



JOURNEY TO THE SIXTH MASS EXTINCTION



Sambodhi Uttam Ambhore

Nowrosjee Wadia College, Pune

Email : Sambodhi.ua@gmail.com

ABSTRACT

Approximately about 4.5 billion years ago a planet was formed in the vast universe which about more or less a billion years later was ready to support something phenomenal, something magical; life. A journey starting from a single-celled organism to reaching a species working on an alien machine called laptop trying to make sense out of what it truly means to be a part of this ecosystem, has not been smooth. Nature as much as it has supported life also showed it its place. Something that can give life can very well take it away. This journey of ups and downs or more precisely, life and death has bloodied our grounds with five major mass extinctions called as the Big Five. These mass extinctions caused a loss of more than 70% of species. Studying these Big Five we notice a periodicity in the die-offs of nature, something that helps us understand the present situation to some extent.

KEYWORDS

Mass extinction, Ecosystem, Big Five, Nature, Species

RESEARCH PAPER

Introduction :

Approximately about 4.5 billion years ago a planet was formed in the vast universe which about more or less a billion years later was ready to support something phenomenal, something magical; life. A journey starting from a single-celled organism to reaching a species working on an alien machine called laptop trying to make sense out of what it truly means to be a part of this ecosystem, has not been smooth. Nature as much as it has supported life also showed it its place. Something that can give life can very well take it away. This journey of ups and downs or more precisely, life and death has bloodied our grounds with five major mass extinctions called as the Big Five. These mass extinctions caused a loss of more than 70% of species. Studying these Big Five we notice a periodicity in the die-offs of nature, something that helps us understand the present situation to some extent.

What is the sixth mass extinction?

Taking a conservative approach to the current extinction crisis we define a mass extinction as an extreme loss of biodiversity, losing more than 75% species of the earth. It occurs when the rate of extinction increases with respect to the rate of speciation. This delicate balance of nature has been disrupted by a species that entered the stage just a few thousand years ago.

Extinction involves both rate and magnitude which are distinct but intimately related metrics. Rate refers to the number of extinctions divided by the time over which they happened. This gave us the background extinction rates. Magnitude is the percent of species that have gone extinct. The detailed analysis of mammals gave us the background extinction rate of 1.8 E/MSY. The combined rate-magnitude comparisons tell us that the current extinction rates for mammals, amphibians, birds, and reptiles if calculated over the last 500 years are as fast as all rates that would've produced the Big Five extinctions over millions of years.

Modern rates of vertebrate extinction are much higher than that of 1.8 E/MSY. Among the vertebrate taxa evaluated by International Union of Conservation of Nature (IUCN), 338 extinctions have been documented since the 1500s. An additional 279 species have become either extinct in wild or listed as possibly extinct. Under the 1.8 E/MSY, 9 vertebrate extinction would've been expected since 1900 but the statistics tell us a different alarming story. Rates of modern extinctions vary amongst the vertebrate groups. Although biologists cannot say precisely how many species there are or exactly how many of them have gone extinct we can conclude that modern extinction rates are exceptionally high and they are increasing. A Living Blue Planet Report (2015) published by World Wildlife Fund and the

Zoological Society of London provided data on 7829 populations from 1243 species of birds, mammals, reptiles, and fishes. A decline in the overall population of 49% was observed between 1970 and 2012.

To explain the phenomenon of mass extinctions, many hypotheses are put forth by scientists who point out the collaboration of many unusual events. Common features of the Big Five suggest that unusual climate dynamics, atmospheric composition, and high-intensity ecological stressors are key elements of these events. Now, why are these hypotheses essentially important? These hypotheses are vital to assess the sixth mass extinction potential as the global stage is set once again for these unusual interactions. Today, rapidly changing atmospheric conditions, increasing levels of CO₂, habitat destruction, pollution, overhunting, overfishing, the spread of invasive species, human population explosion and overexploitation check all the boxes of the possible ecological stressors. They're of extremely high intensity and rapidly increasing, something that most of the living species have not experienced. Thus, without conscious and concerted mitigation efforts, such stressors will escalate and intensify the extinction.

Where did we go wrong?

Something that sets apart this Holocene extinction from the rest is the very cause of it, us. All the earlier global extinctions, we so affectionately named the Big Five had a physical cause be it climate change, continental drift, change in sea levels, volcanic eruptions or meteor strikes. But humans are a part of biotic system of the earth bringing vast and rapid physical changes. We are the trigger factor and we do so in the variety of selfish ways that benefit us.

1. ***Overexploitation:*** *Humans have conveniently excluded themselves from the chain of local ecosystems. This began about 10,000 years ago with the start of agriculture and later on spiked by the Industrial Revolution which acted as a catalyst. As a result, humans no longer needed to interact with other species for survival. They didn't need to adhere to the ecosystem's carrying capacity and hence could overpopulate. This led to an exponential growth of our population coupled with the unequal distribution and consumption of wealth and resources of planet proving to be a catastrophe in making. What has this given us? This has given several countries like UAE with an ecological footprint of 10.68 global hectares per capita.*
2. ***Spread of non-native species over the globe:*** *We humans have proven to be the globe trotters of the world. We have, in knowing and unknowing ways homogenised the flora and fauna of the world. This has brought about introduction of new species to new*

habitats disrupting the natural ecosystem. These exotic species have no natural predators in the new habitats leading to rapid spread causing a great havoc in the natural flow of ecosystem. A survey hosted by Botanical Survey of India Kolkata, West Bengal reported more than 173 Invasive Alien Species growing in our country. These invasive species prove to be highly efficient and threaten the natural biodiversity.

