degradation of water, air and soil quality
- **Population:** growth and spread of human society across the continents
- **Over-consumption/ exploitation:** unsustainable levels of growth and use.

Biodiversity is declining because we are adding stressors to already strained systems. Scientists graph the interdependency of species using population cycle graphs and food webs, which increase in complexity as trophic (nutritional) levels and environmental stresses are added. Take a simple Fox vs. Rabbit cycle in which predation forces hare numbers down, so in turn fox numbers drop, then hare numbers can increase again and so on. The dynamics change when you add a second predator (*invasive mink*), disease (*myxomatosis*), a competitor (*Sika deer*) an abnormally long winter (*climate change*) or a shortage of grass (*land taken for farming*), and so on. The extinction crisis, at its core, is occurring because human society is affecting all food webs, and they are collapsing.

What changed? Humans have existed for millennia

Twelve thousand years ago, at the end of the last ice-age we began farming and five thousand years ago built the first great civilisations. We spread across the continents, our population increased and as we got better at manipulating the environment we produced *extra* i.e. a surplus over and above what was required for immediate survival, and society became organised around controlling the surplus. The tipping point came 500 years ago when society moved from the manipulation of biodiversity for need, to its manipulation for profit. 200

years ago the industrial revolution (7) escalated this, and large scale extinctions began. (10)

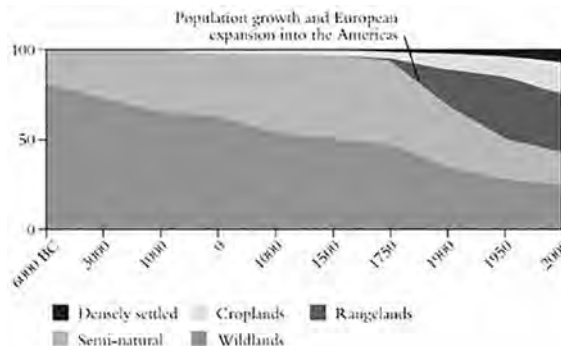


Figure 2: Transformation of the biosphere: Percentage of global ice-free land area (10)

The greedy capitalist.

Capitalism as a mode of production and a social system requires people to be destructive of the environment: it degrades the conditions of its own production, must expand ceaselessly to survive and generates a chaotic world system that intensifies the extinction crisis. (6)

Capitalism contains an endless and limitless drive to go beyond any limiting barrier: any corporation that doesn't out-compete its rivals will be driven out of business. Fruit and vegetables make up only 2% of food crops; Because of market demand sugar, tea and coffee create more economic profit than more nutritionally valuable food. During the Great Irish Famine grain was exported for economic gain. The Chinese famine of the 1950s stemmed from economic policies that favoured steel manufacture at the expense of farming.

Neoliberal policies in Europe and the western world have escalated practices such as deforestation, extraction and burning of fossil fuels, overexploitation of limited resources and excessive consumerism.

What are we losing?

We can measure life by the number of individual species and their prevalence in the biosphere. In general the equatorial regions are more bio-diverse than the poles and land supports more than the ocean.

Incredibly more than 80,000 acres of tropical rainforest are burned every day (13). The World Wildlife

Species by Kingdom

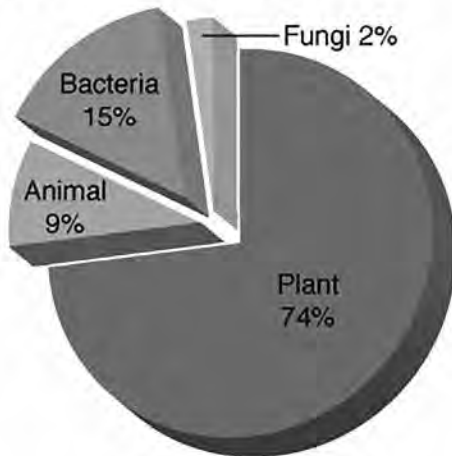


Figure 3: Known species in the 5 Kingdoms of Life (12)

Fund estimates that since 1970 fish populations have halved (14) and a quarter of coral reefs have died. Intense whaling and exploitation of other marine mammals have resulted in a fivefold decrease in marine mammal global biomass (2). Heavy metal pollution, acidification, overfishing and tourism have wreaked havoc on the oceans. At its most expansive the dead zone in the Gulf of Mexico spreads over 20,000 km² (15). While microplastics enter the food chain, larger pieces choke and strangle marine life and gather in terrifying rafts on the surface, washing onto our shores.

