COMMENTARIES

What are we reading? Hot Topics and Authorship in Ecology Literature Across Decades

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Abstract

As the field of ecology evolves, analyses synthesizing trends in key topics addressed over the decades can provide historical context for the development of novel theories and methods, identify "hot topics" over time, and guide future research directions. Such syntheses in a field that aims to diversify can also help quantify efforts to increase representation and authorship by underrepresented groups in STEM. To identify hot topics in ecology, we analyzed key themes in the top-cited ecology papers in three two-decade timeframes spanning 1960–2019. We also analyzed authorship trends (gender identity and nationality) in the top-cited papers. We documented a shift from descriptive studies in single biological systems in the 1960–1970, to more synthesis-based papers and studies discussing human impacts on the environment in the 1980–1990, while the 2000s were dominated by novel quantitative and macroecological approaches. The top-cited papers were overwhelmingly from the United States and Europe, highlighting the need to make studies from across the globe more visible and accessible in the ecological literature. Finally, we detected a trend for more papers led by women authors, but a decline in papers with women last authors, indicating a need to retain women in leadership positions. Overall, our hot topics analysis highlights the expanding breadth and quantitative nature of ecology, but illustrates barriers to diversity in the perspectives represented in the top-cited papers.

Key words: authorship; collaboration; ecology; gender; hot topics; literature synthesis; nationality; senior author; top-cited studies; undergraduate research.

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Introduction

As ecology grows as a discipline, overviews of the trends spanning broad and diverse subdisciplines can improve the potential for interdisciplinary work and guide future research (Milojević 2015, Anderson et al. 2021). Ecology as a field of study aims to understand the relationships between organisms and their environment and use our knowledge of these relationships to address environmental problems (McCallen et al. 2019). However, the important themes in ecology shift over time (Thompson et al. 2001, Ladle et al. 2016, Reiners et al. 2017), allowing us to identify the historical and contemporary intellectual structures of the field as well as promising future directions. Here, rather than focusing on a single journal (e.g., Kim et al. 2018) or automated analyses of abstracts and key words (e.g., McCallen et al. 2019), we analyze the full-text of the top-cited papers in ecology over the past six decades to identify themes that may serve as a proxy for their perceived importance over time (i.e., "hot topics" in ecology; van Noorden et al. 2014).

Ecology requires diverse perspectives and leadership as the field continues to grow (Jimenez et al. 2019, Maas et al. 2019). However, ecology is often biased by overrepresentation of male-identifying scientists and scientists from North America and Europe (Whelan and Schimel 2019). This bias de-values perspectives and potential topics of research interest from underrepresented groups or scientists from the Global South. Efforts to quantify and increase diversity, equity, and inclusion (DEI) in ecology often question whether increased representation of these groups corresponds with rates of authorship in the ecological literature (Salerno et al. 2019, Whelan and Schimel 2019, Maas et al. 2021, Pettorelli et al. 2021). However, authorship trends can vary between early- vs. late-career researchers (Grogan 2019, Huang et al. 2020), resulting in biases in top-published or top-cited authors. Specifically, if DEI measures are increasing diversity in academia, we would expect women authors and people associated with institutions not from the Global North (i.e., Europe, the United States, and Canada) to have increased authorship at both a more early-career stage (i.e., first authors leading studies; Tscharntke et al. 2007) and in leadership positions (i.e., senior authors generally responsible for training and supervising; Duffy 2017) over time. Moreover, rising authorship among underrepresented groups should increase their representation in the top-cited publications in ecology.

Using a dataset of the 25 most-cited ecology papers published during three timeframes (1960–1979, 1980–1999, and 2000–2019), we address the following questions: (1) Have the "hot topics" in ecology literature (i.e., themes in the most-cited papers) changed over time? (2) Have authorship trends (collaborations, nations, and gender identity) in the most-cited papers changed over time?

