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Research Letters

Female ecologists are falling from the academic ladder: A call for action

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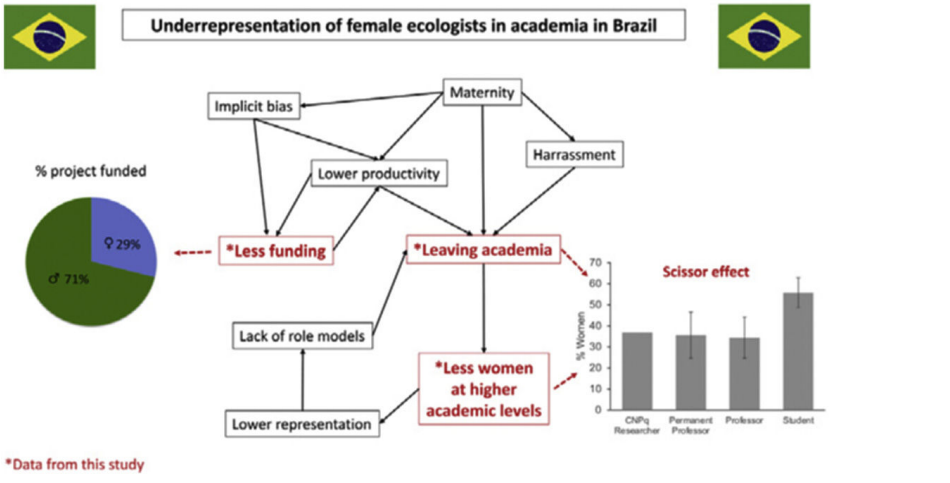
HIGHLIGHTS

- Science needs diversity to be more innovative and creative but women are still greatly underrepresented in many fields.
- Brazilian female ecologists get half the amount of grant funding and higher scholarship rejections compared to men.
- In Brazil, Ecology Post-Graduate programs show a strong decrease in women presence at the highest academic levels.
- Lower access to project funding, maternity, implicit bias, harassment, no role models can lead to women leaving academia.
- Involving more women and more people from underrepresented groups will lead to better science and conservation practices.

GRAPHICAL ABSTRACT



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ABSTRACT

In order to advance and to have new perspectives, science needs diversity. However, women are still underrepresented in various scientific areas, including ecology and conservation. A big gender gap still exists in academia, especially at the highest positions. Here, I investigated gender bias in Brazilian post-graduate programs in Ecology at different hierarchical levels, as well as in project funding and scholarship application success. I found evidence of a scissors effect, where women were the majority among students (56%), while men were among Professors (64%). Furthermore, prestigious scholarship applications submitted by women had higher rejection rates. Female ecologists were only awarded 29% of funded projects and, per grant, received almost half the amount of funding than their male peers. Brazil, like other countries, needs to pay more attention to gender disparities at the highest academic positions in science, and urgently apply measures to reduce them. Actions that support scientist mothers should be implemented, such as considering maternity leave during career evaluations. Increasing the visibility of women and celebrating publicly their achievements could stimulate young women to pursue a career in science and reduce the gender gap. Diversity improves our understanding of ecological phenomena and optimize the success of conservation practices.

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Introduction

On 8 March 2017, Elsevier reported data about STEM papers published by gender across 12 countries around the globe (Elsevier Gender Report, 2017). These data were especially encouraging for Brazil, which, together with Portugal, showed the highest percentage of women researchers (49%). Brazil also showed the highest increase in the percentage of women researchers in the last 15 years (11%). Another report on the scientific productivity of Iberoamerican countries showed that, in Brazil, 72% of the papers had at least one woman as one of the authors, being the country with the highest percentage (OCTS-OEI, 2018).

This is certainly very encouraging for women in academia around the world and, in particular, for Brazil, but a more detailed analysis on the careers of women scientists is necessary to understand if female presence has improved at all academic levels and thus the gender gap is in fact reduced. Indeed, in many STEM fields, even those where the proportion of women has typically been high (e.g. Biology), the presence of women generally decreases with increasing academic position, a phenomenon known as "scissors effect" (Areas et al., 2020) or "leaky pipeline" (Pell, 1996), where women scientists are more likely to leave academia after their PhD (Hill et al., 2010). The presence of women drops substantially going up the academic ladder, where very few women occupy the most prestigious positions. The reasons behind the loss of women scientists are considered to be the combination of several factors that hinder the persistence of women in academia. Some of these obstacles are represented by different forms of harassment (Clancy et al., 2014; Johnson et al., 2018), maternity and a higher share of household chores (Morgan et al., 2021), implicit bias such as in recommendations and hiring (Dutt et al., 2016; Eaton et al., 2020; Moss-Racusin et al., 2012), and lower research funding (Lee and Ellemers, 2015).