Why should we care?

The extinction crisis is at once an environmental issue and a social justice one. The poorest and most vulnerable of us will be hit soonest and hardest. The biodiversity crisis of the south is driven by demand from the politically and economically dominant North. Colonialism plundered both wealth and biodiversity from the south. The black market demand for ivory means 100 African elephants are poached daily. Mining for minerals, jewels and metal scars the landscape. Communities face famine when their arable land is used to produce flowers for export instead of food for local markets. Even much-beloved flagship species are at risk: the world's last male northern white rhino died this year.

Poetry, art, folklore and religion all take inspiration from nature but atop the many aesthetic, holistic and philosophical reasons to conserve our natural environment are the absolute practicalities.

Earth's systems provide us with food, fibre, mineral resources, medicines, industrial products, and innumerable ecosystem services like cleansing our waste water, dampening flood peaks, breaking down rocks into productive soil, maintaining the supply of oxygen in the atmosphere, and supporting pollinators for many crops and predators that control many agricultural pests (16)

The three essential elements for human survival; food, clean water and shelter, depend on healthy earth systems.

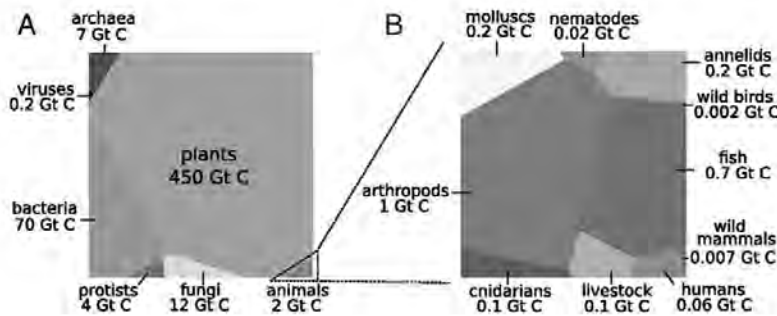


Figure 4: Mass of living matter 'biomass' (2)

Protection from the elements

While steel and concrete constructions may dominate the city skylines of industrialised nations much of humanity depends upon plant biomass; timber, bamboo, hemp, straw and grasses are our building materials. Animals provide the wool, leather and silk, and plants the hemp, cotton and linen that clothe us. To ensure supply we breed these animals and crops at the expense of less 'useful' (and/or of less economically profitable) species.

Forests and grasslands have been replaced by monoculture, managed woodland and farms.

Food and Agriculture.

The children's film "Bee Movie" did not exaggerate when it showed that without the work of bees humanity will starve. Bee and other pollinators, mainly insects, are dying at an alarming rate. Unless urgent action is taken to combat climate change the world's supply of vegetables could fall by more than a third by 2050. (17) Famine is a real threat; already 780 million people suffer hunger.