Methods

We compiled papers for this study from the ISI Web of Science publication database, searched on June 1 2019. We defined the papers by searching for the top 25 cited papers with the key word "ecology" in three two-decade timeframes: 1960–1979, 1980–1999, and 2000–2019 ($N = 75$ papers). A similar 20-year timeframe was used by Neff and Corley (2009). We completed this exercise as part of a summer undergraduate research program in 2019; therefore, any 2019 papers include citations from only half the year. Additionally, the most recent papers are unlikely to have had sufficient time to be as well-cited as older papers within the 2000–2019 papers, likely biasing our top-cited results (and authorship trends) to the early 2000s.

Each author independently assigned the 25 papers from each timeframe into categories reflecting the key themes of each paper. A paper could be assigned to multiple themes. Each author compiled their own categories, which were combined when possible. Major themes everyone identified included: statistical models, methods (novel approaches), synthesis papers (summarizing knowledge of a given area), "ecology of" (descriptive papers about an organism or phenomenon), spatial scale, theoretical papers, and human impacts. All themes and descriptions are provided in Appendix S1: Table S1.

We collected demographic data for each paper, including number of authors, first author pronouns (she/her or he/him [we found no reported they/them or mixed pronouns]; to avoid assumptions of gender based on names, if we could not determine author pronouns from a lab website, news article, memoir, or similar resource, we left pronouns blank), last author pronouns, and country of first author's institution. We note that we determined more pronouns from 2000–2019 due to increased accessibility of online resources reporting pronouns and because the use of non-binary pronouns is recent (i.e., older articles might still not report an author's preferred pronouns).

Data analysis

To examine how each timeframe's (1960–1979, 1980–1999, and 2000–2019) top-cited papers, or hot topics, differ thematically, we used a Principal Components Analysis (PCA) to break the categories identified by each author into uncorrelated component axes (Appendix S1: Table S2) using the "factoMineR" package in R v.4.1.0 (Lê et al. 2008, R Core Development Team 2021). We used the top eight axes identified (which cumulatively explained >70% of the variance) as predictors in a linear model testing how hot topics varied by timeframe. We included timeframe as the response variable and the PC axes as predictor variables.

To examine changes in authorship and collaboration over time, we used three separate generalized linear models (lme4 package; Bates et al. 2015). We included (1) number of authors (Gaussian distribution) and (2) first author and (3) last author gender identities (both binomial distributions, where 1 = she/her and 0 = he/him) as three separate response variables and timeframe as a fixed predictor variable. Single-authored papers were only included as first authors.

Results and discussion

Trends in hot topics

Across all timeframes, synthesis papers were the most-represented (N = 61 papers were assigned to this theme), followed by papers presenting novel methods (N = 36) and describing the ecology of a system (N = 34).

Hot topics differed among the three timeframes examined (Appendix S1: Table S3; Fig. 1). They were most affected by PC axes 1, 2, and 3 (Appendix S1: Table S3; all $P < 0.05$), which corresponded to "ecology of," "models" (i.e., statistics), and "human impacts," respectively (Appendix S1: Fig. S1). 1960–1979 was characterized by "ecology of" papers, which consisted of descriptive papers about a given system (usually wildlife or plants). This reflects ecologists studying organisms at the species level from the onset of the field (Anderson et al. 2021). There were also more papers

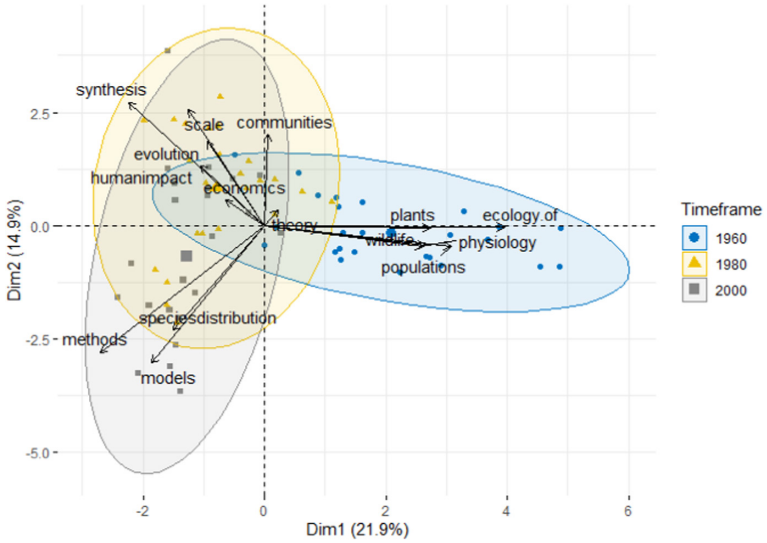

Fig. 1. Variation in themes among the 25 top-cited ecology papers in three timeframes: 1960–1979 (blue), 1980–1999 (yellow), and 2000–2019 (gray). Dimension 1 explains 21.9%, whereas Dimension 2 explains 14.9% of the variation in themes. Ellipses are 95% confidence intervals (grouped by timeframe).