The objective of this study was to quantify the presence of female ecologists in academia at different career stages in Brazil, and to investigate possible biases for funding. I thus analyzed Ecology grant funding with a gender perspective. In particular, I examined if there was a gender-biased application success that disfavored female ecologists that applied to prestigious productivity scholarships. To investigate the existence of a scissors effect, I estimated the percentage of women among students and professors in ecology and conservation post-graduate programs. Studies on gender bias in science and academia are mostly from North America and Europe. Brazil is thus a perfect model country to investigate the prevalence of gender bias in ecology, as it is the most biologically diverse country in the World. Ecologists are professionals that play a very important role in basic research on biodiversity and are very involved in conservation efforts. Brazil is one of the countries where biodiversity loss is highest and ecological studies and conservation efforts are urgent. Quantifying the extent of gender bias is necessary to amend this scenario and to make ecological conservation a more inclusive field, thus leading to more effective and innovative actions that are urgent in a megadiverse country like Brazil.

Methods

To investigate differences in funding between male and female ecologists, I used data on all type of grants from the CNPq "Ecology and Limnology" area that ended in 2015. CNPq (Conselho Nacional de Desenvolvimento Científico e Tecnológico) is the Brazilian National Council for Scientific and Technological Development, which is an agency of the Ministry of Science and Technology that funds research. I obtained the data from the CNPq "Transparency Portal" and analyzed the sum of the total amount of money awarded, the average funding per project, and the number of grants awarded to male and female researchers in the "Ecology and Limnology" area, which is the committee reserved for ecological projects.

I also collected data on the number of female and male researchers in the "Ecology and Limnology" area from the CNPq website in October 2016. Every year, CNPq offers a 3-year Productivity Scholarship to the best researchers in various areas of Science and Technology. These scholarships are very prestigious and are divided into 1A, 1B, 1C, 1D and 2, being 2 the lowest and 1A the highest category. I also used data from the 2017 CNPq Productivity Scholarship applications for the "Ecology and Limnology" Committee and estimated the percentage of men and women who were awarded each type of scholarship, as well as the percentage of those who were not awarded the scholarship.

Finally, I collected data on professor and student genders for 29 post-graduate programs in different fields of ecology and conservation in Brazil using the Sucupira database in October 2016. Sucupira is managed by CAPES (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior), a governmental agency of the Brazilian Ministry of Education, and includes all information on post-graduate programs, thus providing a complete dataset for this research purpose. Brazilian names are gender-specific, but whenever the name was equivocal to define the person's gender, I looked it up online and searched for information that could confirm it. I used a binary gender classification, as gender identification is not included in the Sucupira database. It would be ideal to use a more inclusive gender classification system, but, because of the lack of it, binary gender classification is most commonly used in studies of representation of women (Santamaría and Mihaljević, 2018), in spite of its limitation.

CAPES classifies the post-graduate programs with PhD and Masters courses on a scale from 4 to 7, where 7 is the highest status. Professors in each program are divided into 2 categories: "Permanent" and "Collaborator". "Permanent" professors are the bulk of each program and more numerous. Achieving this status requires higher standards, which generally reflects a higher number of publications and more advised students, than professors in the "Collaborator" category. For each post-graduate program, I also collected information on its CAPES score (4–7) and its geographical location (North, Northeast, Central West, Southeast, South). For the post-graduate data, I calculated the % of women for each category. I conducted one-way ANOVAs and Tukey's HSD post hoc tests to investigate if different CAPES scores and different geographical regions affected the percentage of female professors (permanent and collaborator together) and students. I also conducted a Pearson's correlation analysis to see if female professor percentage was correlated with female student percentage.

Results

With regards to the CNPq grants, the total funding awarded to all ecology grants was R$6,954,162 and female ecologists received overall 60% less funding (R$1,377,719) compared to their male peers (Fig. 1). The average amount of funding per grant received by male ecologists was R$103,267 (±R$121,335 SD) (62.3%), while it was R$62,623 (±R$41.132 SD) (37.7%) for female ecologists (Fig. 1). Male ecologists were coordinators of 54 (71.1%) grants, while female ecologists coordinated 2.5 times less projects than men (only 22) (Fig. 1).

