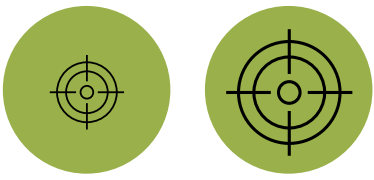
Is a Credibility Crisis on the Horizon for Ecology?

13%

Median statistical power in recent empirical ecology studies

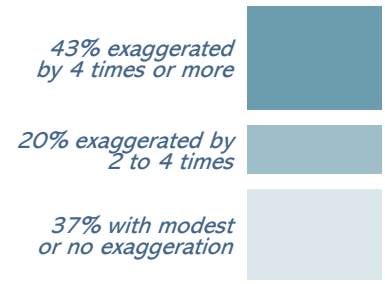


Statistical power is the likelihood that a research study will detect an effect of one variable on another outcome. Statistical power depends on the sample size, the variability of the outcome, and the size of the true effect. The conventional target for statistical power in research is 80%.

LIMITED STATISTICAL POWER

63%

Estimated proportion of effects reported in ecology studies that are exaggerated by a factor of two or more



When studies with limited statistical power detect an effect, the magnitude tends to be exaggerated. Publication bias favors reporting of these exaggerated results.

EXAGGERATION BIAS

In a survey of 244 ecologists, more than half predicted the median power of the study designs in our analysis would be 80% or higher. Much more than our best estimate: 13%

MISPERCEPTION OF STATISTICAL POWER

Analysis of recent ecology studies shows an unusual dip in the distribution of test statistics around the conventional threshold for statistical significance. This pattern is consistent with selective reporting of only statistically significant effects.

UNUSAL DISTRIBUTION OF TEST STATISTICS

This study assessed the prevalence of research practices that could indicate a looming credibility crisis in ecology. It examined 354 recent studies (2018 - 2020) from five popular journals in the field.

354
Studies

Ecology
Ecology Letters
Journal of Ecology
Nature
Science

THIS STUDY

These findings, which are not unique to ecology, might reduce confidence in research, but the authors do not believe we are in a crisis yet. Rather, the findings highlight how norms and incentives might skew researchers' behaviors. To avert a credibility crisis, the authors suggest some remedies:

Emphasize research designs and questions, not results.

Encourage pre-registration of studies.

Reward replication and reporting of imperfect, small, null, and "messy" results.

Raise awareness about the ethics of statistical research practices.

CAN WE AVERT A CRISIS?

Want to learn more?

Kimmel, Kaitlin, Meghan Avolio, Paul J. Ferraro. 2023. Empirical Evidence of Widespread Exaggeration Bias and Selective Reporting in Ecology. *Nature Ecology & Evolution.*

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