on physiology and population dynamics relative to other timeframes. In 1980–1999, papers summarizing the state of a particular subfield ("synthesis") became more common, as did papers about spatial scale and human impacts. Similar to an analysis by Anderson et al. (2021), the shift to focus on human impacts on the environment (rather than descriptions of organisms or habitats) may reflect changing societal awareness of anthropogenic change and biodiversity loss, as conservation became a recognized field in 1985 (Meine et al. 2006) and ecologists began studying threats to biodiversity loss (Palsson et al. 2013). Unlike studies examining themes by key words, we did not detect an increase in top-cited papers on associated solutions, policy, or management (McCallen et al. 2019). Finally, 2000–2019's most cited papers were dominated by novel methods, particularly in statistical modeling and species distributions, again matching previous analyses detecting a shift from qualitative to quantitative methods just before the 2000s (Ríos-Saldaña et al. 2018, Anderson et al. 2021). The increase in macroscale approaches (e.g., species distribution models) in the 2000s (as opposed to the more microscale, population-based studies of the 1960s) likely corresponds with the adoption of large-scale ecological datasets with increased spatial and temporal extents and improved geospatial technologies (Soranno and Schimel 2014).

Collaborations and nations

Collaborative studies have increased over time, with the number of authors included on a paper rising in each timeframe ($F_{1,73} = 11.14$, $P = 0.001$; Appendix S1: Table S4; Fig. 2A). This finding mirrors previous findings of more authors listed on papers in ecology (Duffy 2017), the increasing formation of interdisciplinary teams to solve ecological patterns (Pannell et al. 2019) and the trend for multiple-author papers to be more cited than single-author papers (Persson et al. 2004).

The top-cited studies are dominated by North American and European institutions (Fig. 3). Specifically, the United States contributed 58% (43/74) of the top-cited papers, followed by the United

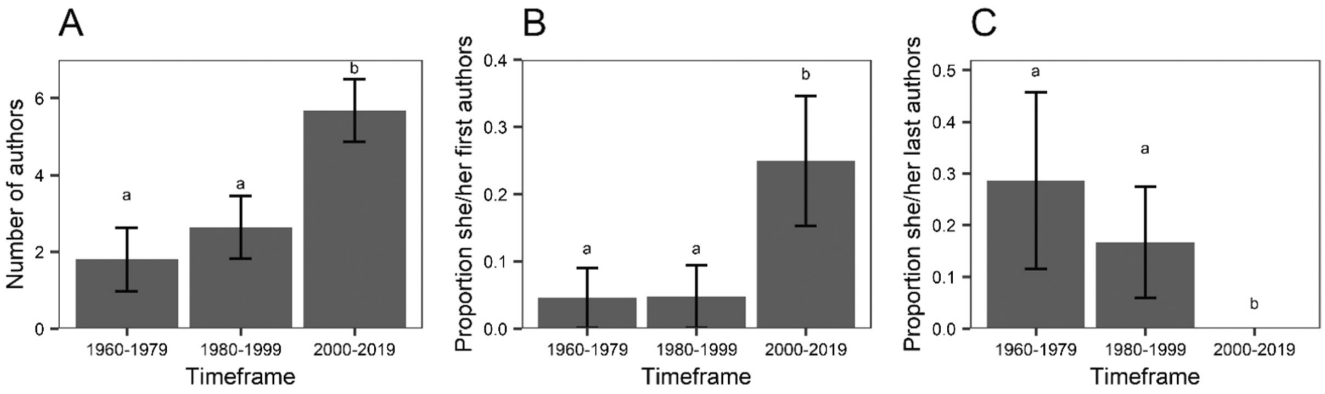

Fig. 2. (A) Number of authors listed on a paper, (B) proportion of women (she/her pronouns) first authors, and (C) proportion of women last authors across three timeframes (1960–1979, 1980–1999, and 2000–2019). Values are least square means ± standard error. Letters represent differences at the α = 0.05 level.