In 2016, CNPq researchers included 126 men (63.3%) and 73 women (36.7%). In 2017, approximately one third (36%) of the candidates that applied for a CNPq Productivity Scholarship were women (Table 1 and Fig. 2). There were no 1A scholarship awarded to either men or women, but for the 1B, 1C, and 1D categories, women represented only one quarter or less of the recipients (Table 1 and Fig. 2). Only at the lowest category (2) the percent-

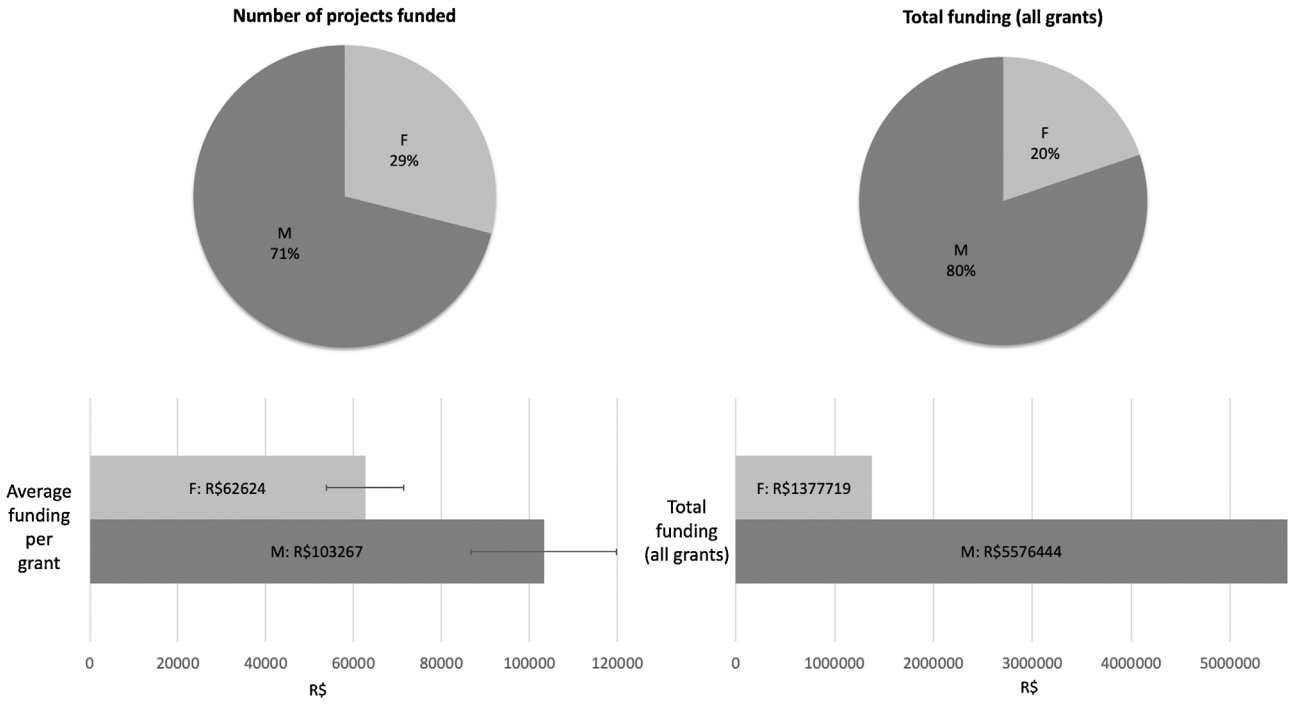


Fig. 1. Pie chart on the left shows the number of CNPq projects of the "Ecology and Limnology" area that ended in 2015 that got awarded to female and male researchers (%). The pie chart on the right shows the sum of the total amount of money (%) awarded to all grants. The bar graphs show the average amount of funding per grant (on the left) and the total amount of money including all grants. Error bars represent ±1 Standard Errors.

Table 1
Distribution of CNPq scholarships of the Ecology and Limnology area awarded and rejected in the 2017 application.

CNPq scholarship type	Number of women	Number of men	Total number	Proportion of women	Proportion of men
1B	2	10	12	0.17	0.83
1C	1	3	4	0.25	0.75
1D	5	15	20	0.25	0.75
2	12	15	27	0.44	0.56
Not approved	20	29	49	0.41	0.59
Total	40	72	112	0.36	0.64

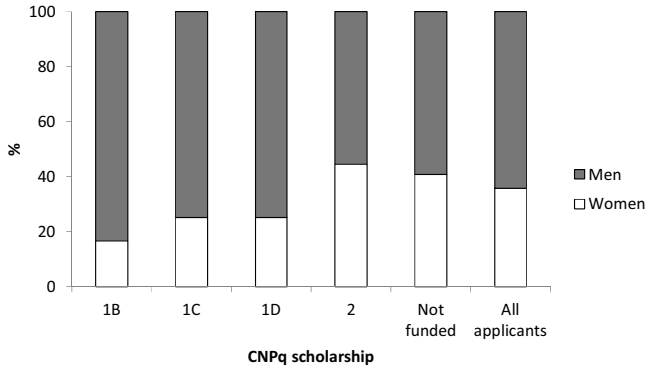


Fig. 2. Distribution of CNPq scholarships applications of the Ecology and Limnology area that were awarded (1B, 1C, 1D, 2) and rejected in the 2017 application process. Percentage of male applicants are in dark grey and female in white.