The spread of chytrid fungus, a gift of international travellers, is one such example responsible for threatening the amphibian population all over the world.

- 3. Influencing evolution:** *Humans alter their surroundings in more ways than we can imagine. We've modified the biosphere at a huge extent. All our activities ranging from the use of fertilizers and pesticides in the field to designing a new vaccine in some laboratory, everything we do has an impact on the living ecosystem. We do so by manipulating genomes by artificial selection, domesticating plants, animals and also managing ecosystems with our efforts for conservation.*

Since the arrival of humans, we have manipulated resources as per our will and liking. This manipulation was not only limited to the abiotic resources but biotic as well. It has resulted in the evolution of many domestic species in a certain way that we have desired. This use of the highly evolved superior brain on the other species made us rise to the position of super-predators. We didn't need have claws or large canines to attain the position. We fashioned weapons starting from the stone tools then upgrading as per need and occasion. This caused a sudden jump of humans to the throne of super-predators for which neither humans or the nature was ready. Hunting, poaching, agriculture, industries, chemicals, wars i.e. the human brain, has in fact, challenged and shaped the ways of evolution in 'n' number of ways.

- 4. Development of Technosphere:** *A term coined by Peter Haff of Duke University explaining the vast combination of humanity and its technology. Although originally created by humans we have, in effect, lost control. We are the stage we can't just shut it off. It is the vast combination of humanity and technology that proves to be a driving force of this extinction crisis. Even though many scientists deny the term and think that humans and their ultrasocial behaviours are the only reasons for these, none can argue against the fact that arrival of humans has transformed the planet. The technology, whether the stone tools or wheels of stone age man or modern day machineries, is now an inseparable part of us. As Mary Shelley's novel Frankenstein says, not only has our creation asserted its own agency, but it now wields a power over us.*

Rising debates.

Even though the majority of the scientists agree with the theory of the ongoing crisis of mass extinction, there are some which question the foundation of this analysis. The root of this skepticism comes from the lack of consideration of the biodiversity gains that may have occurred in the same time periods. There is also the claim of exaggerations of species loss estimates, a deliberate attempt to gain public attention. The research paper *Emergence of Sixth Mass Extinction?* by John Briggs tries to explain the situation. By accepting the Pleistocene Background extinction rate of 0.5 species per year we calculated that about 250 extinctions of the past happened due to non-human causes. According to the IUCN Red List (2014) 338 terrestrial vertebrate species have been extinct since 1500. If we subtract the previously obtained number of extinct species of 250 from that of 338, we are left with an approximate figure for human-caused extinctions which amounts to 0.18 species per year. He thus questions the basis of the claim that this is the start of sixth mass extinction. After a thorough study of the list, it was found that 95% of all extinctions had taken place on oceanic islands which according to him had little or no effect on continental ecology or ecosystem.

Another reason is that all the estimations and analyses are based on vertebrate fossil analysis to predict global events. Vertebrates comprise a very small fraction of the fauna that inhabits the earth. He also claims that the danger of emerging mass extinction in the oceans is no more real than it is on land as there have been no extinctions recorded in the past 30 years. Despite all these claims he puts emphasis on the declining population of fishes and the need for conservation due to climate change.

Conclusion :

Since the arrival of modern humans, significant changes have been observed. Even though there are still ongoing debates about the Holocene Mass Extinction one thing that no scientist can deny is the climate change. According to the reports of NASA, there has been a global temperature rise of about 1.62 degrees Fahrenheit (0.9 degree Celsius) since the late 19th century. There has been warming of the oceans, more than 0.4 degrees Fahrenheit since 1969 and continues to rise. There has been a major shrinking of ice sheets, about 286 billion tons per year in Greenland, 127 billion tons of ice per year in Antarctica from 1993 to 2016. This rate has tripled in the last decade. There has been a decline in both thickness and extent of the Arctic sea ice. The glacial retreats and decreased snow covers have caused a sea level rise of about 8 inches in the last century. The high levels of pollution and human activities have caused ocean acidification. Since the industrial revolution, ocean acidity has increased

by 30%. Present day, the amount of CO₂ absorbed by the upper layer of oceans increases by 2 billion tons per year. The invention of a substance called polythene has proved to be a major threat to the environment. Humans generate about 3.5 million tons of plastic and other solid wastes a day of which 40% are not managed properly and are dumped or openly burned. This careless behaviour of humans has given rise to a giant accumulation of plastic called The Great Pacific Garbage Patch which contains more than 79000 tons discarded plastics and covers an area of about 1.6 million square kilometres.

The entire scenario gives rise to an inner turmoil and endless series of questions. Are we proceeding towards the sixth mass extinction or is it too soon to say? We have certain data; numbers, statistics charts and proof that make us question that irrespective of the fact if we are on our road to the extinction or not, is this how things are supposed to be? We've not yet seen the throes of the sixth extinction, but if we continue we would jump from one quarter to halfway in the span of a few centuries causing something that was about million years away.

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