Biodiversity loss may accelerate ecosystem destabilization

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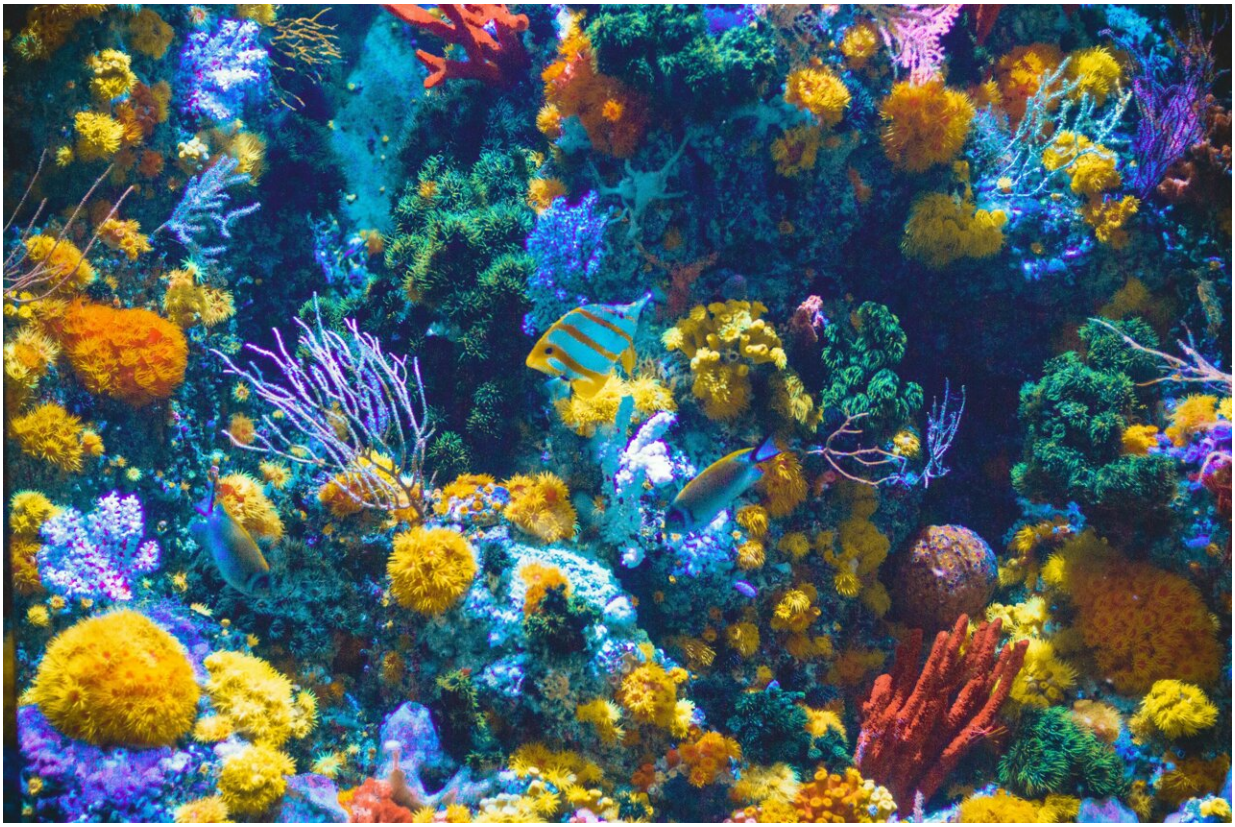

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What maintains stability within an ecosystem and prevents a single best competitor from displacing other species from a community? Does ecosystem stability depend upon the presence of a wide variety of

species, as early ecologists believed, or does diversity do the exact opposite, and lead to instability, as modern theory predicts?

A new study from McGill University and the Max Planck Institute and published recently in *Science* suggests an answer to this question that has stood unanswered for half a century among ecologists.

The researchers approached the question of population growth using a model that, so far, had not been used in this context—though it aligns with conventional wisdom and the way that people have traditionally modeled individual growth (from birth to maturity).

The researchers used data about population abundance, growth and biomass from a variety of species—including insects, fish and mammals—from across the globe, collected over the past 60 years. Their results, based on extensive analysis, suggests that, contrary to contemporary ecological theory, species diversity leads to ecosystem stability, as early ecologists had believed.

Growth in populations slows with density

"While nearly all prior theory assumes that populations grow exponentially, there is growing evidence that species actually follow a slightly different course, one in which exponential growth continuously slows down. It's a bit like the law of diminishing returns in economics," says Ian Hatton, a research associate in the Department of Earth and Planetary Sciences, at McGill University and the corresponding author on the paper.

"What's amazing is that such a small difference in population growth can have such a large effect on community interactions, completely reversing the predictions from decades of theory."

Their findings raise alarming questions about the potential large-scale impacts of biodiversity loss.

"This research is becoming increasingly urgent given the current rates of species extinction and loss of biodiversity," says Hatton. "In addition to better aligning theory with data, the model makes an unsettling prediction: losses in biodiversity can further destabilize an ecosystem and prevent them from recovering after a disturbance."

More information: Ian A. Hatton et al, Diversity begets stability: Sublinear growth and competitive coexistence across ecosystems, *Science* (2024). DOI: 10.1126/science.adg8488

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