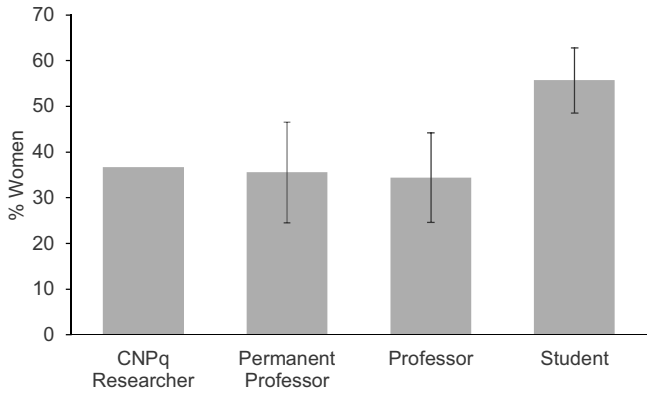


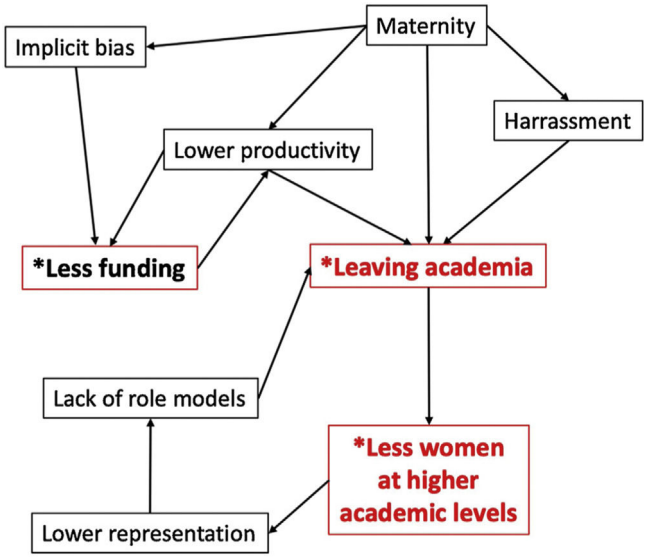
Fig. 3. Percentage of women in different categories in the Brazilian Ecology Post-Graduate programs and CNPq Researchers. The "Professors" category represents the sum of Permanents and Collaborators. Error bars indicate ±1 Standard Deviation.

age of women grantees (44%) was higher than the percentage of women applying (Fig. 2). Forty percent of the applications submitted by men were rejected, while 50% of those submitted by women were rejected.

In the post-graduate programs, the average % female professors (permanent plus collaborators) was 34.4% (±9.8 SD). The lowest % female professor was 12.5%, while the highest, and the only one above 50%, was 51.7% (Table S1). The average % female professor in the Permanent category was 35.5% (±11.0 SD), but none of the programs had women presence over 50% – only at one Institution it was exactly 50% (Table S1). The average % female student (Masters and PhD together) was 55.7% (±7.1 SD), where the lowest presence of female students was 40% and the highest was 72% (Table S1).

I did not find significant differences in the % female professor between CAPES score ($F_{1,27} = 0.16$, $p = 0.69$) nor geographical

Box 1: Schematic diagram of the multiple factors affecting the persistence of female researchers in academia. * indicates data reported in this study.



regions ($F_{4,24} = 1.77$, $p = 0.17$) (Fig. S1). However, while CAPES score had no effect on the % female students ($F_{1,27} = 0.38$, $p = 0.54$), the geographical region did ($F_{4,24} = 3.83$, $p = 0.015$), as the programs in the North were those with the lowest percentage of female students (Fig. S1). There was no significant correlation between % female students and % female professors ($R = 0.25$, $t = 1.36$, $p = 0.18$).