Kingdom (N = 9), other European countries (N = 10; Germany N = 3; Switzerland and the Netherlands N = 2 each; France, Spain, and Sweden N = 1 each), Canada (N = 4), and Australia and New Zealand (N = 4). Universities based in Costa Rica, Fiji, and Venezuela each contributed one paper to the 1960–1979 top-cited list (Stiles 1975, White 1978, Zapata and Arroyo 1978) and Brazil contributed one paper to the 2000s top-cited list (Ribeiro et al. 2009). Our finding suggests that previously detected trends for increasing authorship from underrepresented countries (e.g., Maas et al. 2021) are not mirrored in top-cited publications despite broad interest in how ecological patterns and processes vary across the globe. Such studies would benefit from truly global collaborations (Nuñez et al. 2019). See Nuñez et al. (2021) for an excellent overview of how to make ecology global, including addressing structural barriers in language, funding (including publication costs), training, biases, and research cultures that reward English-speaking scientists from privileged areas.

Gender identity

First authorship among women increased between the 1960–1999 and 2000–2019 timeframes ($\chi^2_{1,61}$ = 4.59, P = 0.03; Appendix S1: Table S4; Fig. 2B). No women first-authored a top-cited paper from 1960–1979. However, only two and five women were first authors in 1980–1999 and 2000–2019,

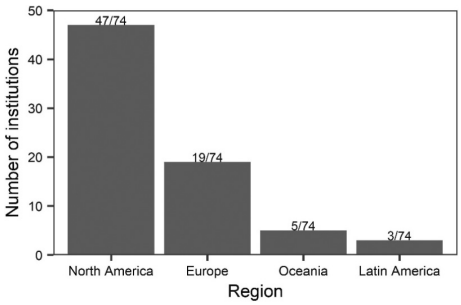

Fig. 3. Proportion of first authors affiliated with institutions from four regions: North America (the United States and Canada), Europe (the United Kingdom, Germany, Switzerland, the Netherlands, France, Spain, and Sweden), Oceania (Australia, New Zealand, and Fiji), and Latin America (Costa Rica, Brazil, and Venezuela). We provide the number of studies for a region/total number of studies above each bar.

respectively. This pattern mirrors the slowly increasing proportions of women authors over time detected in other studies, potentially due to increased women trainees and early-career researchers in ecology (Maas et al. 2021).

In contrast, papers last-authored by a woman have declined over time, with no women listed as senior author in 2000–2019 ($\chi^2_{1,33}$ = 4.33, P = 0.04; Appendix S1: Table S4; Fig. 2C). Salerno et al. (2019) detected an increase in women authors but no increase in women senior authors in 10 ecology and zoology journals. This pattern is a likely consequence of the leaky pipeline in STEM, as fewer women remain in leadership positions (e.g., associate or full professors) relative to males (Damschen et al. 2005, Monroe et al. 2008, Martin 2012, Ceci et al. 2014, Duffy 2017). We acknowledge that this result assumes that senior authorship serves as a proxy for later-stage careers or leadership positions (following Salerno et al. 2019), although this depends on laboratory culture or may reflect the amount of intellectual contribution (we also note that this paper's first author is the most senior). However, in ecology most researchers view the last author as the most senior author on a paper (Duffy 2017). Papers authored by women can also be less visible due to fewer publications (West et al. 2013), higher standards for publication (Monroe 2013, Silbiger and Stubler 2019), fewer speaking engagements (Farr et al. 2017, Nittrouer et al. 2018), costs of collaborating (e.g., negative impacts of co-authorship on tenure decisions for women [Sarsons 2017], decreasing citations for women who co-author studies [Hengel and Moon 2020], or misallocation of credit to men in group projects [Koffi 2021; Sarsons et al. 2021]), less success in online dissemination of research (Vásárhelyi et al. 2021), and less recognition in citation counts (Huang et al. 2020) relative to males. Altogether, our results agree with other recent authorship trends in biology and ecology (Fox et al. 2018) and indicate that institutional changes should focus on retention of women (e.g., reducing disparities in participation, opportunities, and credit; see Salerno et al. 2019, Almukhambetova et al. 2021) to increase leadership and publication by women at later career stages.

