Ensaios & Opiniões

When misinterpretation leads to sexism: perspectives on gender disparity in Brazilian Herpetology

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ABSTRACT

In a recent article published in Nature Communications, AlShebli et al. (2020) analyzed the mentor-protégé relationship in scientific collaborations. Specifically, they examined the impact of gender on scientific careers and concluded that women scientists should rely on male guidance for a successful career and higher publication impact. Here, we respond to these authors criticizing the superficial interpretation of their findings and the likely disastrous impact for the fight for gender equity in academia, focusing on the field of Brazilian Herpetology. Our goal is to highlight women's role as mentors in Herpetology, contextualizing the gender gap in our field with the literature in gender studies.

The world is still reckoning with pervasive and inexcusable gender inequality underpinned by bias and sexism, and science is no exception. The gender gap in Science, Technology, Engineering and Math (STEM) has been a subject of increased discussion over the last two decades, where significant progress can be seen in women participation and representation (Rees, 2010; Holman et al., 2018; Shannon et al., 2019). An open discussion about gender disparity promotes awareness around the issue, aiming to improve equity and facilitate a culture of ethical treatment, inclusion, and diversity in science. Since mentorship plays an essential role in career development, women-to-women mentorship can be central to women's permanence and progress in academia. It can also reduce the gender gap by providing a safe academic environment, collaborative networks, or even just serving as role models for future female scientists (Carrell et al., 2010; Gaule & Piacentini, 2018).

In a recent paper published in November 2020 in Nature Communications and retracted a month later, AlShebli et al. (2020) analyzed the mentor-protégé relationship in scientific collaborations and the impact of gender mentorship on scientific careers, showing a decrease in both the post-mentorship impact of female protégés and the gain of female mentors. As a setback in this discussion, the authors conclude that women scientists should rely on male mentorship for a successful career and a higher publication impact. Their conclusion ignores any contribution of

sexist discrimination to the gender disparity observed in their data and contributes to the gender disparity within the academic environment (see Dickey, 2011), heating the gender debate in the scientific community. Despite the sampling bias in methods and shortcomings on the analyses performed in the study (discussed in Diele-Viegas et al., 2020), women indeed face several different issues during their scientific careers that hinder their productivity. Once gender studies rely on complex epistemic issues beyond science, the socio-cultural context must play an important role in the overall interpretation of statistical-based results (Medina, 2013). Although we acknowledge their several methodological flaws currently under debate and scrutiny (see Diele-Viegas et al., 2020; Wessel, 2020), we focus our criticisms on the shallow interpretation of their findings and its pervasive consequences for the Brazilian Herpetology field. Our goal is to highlight women's role as mentors in Herpetology, contextualizing the gender gap in our field with the literature in gender studies.

Science has a patriarchal structure that privileges male scientists, which is explained by historical numerical imbalance, socio-psychological aspects, and cultural factors (Astegiano, 2019). Resources are inequitably distributed among men and women in many academic science settings (see The Massachusetts Institute of Technology, 1999). Thus, despite the significant progress on women's participation in science, the field is still gender-biased, which is noticed since graduation (see Steele et al., 2002; Holman et al., 2018). As shown by Budden et al. (2007), there was a significant increase in female first-authored papers after the implementation of a double-blind review process in an ecology journal, indicating that the gender bias observed in academia is not related to the studies' quality. Moss-Racusin et al. (2012) also showed that female students were considered less competent and less worthy of being hired than male students when identical professional applications for an academic job were submitted to a faculty judgment, besides being offered a smaller starting salary and less career mentoring. These studies suggest that gender might be the only variable explaining this bias against women in academia. Other studies also demonstrate gender bias in different domains (see Goldin & Rouse, 2000; Heilman et al., 2004).

The AlShebli et al. (2020) study measured career success (as well as mentorship success) based on the impact of published papers in terms of the number of citations. Although the overall number of publications is similar for both women and men scientists (Astegiano, 2019), men are still dominant in terms of publication impact (Larivière et al., 2013; Wu et al., 2020), but only if the considered studies include self-ci-

tations (Astegiano, 2019). Women usually receive lower salaries and have fewer opportunities to reach senior and influential positions (Palermo et al., 2008; Larivière et al., 2013; Valentova et al., 2017). When becoming mothers, they often experience criticism in both motherhood and academia, being judged as a bad mother and/or inferior scientist (Larivière et al., 2013; Ahmed et al., 2020). Such issues are also influenced by the Matilda Effect (Rossiter, 1993), known as the consistent under-recognition of women scientists. In this context, male principal investigators usually publish with male peers, and both grant proposals and publications are more rejected when they are led by women (Bornmann et al., 2007; Knobloch-Westerwick et al., 2013; Salerno et al., 2019). Implicit biases could thus be sources of female withdrawal and leaky pipelines in academia, indicating, for example, that double-blind peer reviews would be more beneficial for women production, and that gender stereotypes are more detrimental to women's career than female mentorships (Knobloch-Westerwick et al., 2013; Salerno et al., 2019).