Discussion

This study showed that, even in Brazil, where there is an apparent gender equality among researchers across disciplines (Elsevier Gender Report, 2017), in the field of Ecology there is still a pervasive gender bias in funding and women representation. The presence of women decreases going up the academic ladder in the post-graduate programs, thus showing a clear scissors effect (Areas et al., 2020). There is a clear gender bias at the professor level, but among students, women are the majority. Male professors were always the majority in all graduate programs, except one, on average being almost twice the number of female professors, and sometimes being 3–4 times more. On the contrary, the majority of programs was female-biased among students (55.7%). We thus observed a decrease in the presence of female ecologists throughout the academic career. What remains to be understood is: (1) why women leave their academic careers, and (2) how to avoid them leaving. My data provide some indication of possible causes, as they show that women ecologists receive much less funding for their research, both in terms of number of projects awarded (29%) and of average amount per grant (almost half the amount awarded to men). Also, women had lower CNPq Productivity Scholarship application success compared to their male peers, as the share of female scholarship awardees was lower compared to the share of female applicants, which is likely the result of implicit bias.

There are some possible explanations for the drop in women presence in academia (Box 1). One is that the professor sex ratio reflects the students' sex ratio of several years back. In this scenario, we should expect the professor sex ratio to slowly get closer to the current students' sex ratio. This, however, does not seem to be a likely scenario, as shown, for instance, in Physics, where, across 10 years, female undergraduate % increased slightly, but women percentages at higher levels remained similar (Barbosa and Lima, 2013). This suggests that the forces that are driving women out of academia did not fade out throughout the years and are still present. On top of this, in Brazil there are no affirmative actions or any other policies or institutional incentives to encourage women to continue a career in STEM and to ensure gender equality in academia (e.g. Athena Swan in the UK). Such policies have increased women leadership and funding (Ovseiko et al., 2020) and should be implemented in Brazil as well.

Women leave academia mostly at the post-doc levels for a number of different reasons. For instance, female candidates receive worse recommendation letters for job applications compared to their male fellows when applying for post-doc positions (Dutt et al., 2016). Implicit bias against female scientists, which is an unperceived and unconscious perception that women are less capable than men, can be very strong, possibly representing one of the main factors that negatively affect a woman's persistence in academia. The strength of implicit bias against women has been shown in many different circumstances with important consequences for hiring success, citation rates, funding (Calaza et al., 2021; Eaton et al., 2020; Larivière et al., 2013; Moss-Racusin et al., 2012; Witteman et al., 2019). For instance, during grant evaluations, women are evaluated less favorably or have to be much more productive to get the same score as men (Lee and Ellemers, 2015; Wennerås and Wold, 1997; Witteman et al., 2019). Indeed, double-blind review processes have been shown to increase by 8% the acceptance rate of papers with women as first author in the journal *Behavioral Ecology* (Budden et al., 2008). My results show that female ecologists in Brazil are much less successful in securing grants and scholarships and implicit bias might be playing a very important role for this negative outcome. Funding is crucial to be able to conduct research and maintain lab activities and students. Thus, gender-biased funding success inevitably reflects on productivity and grant evaluations are heavily based on the applicant's number of publications, creating a vicious circle that makes it more difficult for women to achieve success. Possible solutions to overcome the problem of implicit bias and funding gap is to employ double-blind review processes and to give more importance to the project evaluated than to the researcher's cv (Raymond and Goodman, 2019). This last practice has been shown to diminish the gender gap in funding (Witteman et al., 2019) and it should be more widely applied, especially in Brazil, where evaluations are strongly based on the applicants' cv. Grants specific for women, such as that implemented by the L'Oréal-UNESCO For Women in Science Program (https://www.forwomeninscience.com), should also be implemented on a larger basis.

Another important factor that could be driving women out of academia is the lack of role models for female students. Among the most-cited scientists (Ioannidis et al., 2020) in Brazil, women only represented a very small percentage (11%) - for the Ecology subfield they were only 4 out of 32 (Oliveira et al., 2021). Women do not see themselves represented at the upper levels and they thus manifest low self-confidence and a feeling of non-belonging (Shen, 2013). Small steps to reduce gender gap can be made by celebrating female ecologists' achievements to increase their visibility. Scientific societies also need to increase female speakers during conferences, especially in plenaries. But more actions are needed, such as quota for women for the highest academic positions and achievements.

Sexual harassment can also be playing a role in discouraging women to continue in academia. The academic sector shows the second highest levels of sexual harassment (58% of women reporting cases), preceded only by the military sector (Johnson et al., 2018). Sexual harassment and assault have also been reported at high rates during fieldwork (Clancy et al., 2014), which is a fundamental component of ecological and conservation research. Even if

perpetrators of sexual harassment can be both men and women, that performed by senior men towards more junior women is the most frequently reported (Clancy et al., 2014). Having a more gender-balanced composition of researchers, especially in more senior positions, could decrease the occurrence of such type of harassment, especially during fieldwork, and thus improve women permanence in academia. More actions need to be taken to punish harassers, to educate the academic community to identify and avoid harassment and microaggressions, and to make academia a safe place for women and other underrepresented groups.

