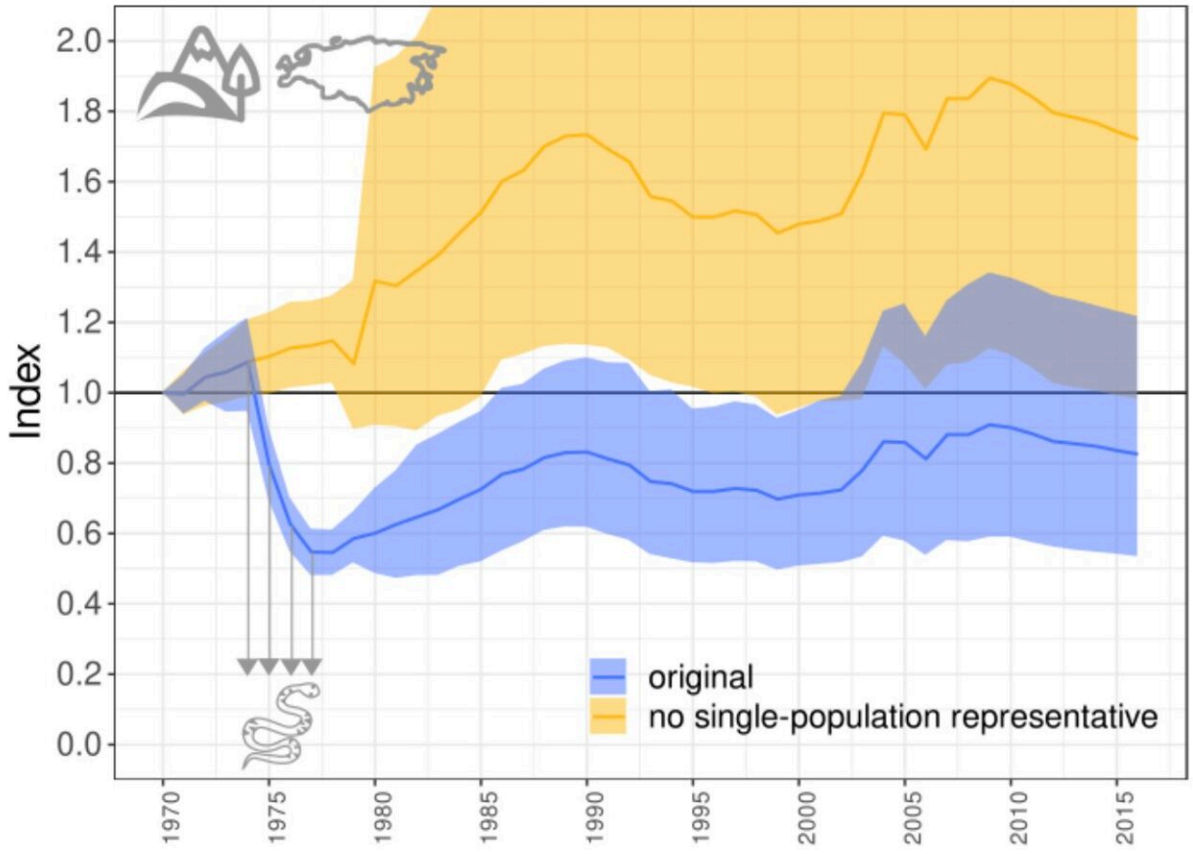
Do vertebrate populations really decline so much? Calculations indicating severe declines might be wrong, says study

June 27 2024



Comparison of the LPI for the terrestrial ecosystems of the Palearctic realm with and without including one population of viper (Vipera berus). This one viper population is the only representative for herptiles in the Palearctic for the four years at the beginning of the whole period (arrows) and is responsible for less-

than-one index values for most of the period, erroneously indicating an overall decline in terrestrial Palearctic vertebrate populations. Credit: Charles University

A widely-used Living Planet Index (LPI) characterizes the average change in population sizes of vertebrates and is considered one of the main indicators of the state of the planet.

Anna Toszogyova, Jan Smycka and David Storch from Charles University show that the LPI suffers from several mathematical and statistical issues, leading to a bias towards an apparent decrease even for balanced populations. The claim that vertebrate populations declined by 70% since 1970 is thus unsubstantiated. The study has been published in *Nature Communications*.

Few people doubt that we live in an era of unprecedented biodiversity loss. However, strong statements require strong support by data—in this case, reliable indicators of biodiversity change.

One of the most popular indicators of the current state of nature has been the LPI, bi-annually published by the World Wildlife Fund in The Living Planet Report. According to the LPI, population abundances of vertebrates decreased on average by two-thirds since 1970.

This number is really terrifying—such a population decreases in last 50 years would imply a huge global disaster. Not surprisingly, this statement has been widely cited in the media and by world environmental leaders, including Greta Thunberg and David Attenborough.

However, when this number was first published, some researchers suspected it was somehow problematic. We all know that many species rapidly decline, but field ecologists are at the same time aware of many

populations that have been rising in recent decades—for instance many large predators in both Europe and North America are now rapidly spreading, as are many non-native species.

More importantly, previous analyses based on systematic surveys of all populations of a large taxon across large regions indicated surprisingly balanced population increases and declines. Where then was such a scary number coming from?

The problem might be that standardized surveys typically comprised only some regions of the northern hemisphere, while more comprehensive global sampling may reveal a different picture.

"In 2019, we started to be interested in the abovementioned discrepancy, taking the data from the Living Planet Database, the basis of the LPI, to see if vertebrate populations from different parts of the world reveal different proportions of decreasing and increasing trends. To our surprise, this was not the case," says the senior author of the critique, prof. David Storch from the Department of Ecology, Faculty of Science, and the Center for Theoretical Study (CTS), Charles University.

Increasing and decreasing populations were more or less balanced regardless of study region or taxon. The same conclusion was reached by several studies published in about the same time—as the title of one of these papers says, there is a balance of winners and losers in the Anthropocene. So how is it possible that the LPI, based on similar types of data, suggests such a pronounced decline?

"Instead of further documenting the balance between declining and increasing populations in the Living Planet Database, we have decided to thoroughly explore the LPI itself, i.e. the method of its calculation. After two years of detailed inspection of LPI methodology, we have found several issues that bias the LPI towards indicating an overall population

decline even when decreasing and increasing populations are balanced," says the first author of the study, Dr. Anna Toszogyova from the CTS.

All the revealed issues lead to the bias towards decreasing LPI. After accounting for them, the average decline of vertebrate populations is substantially lower, and for the unweighted version of LPI (in which regions and taxa are not weighted by their species richness), it is indistinguishable from no average decrease at all.

However, this does not mean that in reality there is no overall decrease in vertebrate populations. Many regions that were severely transformed were almost certainly not sampled, and the most serious population decreases may be thus missing from the Living Planet Database.

On the other hand, many vertebrate populations may be recovering from their collapses that happened already before 1970. It would be naive to assume that the pressure on vertebrate populations started in the 1970s—many vertebrate populations were severely exploited already in the 19th century and the first half of the last century, and they recovered only in the last few decades due to increasing global awareness of environmental issues and socioeconomic changes across the world.

"The current phase of the Anthropocene is characterized by more complex changes than the simple disappearance of vertebrate populations. And this is a good news, after all," conclude the authors of the study.

More information: Anna Toszogyova et al, Mathematical biases in the calculation of the Living Planet Index lead to overestimation of vertebrate population decline, *Nature Communications* (2024). DOI: 10.1038/s41467-024-49070-x

Blog post:

https://communities.springernature.com/posts/the-living-planet-index-is-not-a-reliable-measure-of-population-changes

Provided by Charles University