The participation of women in science increases the academic environment's diversity and improves the mechanism for scientific innovation (Hofstra et al., 2020). The high performance of women or mixed research groups is related to social perceptiveness and collective intelligence, which differs from men-only groups (see Nielsen et al., 2017). Further, women professors are seen as a positive role model by female students, increasing their association with science, which is paramount to reduce the leaky pipeline and a pro-science career (Young et al., 2013; Estrada et al., 2018). Indeed, previous studies suggest that not only female students actively search for women advisors (Gaule & Piacentini, 2018), but also their performance in math and science courses increases when they are mentored by a woman instructor (Carrell et al., 2010). Concurrently, it reduces the cultural stereotype of science as a masculine activity (Young et al., 2013), stimulating young girls' entry into STEM fields.

In this pathway, a variety of initiatives have been taken to change gender disparity in the Brazilian scientific community (Werneck et al., 2019; Barros & Mourão, 2020), such as the Kunhã Asé Network of Women in Science (Carvalho, 2020), and the Parent in Science movement (*https://www.parentinscience.com/*; Staniscuaski et al., 2020). Specifically, for the Herpetology field a group of women herpetologists created a support and collaboration network, the *Herpetologia segundo as Herpetólogas* (Herpetology according to women herpetologists). Moreover, since 2018, several other actions have also been taken, such as the creation of a social media group, which currently has 250 Brazilian women herpetologists working from all over the world

and from all academic levels and career stages. This network already led to actions aiming to promote equity in Brazilian Herpetology (such as the present essay), amplify the reach of women herpetologists' research, and minimize sexism within this community. Historically, male Brazilian herpetologists were dominant (Carnaval, 2016), but the number of women herpetologists has increased in the country, with several women occupying leadership positions and being recognized within different study areas and taxonomic groups. Therefore, the study published by AlShebli et al. (2020) represents a setback in the discussions promoted by these and other groups worldwide, in addition to ignoring the robust scientific literature on the subject.

The first debate approaching women's importance in Brazilian Herpetology, entitled '*Mulheres na Herpetologia ontem, hoje... e agora? Discutindo gênero para uma efetiva inclusão'* (Women in the Herpetology yesterday, today... and now? Discussing gender for effective inclusion), was held in 2019 during the IX Brazilian Congress of Herpetology (CBH). This discussion pervaded the challenges faced by women in their work environments, in the field, and during motherhood, in addition to the discredit that women suffer from their peers. Among the results presented at this symposium, it was noticed that in the latest awards held at herpetological events, such as *"Prêmio Jovem Conservacionista"* (Young Conservationist Award), promoted by Amphibian Specialist Group for Brazil (ASG Brasil) and partners in 2018, and *"Bolsa Congresso"* (Congress Scholarship) promoted by Brazilian Herpetological Society (SBH) in 2019, over 80% of the winners were women. In addition, the ASG Brasil awarded women that dedicate their research to amphibian conservation in Brazil with the *"Prêmio Bertha Lutz"* (Bertha Lutz Award). These data reinforce that studies developed by women are as relevant as those of men. However, this equity is not noticed when we observe the recognition of researchers in the scientific community.