Lastly, probably one of the most important factors that drives the decision of a woman to leave academia is the lack or paucity of support policies for mother scientists. Maternity has been shown to be a determining factor in reducing women scientific productivity and influencing the decision of leaving academia (Ceci et al., 2014; Morgan et al., 2021; Myers et al., 2020; Santos Machado et al., 2019). Maternity can represent an even bigger obstacle for ecologists, as they are often required to spend long periods away in the field to conduct their research, which could be unfeasible when having small children. Maternity should be considered in project and scientist evaluations to avoid a motherhood penalty, which is even stronger among early-career women (Lutter and Schröder, 2020). In the last couple of years, in Brazil, some grant calls have included a differential evaluation for researchers who are mothers, such as longer periods for cv evaluations (e.g. increasing one year for each child), or correction factors for project or cv scores (for a list see www.parentinscience.com). This should be universally implemented, together with other actions such as the creation of specific grants for mothers and early-career women. Unfortunately, the pandemic has the potential to further deepen gender bias in academia, as mothers and black women have been hit much harder than their male peers (Myers et al., 2020; Staniscuaski et al., 2021a). Implementing gender-oriented policies to avoid setbacks driven by the pandemic is thus urgent (Maas et al., 2020; Staniscuaski et al., 2021b).

A gender-balanced community at all hierarchical levels in the field of Ecology and Conservation can lead to better and more innovative science (AlShebli et al., 2018; Duffy et al., 2021; Maas et al., 2020; Nielsen et al., 2017) and thus guarantee more effective conservation practices (Maas et al., 2019). Just as less diverse ecosystems perform worse than more diverse ones (Tilman et al., 2014), homogeneous research teams could bring narrower perspectives and more limited conclusions in ecological studies and conservation measures (Duffy et al., 2021). The lack of inclusion of women and other underrepresented groups can lead to biased perspectives and a reduction of transdisciplinary thinking which can decrease the success of conservation actions (Maas et al., 2019). Strengthening inclusion, equity, and diversity, involving more women and more people from underrepresented groups (in terms of ethnicity, socio-economic conditions, sexual orientation), needs to be a priority for everyone in academia to improve our understanding of ecological phenomena and optimize the success of conservation practices.

Conflict of interest

The author declares no conflict of interest.

Declaration of Competing Interest

The authors report no declarations of interest.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.pecon.2022.04.001.