Conclusions

We analyzed these papers as part of a National Science Foundation Research Experience for Undergraduates (NSF REU) professional development activity to familiarize students with Web of Science searches and the structure of a scientific paper. We focused on key components of the abstracts in laboratory meetings to synthesize the most relevant information, before we each skimmed each paper to assign themes. In this exercise, students were able to identify some common authorship trends prior to analysis (e.g., number of collaborators) and discussed how research themes develop over time (e.g., shift from baseline, descriptive information to macroecological, statistical methods; although one limitation of our study was not being able to tease apart trends within smaller sets of years [e.g., decades] or analyze specific key words; we selected three timeframes and broad themes due to the short span of a summer REU program). One surprising result we noted was the limited number of "human impacts" or climate change papers, despite the popularity of some (e.g., Vitousek et al. 1997, Parmesan 2006). However, as van Noorden et al. (2014) note in their analysis of top-cited *Nature* papers, the most well-known papers do not necessarily become the most cited, but rather those that describe theories and methods essential to the development of their fields.

The hot topics in ecology over the past six decades appear to have evolved from descriptive studies, to studies positing theoretical hypotheses and examining the effects of humans on biodiversity, to a

more data-driven field focused on improved quantitative methods. While some debate a loss of natural history within ecology (Able 2016, Barrows et al. 2016), the continued interest in human impacts and species distributions suggests that ecologists can continue to combine natural history and develop novel quantitative and applied approaches to address complex environmental problems. However, our results also highlight a lack of diversity in the perspectives represented in the top-cited ecology literature.

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Data availability statement

Data for this paper are available in Figshare http://doi.org/10.6084/m9.figshare.19719202

Literature Cited

Able, K. W. 2016. Natural history: an approach whose time has come, passed, and needs to beresurrected. ICES Journal of Marine Science 73:2150–2155.

Almukhambetova, A., D. H. Torrano, and A. Nam. 2021. Fixing the leaky pipeline for talentedwomen in STEM. International Journal of Science and Mathematics Education. https://doi.org/10.1007/s10763-021-10239-1

Anderson, S. C., et al. 2021. Trends in ecology and conservation over eight decades. Frontiers in Ecology and the Environment 19:274–282.

Barrows, C. W., M. L. Murphy-Mariscal, and R. R. Hernandez. 2016. At a crossroads: the nature of natural history in the twenty-first century. Bioscience 66:592–599.

Bates, D., M. Mächler, B. Bolker, and S. Walker. 2015. Fitting linear mixed-effects models, fitting linear mixed-effects models Usinglme4 using lme4. Journal of Statistical Software 67:1–48.

Ceci, S. J., D. K. Ginther, S. Kahn, and W. M. Williams. 2014. Women in academic science: a changing landscape. Psychological Science in the Public Interest 15:75–141.

Damschen, E. I., K. M. Resenfeld, M. Wyer, D. Murphy-Medley, T. R. Wentworth, and N. M. Haddad. 2005. Visibility matters: increasing knowledge of women's contributions to ecology. Frontiers in Ecology and the Environment 3:212–219.

Duffy, M. A. 2017. Last and corresponding authorship practices in ecology. Ecology and Evolution 7:8876–8887.

Farr, C. M., S. P. Bombaci, T. Gallo, A. M. Manan, H. L. Riedl, L. T. Stinson, K. Wilkins, D. E. Bennett, T. Nogeire-McRae, and L. Pejchar. 2017. Addressing the gender gap in distinguished speakers at professional ecology conferences. Bioscience 67:464–468.

Fox, C. W., J. P. Ritchey, and C. E. T. Paine. 2018. Patterns of authorship in ecology and evolution: first, last, and corresponding authorship vary with gender and geography. Ecology and Evolution 8:11492–11507.