The low number of women invited to evaluate the Brazilian list of threatened species (up to 30% of the participants) and as keynote speakers at the CBHs (up to 28% of the speakers until the VIII CBH, 2017) reinforces the assertion presented at the symposium. As a result of feminist actions initiated in 2018, this scenario changed at IX CBH (2019), when the number of speakers of each gender was equilibrated (five men and five women). From this symposium, an essay was published at the end of the same year in *Herpetologia Brasileira* (Werneck et al., 2019), which listed several actions that can minimize sexism within our community. An important incentive for the continuity of all these actions came recently when Dr. Albertina Lima, Dr. Paula Eterovick and Dr. Monique Van Sluys fig-

ured among the world's most influential scientists throughout their careers. They were the only women among the fourteen Brazilian herpetologists mentioned in the list (corresponding to 21.4%; Ioannidis et al., 2020). Indeed, seniority's effect differs between genders - women are generally recognized much later in career life than men, who even receive productivity grants much earlier than women and achieve higher senior levels faster and at a more steady pace (Valentova et al., 2017). It seems that women need to prove themselves capable throughout the entire career to receive recognition only at the end. However, listing Dr. Eterovick, Dr. Van Sluys, and Dr. Lima, which are in different stages of their careers, is an example of women's ability to produce high impact articles, even considering our underrepresentation in science.

Studies like AlShebli et al. (2020) may trigger a negative impact, decreasing the demand for female mentors, further decreasing female representation in science. The weight of responding to this type of publication falls on minorities who are already suffering other pressures and oppressions that hamper their productivity (Fig. 1). Throughout the AlShebli et al. (2020) study, the authors ignore historical, social, economic, and structural issues when interpreting their results. Their discussion does not account for the impact of motherhood on scientific production, *machismo* [1](see Bernal et al., 2019), or intellectual, moral, and sexual harassment, which may reflect abusive relationships between male mentors and female protégés that negatively impact the career of the victims beyond the scientific production. The academic pipeline from junior to senior faculty leaks female scientists, and the senior ranks of science highlight the barriers to female progression from previous generations (Larivière et al., 2013). The uproar recent media exposition of the paper highlights the women's concerns across the globe, which reflects in the Herpetology field (Wessel & Ortega, 2020; Ortega & Wessel, 2020). However, women herpetologists still need to fight against personal exposition, upper pressure for avoiding pregnancy (or chosing between motherhood and career), and discrimination. When becoming mothers, fieldwork, or laboratory activities seem impossible without further support. Therefore, these non-measured impacts should be accounted for.

Recognizing that gender disparity still occurs in several scientific fields is relevant for planning strategies in society, academia, and Brazilian Herpetology. However, studies that assess gender bias and the entire scientific community should contribute to solutions

1 Machismo: Common and oppressive behavior of a society where culturally ingrained masculine pride (Bernal et al., 2019)

rather than increase the existing disparity (Grogan, 2019). Mühlenbruch & Jochimsen (2013) called attention to the necessity of a wholesale reform in gender equality in science. New research policies to promote diversity in recruitment and facilitate the returning after academic breaks are as important as more transparency and funding availability. Additionally, Röbler et al. (2020) drew attention of scientific journals to include a declaration whether the study considered diversity, equity, and inclusion when submitting articles. Finally, we present suggestions on what we need to stop, encourage, and promote in the academic environment to promote gender equity in Brazilian Herpetology (Fig. 2).

Thus, our arguments and perspectives support the assumption that diversity generates better outcomes in academia and all other workplaces. AlShebli et al. (2020) study has a vain original idea trying to associate a flawed concept of success with mentors' gender, who are also vulnerable to gender bias themselves. We cannot stand silently reading a paper that, while intending to study gender bias in science, reinforces sexism and increases the weight on the shoulders of minorities, who have already received other pressures that hinder their productivity. In response, several women have been mobilizing in repudiation of AlShebli et al. research, spending time and effort on it. We wonder if men could join as allies spending a comparable amount of time and energy on this issue. Undoubtedly, some researchers have criticized manifests against AlShebli et al. (2020). However, this study's impact can be disastrous for the fight for gender equity in academia, leading to a decrease in women mentors, further decreasing our representation in science. Thus, responses like this one are essential to fight these potential setbacks. Many of us were or have been mentored directly and indirectly by women throughout our academic trajectories. We all agree that their mentorship positively impacted our career as scientists and possibly the career of future generations of Brazilian herpetologists. Thus, we thank them for being pioneers and showing us that we can be great mentors (see Acknowledgments).

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Note added to proof:

During the publishing process Al Shebli et al. (2020) published a retraction note available at https://www.nature.com/articles/s41467-020-20617-y (AlShebli B., Makovi K., Rahwan T. 2020. Retraction Note: The association between early career informal mentorship in academic collaborations and junior author performance.Nature Communications 11:1 DOI:10.1038/s41467-020-20617-y).



Figure 1. Female herpetologists who have paused their research to elaborate this letter.



Figure 2. Strategies to promote gender equality in Brazilian herpetology.