References

AlShebli, B.K., Rahwan, T., Woon, W.L., 2018. The preeminence of ethnic diversity in scientific collaboration. Nat. Commun. 9, 5163, http://dx.doi.org/10.1038/s41467-018-07634-8.
Areas, R., Abreu, A.R. de P., Santana, A.E., Barbosa, M.C., Nobre, C., 2020. Gender and the Scissors Graph of Brazilian Science: From Equality to Invisibility., http://dx.doi.org/10.31219/osf.io/m6eb4.
Barbosa, M.C., Lima, B.S., 2013. Mulheres na Física do Brasil: Por que tão poucas? In: Trabalhadoras: Análise Da Feminização Das Profissões e Ocupações. Ed. Silvia Cristina Yannoulas.
Budden, A.E., Tregenza, T., Aarssen, L.W., Koricheva, J., Leimu, R., Lortie, C.J., 2008. Double-blind review favours increased representation of female authors. Trends Ecol. Evol. 23, 4–6, http://dx.doi.org/10.1016/j.tree.2007.07.008.
Calaza, K.C., Erthal, F.C.S., Pereira, M.G., Macario, K.C.D., Daflon, V.T., David, I.P.A., Castro, H.C., Vargas, M.D., Martins, L.B., Stariolo, J.B., Volchan, E., de Oliveira, L., 2021. Facing racism and sexism in science by fighting against social implicit Bias: a Latina and Black woman's perspective. Front. Psychol. 12, 2695, http://dx.doi.org/10.3389/fpsyg.2021.671481.
Ceci, S.J., Ginther, D.K., Kahn, S., Williams, W.M., 2014. Women in academic science: a changing landscape. Psychol. Sci. Public Interest 15, 75–141, http://dx.doi.org/10.1177/1529100614541236.
Clancy, K.B.H., Nelson, R.G., Rutherford, J.N., Hinde, K., 2014. Survey of academic field experiences (SAFE): trainees report harassment and assault. PLoS One 9, e102172, http://dx.doi.org/10.1371/journal.pone.0102172.
Duffy, M.A., García-Robledo, C., Gordon, S.P., Grant, N.A., Green, D.A., Kamath, A., Penczykowski, R.M., Rebolleda-Gómez, M., Wale, N., Zaman, L., 2021. Model systems in ecology, evolution, and behavior: a call for diversity in our model systems and discipline. Am. Nat. 198, 53–68, http://dx.doi.org/10.1086/714574.
Dutt, K., Pfaff, D.L., Bernstein, A.F., Dillard, J.S., Block, C.J., 2016. Gender differences in recommendation letters for postdoctoral fellowships in geoscience. Nat. Geosci. 9, 805–808, http://dx.doi.org/10.1038/ngeo2819.
Eaton, A.A., Saunders, J.F., Jacobson, R.K., West, K., 2020. How gender and race stereotypes impact the advancement of scholars in STEM: professors' biased evaluations of physics and biology post-doctoral candidates. Sex Roles 82, 127–141, http://dx.doi.org/10.1007/s11199-019-01052-w.
Elsevier Gender Report, 2017. Gender in the Global Research Landscape.
Hill, C., Corbett, C., St. Rose, A., 2010. Why so Few? Women in Science, Technology, Engineering, and Mathematics. AAUW, Washington, D.C.
Ioannidis, J.P.A., Boyack, K.W., Baas, J., 2020. Updated science-wide author databases of standardized citation indicators. PLoS Biol. 18, e3000918, http://dx.doi.org/10.1371/journal.pbio.3000918.
Johnson, P.A., Widnall, S.E., Benya, F.F., 2018. Sexual Harassment of Women: Climate, Culture, and Consequences in Academic Sciences, Engineering, and Medicine. The National Academies Press, Washington, D.C., http://dx.doi.org/10.17226/24994.
Larivière, V., Ni, C., Gingras, Y., Cronin, B., Sugimoto, C.R., 2013. Bibliometrics: global gender disparities in science. Nature 504, 211–213, http://dx.doi.org/10.1038/504211a.
Lee, R. van der, Ellemers, N., 2015. Gender contributes to personal research funding success in the Netherlands. PNAS 112, 12349–12353, http://dx.doi.org/10.1073/pnas.1510159112.
Lutter, M., Schröder, M., 2020. Is there a motherhood penalty in academia? The gendered effect of children on academic publications in German sociology. Eur. Sociol. Rev. 36, 442–459, http://dx.doi.org/10.1093/esr/jcz063.
Maas, B., Toomey, A., Loyola, R., 2019. Exploring and expanding the spaces between research and implementation in conservation science. Biol. Conserv. 240, 108290, http://dx.doi.org/10.1016/j.biocon.2019.108290.
Maas, B., Grogan, K.E., Chirango, Y., Harris, N., Liévano-Latorre, L.F., McGuire, K.L., Moore, A.C., Ocampo-Ariza, C., Palta, M.M., Perfecto, I., Primack, R.B., Rowell, K., Sales, L., Santos-Silva, R., Silva, R.A., Sterling, E.J., Vieira, R.R.S., Wyborn, C., Toomey, A., 2020. Academic leaders must support inclusive scientific