The common perception that Earth simply cannot produce enough food for all 7.9 billion people is false. Current global food production could feed ten billion but capitalist structures allow roughly one third of the food produced in the world for human consumption every year — approximately 1.3 billion tonnes— to be wasted. The graph below clearly shows that while we do need to implement change at a consumer level (especially in the developed world), the vast majority of this waste is at corporate level. *Under capitalism food is a commodity to sell for profit rather than a biological necessity to relieve hunger and sustain life.*

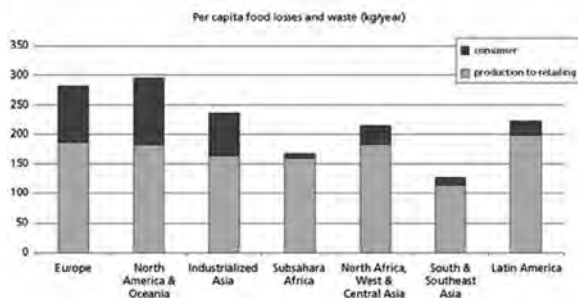


Figure 5: Kilograms of Food Lost and wasted per capita each year (17)

With capitalism as the driving force behind food production the environment and the lower social classes will continue to lose out.

Globalisation greatly increased the variety of food available to the average family (imagine an Ireland without potatoes, chicken or tea), providing new and better sources of essential vitamins and minerals. Yet capitalist policies have led to the reduction in the variety of food stuffs eaten by human societies worldwide. Over-dependence on one crop increases the risk of famine (Ireland and potatoes) as well as reducing biodiversity.

Incredibly the vast majority of current food production focuses on only 18 livestock species and 155 plants, which have become the dominant plants and animals on earth. *Domesticated poultry accounts for 70% of all the birds on Earth.* The biomass of humans (≈ 0.06 Gt C) and the biomass of livestock (≈ 0.1 Gt C, dominated by cattle and pigs) far surpass that of wild mammals, ≈ 0.007 Gt C. Wild mammal numbers have halved in the last fifty years and are approximately sevenfold lower than 5000 years ago. (2)

Even for the profit-focused capitalist the loss of variety spells bad news. Much of our food and medicine come from the plant and fungi kingdoms.

Fungi

We eat mushrooms and yeast is essential for the production of bread, beer and Marmite. The toxins of their inedible cousins have many uses in science and medicine: giving us penicillin, streptomycin, chloramphenicol and tetracycline. We have examined the potential of very few of the known species, which may be as little as 5% of the species of fungi that exist

Bacteria

Bacteria are essential for soil health, a functioning water cycle and our survival. "Good" species help us digest food, clean up oil spills and kill pathogens while "bad" ones make us ill and cause food to rot. Extracts of bacterial DNA provide us with tools to study human genetics, carry out cell research and develop medicinal treatments.

Plants

300,000 known Plant species make up 82% of Earth's biomass (2). Only 13,000 of the have been studied for potential uses (beyond timber, fuel and aesthetics). Herbal medicine has been in use for millennia. For 2,500 years willow bark has been used to treat pain and fever. (19) Chemists first isolated the active ingredient in the 1850s and in 1899 Aspirin was released on the market. Poppies have been cultivated since 3400BCE, and used as an anaesthetic, a painkiller and for their euphoric affects. We also got digoxins from fox gloves (used to treat heart conditions and asthma), quinine from the cinchona tree (used for centuries to treat malaria) and ginger for stomach upsets (20).

Conclusion

The great species extinction currently underway goes hand in hand with climate change and the plastification of the oceans. All are aspects of what John Bellamy Foster, following Marx, calls 'the metabolic rift' between humans and nature opened by capitalism. Each of these problems, taken in isolation, is very difficult to solve in a for –profit economy. Just look at the massive vested interests, beginning with the oil and car companies, in fossil fuel production. But taken together as symptoms of an underlying problem which none of the establishment or the ruling classes even recognise – namely the way in which capitalism by its very nature alienates humans from nature and destroys our global environment in a thousand different ways from deforestation to pollution of our cities to dumping sewage in our seas – it is not possible for there to be a viable and real solution on the basis of capitalism.

If our children and grandchildren are to have a human future in a world worth living in, not a monstrous devastated and possibly fascist future we, the mass of ordinary people internationally, have to find a way of reconstituting and reorganising our economies, our production on the basis of human need, which includes the protection of our environment and our fellow species – that is an a fundamental human need – not profit. That means revolution!

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