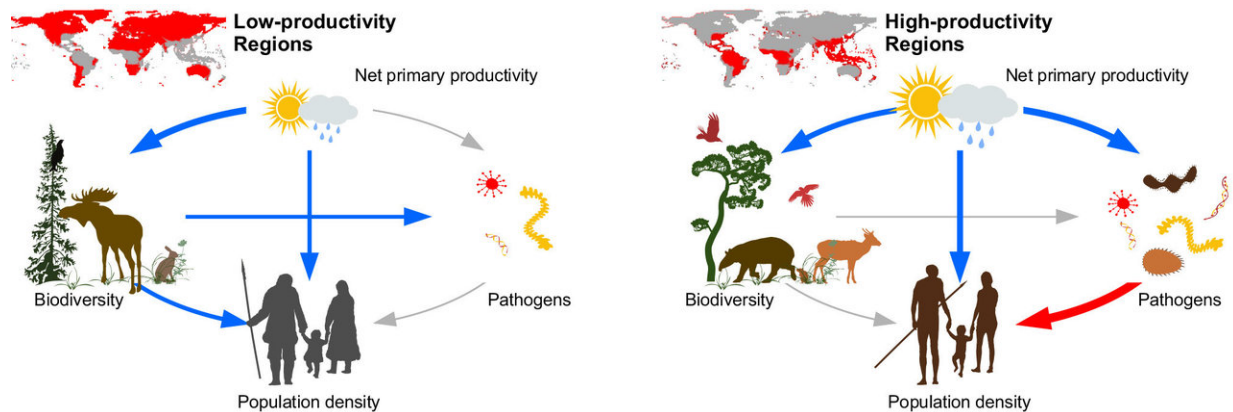


Cultural evolution has not freed hunter-gatherers from environmental forcing

January 4 2018



Blue, red, and gray arrows indicate positive, negative and statistically insignificant effect of a variable. Thickness of an arrow indicate the strength of the effect of a variable. Net primary productivity has also indirect effects on population density mediated by biodiversity and pathogens. Credit: Miska Luoto

Because of culture, humans are often considered to be divorced from the environment and not under the same ecological forcing as other species. However, in a new paper published in *Proceedings of the National Academy of Sciences (PNAS)* scientists from the University of Helsinki, Faculty of Science, show that key environmental parameters, namely climate-related primary productivity, biodiversity, and pathogen stress, have strong influence on the global pattern of population densities of ethnographically documented hunter-gatherers.

"These results demonstrate that cultural evolution has not freed human hunter-gatherers from strong environmental forcings," says Dr. Miikka Tallavaara.

Downside of the tropical affluence: abundance of pathogens

Interestingly, the importance of the three environmental variables varies between different parts of the globe: Productivity and biodiversity exert the strongest influence on [population](#) density in high- and mid-latitudes, whereas pathogen stress becomes more important in the tropics.

"Our results suggest that temperate and subtropical biomes provide the most suitable conditions for pre-agricultural humans due to the optimum between the positive effects of resource availability and the negative effects of [pathogens](#)," adds professor Miska Luoto.

The role of productive environments in the beginning of agriculture

A large fraction of the area of these highly suitable biomes has nevertheless been occupied by agricultural populations during the last 6000 years. Competing theories about the origins of agriculture emphasize the role of either productive and stable environments or population packing among hunter-gatherers as prime movers behind the transition from hunting and gathering to farming.

Dr. Tallavaara says, "Our study highlights the difficulty in judging between environmental and demographic causes of the transition, because resource availability and hunter-gatherer population density appear to be closely linked."

Environment has affected humans throughout our evolutionary history

Most of the history of our species, humans have been hunters and gatherers. Thus, the results of this study imply that human populations have been influenced by environmental conditions throughout their [evolutionary history](#).

"Environment has been crucial driver of human population dynamics up to the end of the pre-industrial era but we still are heavily depended on natural conditions and life-support systems, although modern technology has made it more invisible to most people in daily life," says Docent Jussi T. Eronen.

More information: Miikka Tallavaara et al, Productivity, biodiversity, and pathogens influence the global hunter-gatherer population density, *Proceedings of the National Academy of Sciences* (2017). [DOI: 10.1073/pnas.1715638115](#)

Provided by University of Helsinki

Citation: Cultural evolution has not freed hunter-gatherers from environmental forcing (2018, January 4) retrieved 27 April 2024 from <https://phys.org/news/2018-01-cultural-evolution-freed-hunter-gatherers-environmental.html>

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