

Biologist warn of early stages of Earth's sixth mass extinction event

Date: July 24, 2014

Source: Stanford University

The planet's current biodiversity, the product of 3.5 billion years of evolutionary trial and error, is the highest in the history of life. But it may be reaching a tipping point.

In a new review of scientific literature and analysis of data published in *Science*, an international team of scientists cautions that the loss and decline of animals is contributing to what appears to be the early days of the planet's sixth mass biological extinction event.

Since 1500, more than 320 terrestrial vertebrates have become extinct. Populations of the remaining species show a 25 percent average decline in abundance. The situation is similarly dire for invertebrate animal life.

And while previous extinctions have been driven by natural planetary transformations or catastrophic asteroid strikes, the current die-off can be associated to human activity, a situation that the lead author Rodolfo Dirzo, a professor of biology at Stanford, designates an era of "Anthropocene defaunation."

Across vertebrates, 16 to 33 percent of all species are estimated to be globally threatened or endangered. Large animals -- described as megafauna and including elephants, rhinoceroses, polar bears and countless other species worldwide -- face the highest rate of decline, a trend that matches previous extinction events.

Larger animals tend to have lower population growth rates and produce fewer offspring. They need larger habitat areas to maintain viable populations. Their size and meat mass make them easier and more attractive hunting targets for humans.

Although these species represent a relatively low percentage of the animals at risk, their loss would have trickle-down effects that could shake the stability of other species and, in some cases, even human health.

For instance, previous experiments conducted in Kenya have isolated patches of land from megafauna such as zebras, giraffes and elephants, and observed how an ecosystem reacts to the removal of its largest species. Rather quickly, these areas become overwhelmed with rodents. Grass and shrubs increase and the rate of soil compaction decreases. Seeds and shelter become more easily available, and the risk of predation drops.

Consequently, the number of rodents doubles -- and so does the abundance of the disease-carrying ectoparasites that they harbor.

"Where human density is high, you get high rates of defaunation, high incidence of rodents, and thus high levels of pathogens, which increases the risks of disease transmission," said Dirzo, who is also a senior fellow at the Stanford



African elephant with calf, Amboseli National Park. Elephants and other large animals face an increased risk of extinction

Credit: © EcoView / Fotolia

Woods Institute for the Environment. "Who would have thought that just defaunation would have all these dramatic consequences? But it can be a vicious circle."

The scientists also detailed a troubling trend in invertebrate defaunation. Human population has doubled in the past 35 years; in the same period, the number of invertebrate animals -- such as beetles, butterflies, spiders and worms -- has decreased by 45 percent.

As with larger animals, the loss is driven primarily by loss of habitat and global climate disruption, and could have trickle-up effects in our everyday lives.

For instance, insects pollinate roughly 75 percent of the world's food crops, an estimated 10 percent of the economic value of the world's food supply. Insects also play a critical role in nutrient cycling and decomposing organic materials, which helps ensure ecosystem productivity. In the United States alone, the value of pest control by native predators is estimated at \$4.5 billion annually.

Dirzo said that the solutions are complicated. Immediately reducing rates of habitat change and overexploitation would help, but these approaches need to be tailored to individual regions and situations. He said he hopes that raising awareness of the ongoing mass extinction -- and not just of large, charismatic species -- and its associated consequences will help spur change.

"We tend to think about extinction as loss of a species from the face of Earth, and that's very important, but there's a loss of critical ecosystem functioning in which animals play a central role that we need to pay attention to as well," Dirzo said. "Ironically, we have long considered that defaunation is a cryptic phenomenon, but I think we will end up with a situation that is non-cryptic because of the increasingly obvious consequences to the planet and to human wellbeing."

The coauthors on the report include Hillary S. Young, University of California, Santa Barbara; Mauro Galetti, Universidade Estadual Paulista in Brazil; Gerardo Ceballos, Universidad Nacional Autonoma de Mexico; Nick J.B. Isaac, of the Natural Environment Research Council Centre for Ecology and Hydrology in England; and Ben Collen, of University College London.

Story Source:

The above story is based on [materials](#) provided by [Stanford University](#). The original article was written by Bjorn Carey. *Note: Materials may be edited for content and length.*

Journal Reference:

1. R. Dirzo, H. S. Young, M. Galetti, G. Ceballos, N. J. B. Isaac, B. Collen. **Defaunation in the Anthropocene.** *Science*, 2014; 345 (6195): 401 DOI: [10.1126/science.1251817](https://doi.org/10.1126/science.1251817)

Cite This Page:

MLA **APA** **Chicago**

Stanford University. "Biologist warn of early stages of Earth's sixth mass extinction event." ScienceDaily. ScienceDaily, 24 July 2014. <www.sciencedaily.com/releases/2014/07/140724171956.htm>.



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1. O que o texto diz sobre a biodiversidade atual em relação àquela do passado?

2. Quantas espécies e indivíduos de vertebrados terrestres foram perdidas de acordo com o texto?

3. Ainda segundo a matéria, quantas espécies estão ameaçadas hoje?

4. Quais foram as principais causas dos eventos passados de extinção em massa apontadas pelo autor?

5. Por que os animais de grande porte seriam mais susceptíveis às principais causas de extinção de origem antrópica segundo a matéria?

6. Quais foram os resultados do experimento de exclusão realizado no Quênia de acordo com o texto?

7. O autor menciona uma relação entre a população humana e o número de invertebrados nos últimos 35 anos. De acordo com o texto, como é essa relação?

8. Quais os efeitos da extinção de invertebrados para os serviços dos ecossistemas segundo o artigo?

9. Quais as soluções apresentadas para redução da taxa com que as espécies estão sendo perdidas?

10. Interprete o seguinte trecho extraído do artigo: *“Ironically, we have long considered that defaunation is a cryptic phenomenon, but I think we will end up with a situation that is non-cryptic because of the increasingly obvious consequences to the planet and to human wellbeing.”*