communities during COVID-19. Nat. Ecol. Evol. 4, 997–998, http://dx.doi.org/10.1038/s41559-020-1233-3.
Morgan, A.C., Way, S.F., Hoefer, M.J.D., Larremore, D.B., Galesic, M., Clauset, A., 2021. The unequal impact of parenthood in academia. Sci. Adv. 7, http://dx.doi.org/10.1126/sciadv.abd1996.
Moss-Racusin, C.A., Dovidio, J.F., Brescoll, V.L., Graham, M.J., Handelsman, J., 2012. Science faculty's subtle gender biases favor male students. Proc. Natl. Acad. Sci. U. S. A. 109, 16474–16479, http://dx.doi.org/10.1073/pnas.1211286109.
Myers, K.R., Tham, W.Y., Yin, Y., Cohodes, N., Thursby, J.G., Thursby, M.C., Schiffer, P., Walsh, J.T., Lakhani, K.R., Wang, D., 2020. Unequal effects of the COVID-19 pandemic on scientists. Nat. Hum. Behav. 4, 880–883, http://dx.doi.org/10.1038/s41562-020-0921-y.
Nielsen, M.W., Alegria, S., Börjeson, L., Etzkowitz, H., Falk-Krzesinski, H.J., Joshi, A., Leahey, E., Smith-Doerr, L., Woolley, A.W., Schiebinger, L., 2017. Opinion: gender diversity leads to better science. PNAS 114, 1740–1742, http://dx.doi.org/10.1073/pnas.1700616114.
OCTS-OEI, 2018. Papeles del Observatorio. Gender Gaps in Ibero-American Scientific Production. Observatorio Iberoamericano de la Ciencia, la Tecnología y la Sociedad de la Organización de Estados Iberoamericanos (OCTS-OEI), Argentina.
Oliveira, L.D., Reichert, F., Zandonà, E., Soletti, R.C., Staniscuaski, F., 2021. The 100,000 most influential scientists rank: the underrepresentation of Brazilian women in academia. An. Acad. Bras. Ciênc. 93, http://dx.doi.org/10.1590/0001-3765202120201952.
Ovseiko, P.V., Taylor, M., Gilligan, R.E., Birks, J., Elhussein, L., Rogers, M., Tesanovic, S., Hernandez, J., Wells, G., Greenhalgh, T., Buchan, A.M., 2020. Effect of Athena SWAN funding incentives on women's research leadership. BMJ 371, m3975, http://dx.doi.org/10.1136/bmj.m3975.
Pell, A.N., 1996. Fixing the leaky pipeline: women scientists in academia. J. Anim. Sci. 74, 2843–2848, http://dx.doi.org/10.2527/1996.74112843x.
Raymond, J.L., Goodman, M.B., 2019. Funders should evaluate projects, not people. Lancet 393, 494–495, http://dx.doi.org/10.1016/S0140-6736(19)30280-6.
Santamaría, L., Mihaljević, H., 2018. Comparison and benchmark of name-to-gender inference services. PeerJ Comput. Sci. 4, e156, http://dx.doi.org/10.7717/peerj-cs.156.
Santos Machado, L., Perlin, M., Colla Soletti, R., Kmetzch Rosa e Silva, L., Doerderlein Schwartz, I.V., Seixas, A., Klein Ricachenevsky, F., Tamajusuku Neis, A., Staniscuaski, F., 2019. Parent in science: the impact of parenthood on the scientific career in Brazil. In: 2019 IEEE/ACM 2nd International Workshop on Gender Equality in Software Engineering (GE). Presented at the 2019 IEEE/ACM 2nd International Workshop on Gender Equality in Software Engineering (GE), pp. 37–40, http://dx.doi.org/10.1109/GE.2019.00017.
Shen, H., 2013. Inequality quantified: mind the gender gap. Nat. News 495, 22, http://dx.doi.org/10.1038/495022a.
Staniscuaski, F., Kmetzsch, L., Soletti, R.C., Reichert, F., Zandonà, E., Ludwig, Z.M.C., Lima, E.F., Neumann, A., Schwartz, I.V.D., Mello-Carpes, P.B., Tamajusuku, A.S.K., Werneck, F.P., Ricachenevsky, F.K., Infanger, C., Seixas, A., Staats, C.C., de Oliveira, L., 2021a. Gender, race and parenthood impact academic productivity during the COVID-19 pandemic: from survey to action. Front. Psychol. 12, 1640, http://dx.doi.org/10.3389/fpsyg.2021.663252.
Staniscuaski, F., Reichert, F., Zandonà, E., Soletti, R.C., Infanger, C., Mello-Carpes, P.B., Da Costa Ludwig, Z.M., Kmetzsch, L., Ricachenevsky, F.K., Werneck, F.P., Wiggers, G.A., Schwartz, I.V.D., Lima, E.F., Tamajusuku, A.S.K., Neumann, A., Seixas, A., Brandao, A., de Oliveira, L., 2021b. Time to fight the pandemic setbacks for caregiver academics. Nat. Hum. Behav. 1–1, http://dx.doi.org/10.1038/s41562-021-01209-2.
Tilman, D., Isbell, F., Cowles, J.M., 2014. Biodiversity and ecosystem functioning. Annu. Rev. Ecol. Evol. Syst. 45, 471–493, http://dx.doi.org/10.1146/annurev-ecolsys-120213-091917.
Wennerås, C., Wold, A., 1997. Nepotism and sexism in peer-review. Nature 387, 341–343, http://dx.doi.org/10.1038/387341a0.
Witteman, H.O., Hendricks, M., Straus, S., Tannenbaum, C., 2019. Are gender gaps due to evaluations of the applicant or the science? A natural experiment at a national funding agency. Lancet 393, 531–540, http://dx.doi.org/10.1016/S0140-6736(18)32611-4.