Grogan, K. E. 2019. How the entire scientific community can confront gender bias in the workplace. Nature Ecology and Evolution 3:3–6.

Hengel, E., and E. Moon. 2020. Gender and equality at top economics journals. Web. Gender and quality at top economics journals (liverpool.ac.uk).

Huang, J., A. J. Gates, R. Sinatra, and A. L. Barabási. 2020. Historical comparison of gender inequality in scientific careers across countries and disciplines. Proceedings of the National Academy of Sciences 117:4609–4616.

Jimenez, M. F., T. M. Laverty, S. P. Bombaci, K. Wilkins, D. E. Bennett, and L. Pejchar. 2019. Underrepresented faculty play a disproportionate role in advancing diversity and inclusion. Nature Ecology and Evolution 3:1030–1033.

Kim, J. Y., G.-J. Joo, and Y. Do. 2018. Through 100 years of ecological Society of America publications: development of ecological research topics and scientific collaborations. Ecosphere 9:e02109.

Koffi, M. 2021. Innovative ideas and gender inequality. *EconStor*. Working paper series no.35, Canadian labour economics forum (CLEF), University of Waterloo. https://www.econstor.eu/handle/10419/234474

Ladle, R. J., R. A. Correia, Y. Do, G.-J. Joo, A. C. M. Malhado, R. Proulx, J.-M. Roberge, and P. Jepson. 2016. Conservation culturomics. Frontiers in Ecology and the Environment 14:269–275.

Lê, S., J. Josse, and F. Husson. 2008. FactoMineR: an R package for multivariate analysis. Journal of Statistical Software 25:2–18.

Maas, B., R. J. Pakeman, L. Godet, L. Smith, V. Devictor, and R. Primack. 2021. Women and global south strikingly underrepresented among top-publishing ecologists. Conservation Letters 14:e12797.

Maas, B., A. Toomey, and R. Loyola. 2019. Exploring and expanding the spaces between research and implementation in conservation science. Biological Conservation 240:108290.

Martin, L. J. 2012. Where are the women in ecology? Frontiers in Ecology and the Environment 10:177–178.

McCallen, E., J. Knott, G. Nunez-Gir, B. Taylor, I. Jo, and S. Fei. 2019. Trends in ecology: shifts in ecological research themes over the past four decades. Frontiers in Ecology and the Environment 17:109–116.

Meine, C., M. Soulé, and R. F. Noss. 2006. 'A mission-driven discipline': the growth of conservation biology. Conservation Biology 20:631–651.

Milojević, S. 2015. Quantifying the cognitive extent of science. Journal of Informetrics 9:962–973.

Monroe, K. 2013. Tougher standards for female scholars? The psychology behind them and policies to eliminate them. International Studies Perspectives 14:476–484.

Monroe, K., S. Ozyurt, T. Wrigley, and A. Alexander. 2008. Gender equality in academia: bad news from the trenches, and some possible solutions. Perspectives on Politics 6:215–233.

Neff, M. W., and E. A. Corley. 2009. 35 years and 160,000 articles: a bibliometric exploration of the evolution of ecology. Scientometrics 80:657–682.

Nittrouer, C. L., M. R. Hebl, L. Ashburn-Nardo, and V. Valian. 2018. Gender disparities in colloquium speakers at top universities. Proceedings of the National Academy of Sciences 115:104–108.

Nuñez, M. A., J. Barlow, M. Cadotte, K. Lucas, E. Newton, N. Pettorelli, and P. A. Stephens. 2019. Assessing the uneven global distribution of readership, submissions and publications in applied ecology: obvious problems without obvious solutions. Journal of Applied Ecology 56:4–9.

Nuñez, M. A., M. C. Chiuffo, A. Pauchard, and R. D. Zenni. 2021. Making ecology really global. Trends in Ecology and Evolution 36:766–769.
Palsson, G., et al. 2013. Reconceptualizing the 'Anthropos' in the Anthropocene: integrating the social sciences and humanities in global environmental change research. Environmental Science and Policy 28:3–13.
Pannell, J. L., A. M. Dencer-Brown, S. S. Greening, E. A. Hume, R. M. Jarvis, C. Mathieu, J. Mugford, and R. Runghen. 2019. An early career perspective on encouraging collaborative and interdisciplinary research in ecology. Ecosphere 10:e02899.
Parmesan, C. 2006. Ecological and evolutionary responses to recent climate change. Annual Review of Ecology, Evolution and Systematics 37:637–669.
Persson, O., W. Glänzel, and R. Danell. 2004. Inflationary bibliometric values: the role of scientific collaboration and the need for relative indicators in evaluative studies. Scientometrics 60:421–432.
Pettorelli, N., J. Barlow, M. A. Nuñez, R. Rader, P. A. Stephens, T. Pinfield, and E. Newton. 2021. How international journals can support ecology from the global south. Journal of Applied Ecology 58:4–8.
R Core Team. 2021. R: a language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org/
Reiners, W. A., J. A. Lockwood, D. S. Reiners, and S. D. Prager. 2017. 100 years of ecology: what are our concepts and are they useful? Ecological Monographs 87:260–277.
Ribeiro, M. C., J. P. Metzger, A. C. Martensen, F. J. Ponzoni, and M. M. Hirota. 2009. The Brazilian Atlantic Forest: how much is left, and how is the remaining forest distributed? Implications for conservation. Biological Conservation 142:1141–1153.
Ríos-Saldaña, C. A., M. Delibes-Mateos, and C. C. Ferreira. 2018. Are fieldwork studies being relegated to second place in conservation science? Global Ecology and Conservation 14:e00389.
Salerno, P. E., M. Páez-Vacas, J. M. Guayasamin, and J. L. Stynoski. 2019. Male principal investigators (almost) don't publish with women in ecology and zoology. PLoS One 14:e0218598.
Sarsons, H. 2017. Recognition for group work: gender differences in academia. American Economic Review 107:141–145.
Sarsons, H., K. Gërxhani, E. Rueben, and A. Schram. 2021. Gender differences in recognition for group work. Journal of Political Economy 129:101–147.
Silbiger, N. J., and A. D. Stubler. 2019. Unprofessional peer reviews disproportionately harm underrepresented groups in STEM. Peer J 7:e8247.
Soranno, P. A., and D. S. Schimel. 2014. Macrosystems ecology: big data, big ecology. Frontiers in Ecology and the Environment 12:3.
Stiles, F. G. 1975. Ecology, flowering phenology, and hummingbird pollination of some costa Rican Heliconia species. Ecology 56:285–301.
Thompson, J. N., et al. 2001. Frontiers of ecology: as ecological research enters a new era of collaboration, integration, and technological sophistication, four frontiers seem paramount for understanding how biological and physical processes interact over multiple spatial and temporal scales to shape the earth's biodiversity. Bioscience 51:15–24.
Tscharntke, T., M. E. Hochberg, T. A. Rand, V. H. Resh, and J. Krauss. 2007. Author sequence and credit for contributions in multiauthored publications. PLoS Biology 5:e18.
Van Noorden, R., B. Maher, and R. Nuzzo. 2014. The top 100 papers: nature explores the most- cited research of all time. Nature 514:550–553.
Vásárhelyi, O., I. Zakhlebin, S. Milojević, and E.-A. Horvát. 2021. Gender inequities in the online dissemination of scholars' work. Proceedings of the National Academy of Sciences 118:e2102945118.

Vitousek, P. M., H. A. Mooney, J. Lubchenco, and J. M. Melillo. 1997. Human domination of Earth's ecosystems. Science 277:494–499.
West, J. D., J. Jacquet, M. M. King, S. J. Correll, and C. T. Bergstrom. 2013. The role of gender in scholarly authorship. PLoS One 8:e66212.
Whelan, A. M., and D. S. Schimel. 2019. Authorship and gender in ESA journals. Bulletin of the Ecological Society of America 100:1–9.
White, T. C. R. 1978. Importance of a relative shortage of food in animal ecology. Oecologia 33:71–86.
Zapata, T. R., and M. T. K. Arroyo. 1978. Plant reproductive ecology of a secondary deciduous tropical forest in Venezuela. Biotropica 10:221–230.

Supporting Information

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