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AN OVERVIEW OF BOTANICAL RESEARCH THROUGH A BRYOLOGICAL LENS: GEOGRAPHIC ORIGIN OF EDITORIAL BOARD MEMBERS AND ADVISOR GENDER INFLUENCE PUBLICATION SUCCESS

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ABSTRACT

The number of scientific publications produced by a researcher can be influenced by a range of factors, including their gender, line of research and relationship with the editor (i.e., author-editor relationship). Determining whether there are any biases in the publication process and, if so, which are most important, would greatly assist choosing a journal to disseminate research results and in addition, to chosing actions that mitigate installed bias. We performed a scientometric analysis of four broad-ranging famous botanical journals. Univariate and multivariate statistics and techniques of time series analysis were used to describe the profile of publications on bryophytes from a sample of 7,279 papers published by the four journals over a 12-year period. Papers on bryophytes made up only 1–2% of the sampled publications and men were the main advisors for both sexes. However, the most influential factor regarding the publication of papers on bryophytes was the geographic diversity of the editorial board. An editorial board with

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the majority of its members being from a given country is directly related to the number of papers published by researchers from that same country. We conclude that the greater number of men found composing author teams of the evaluated papers suggests some kind of gender discrimination. Prior evaluation of the editorial board of journals should be an important consideration before submitting manuscripts for publication. We suggest that journals should consider greater geographic diversity in the composition of their editorial boards.

Keywords: Bryophytes. Editor-author game. Matilda Effect. Scientometric analysis.

1. Introduction

Diversity is a fundamental factor for the continuity of academic research because it adds new perspectives and new contexts for understanding issues of importance to society (Wooley *et al.,* 2010; Duran & Lopez, 2015). Among the key aspects for academic diversity is gender bias, including several chain biases (e.g., prejudice that leads to underrepresentation in academic positions; Abramo *et al.,* 2009; Wooley *et al.,* 2010; Young, 2016), bias towards lines of research due to the number of specialists in a given area (see Silva, 2016) and editorial bias, which commonly includes geographical relationships (Mendonça *et al.,* 2018).

Men mostly dominate all fields of science (Dasgupta, 2011). Although women have gained space in recent years (Bell, 2010), the diversion of women to other fields is still associated with issues of bias (albeit subtle) in academic science (Moss-Racusin *et al.,* 2012). In Botany, as in other areas, biases are historically based on biological differences between genders and their social roles (e.g., marriage obligations, domestic chores, religiosity and social class; Rudolph 1982, 1990; Shteir, 1993). The biological and social basis of prejudice that has maintained low female representation in the academy endorses the research argument that there is no relationship between female choice for non-scientific disciplines

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and any prejudice supposedly existing in the academy (Ceci & Williams, 2010; Ceci & Williams, 2011).

Women have historically been under-represented in the academy, although their greatest rise has been in the life sciences (Huyer, 2015). This gender gap is reflected in a major bias in the number of scientific publications produced (Larivière *et al.,* 2013). For example, West *et al.* (2013) showed that in a sample universe of 5.5 million published papers, 70% were produced by men and 66% had a male first author. This difference in the number of publications between genders is linked to several factors, such as the later acquisition of scientific positions by women (Young, 2016) and the difficulty of balancing family and professional life, which limits the time and dedication necessary to satisfactory performance scientifically and, thus professional progression (Abramo *et al.,* 2009). These factors, culminating in academic under representation, diminish the prestige of the opinions of women on important scientific issues (Mauleón *et al.,* 2012), and thus their academic representation via scientific publications.

The presence of women in Botany started in a modest way and was seen mainly as entertainment for children and other women (Shteir, 1993). Professional contributions by women throughout the 19th century was marked by preferences for floristic studies of angiosperms, with bryophytes, specifically mosses, being the third most studied group in Europe and North America (Rudolph, 1982, 1990); in a random sample of 1,185 women, only 79 wrote about bryophytes. A century later, North American bryology remained male-dominated: of the 180 notable North American bryologists, listed by Steere (1977) only 33 (~ 18%). From the 12 most notable only one was a woman — Elizabeth Gertrude, (née Knight) Britton.

The number of bryophyte specialists globally is small, even though bryophytes represent the second most diverse group of terrestrial plants on the planet (Goffinet & Shaw, 2009). A global group of researchers and amateurs with experience with bryophytes, called

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BRYONET, has only 2,000 registered members. This dearth of specialists certainly decreases the visibility of this plant group, despite their global importance ecologically (Gradstein *et al.,* 2001; Hallingbäck & Tan 2010; Ingerpuu *et al.,* 2005; Silva & Santos, 2011; Glime 2015) and their pharmacological potential (Krzaczkowski *et al.,* 2008; Chicca *et al.,* 2018).

The particular line of research can also influence the number of publications by a researcher (Sarigöl *et al.,* 2017). Long established fields like floristics and taxonomy tend to generate more papers than say plant physiology (Radkau, 2014; González-Alcaide *et al.,* 2008; Rudolph, 1990; Shteir, 1993).

Review policy is another factor influencing publication. On the one hand, the single-blind policy has been considered biased by allowing editors and reviewers to know the authors, but not vice versa (Budden *et al.,* 2008; Tomkins *et al.,* 2017). On the other hand, debate continues about whether the double-blind policy (i.e., reviewers and authors do not know each other) might free the review process of bias (Tomkins *et al.,* 2017). However, following both policies, editors (who make the final decision) know both the reviewers and the authors. To remedy this problem, the triple-blind policy has been proposed in which reviewers, authors and editors go through the entire review process without knowing of each other (Shah, 2018).

Several further factors can influence the author-editor relationship and interfere with the publication process. According to García *et al.,* (2015), there may be quality control by editors and the thought perspective of authors, such that an author may be influenced to undertake a type of revision that the editor prefers, rather than following their own views. Editors from a specific geographic origin may also tend to publish manuscripts by authors with the same origin (Mendonça *et al.,* 2018). Most recently gender has been suggested as a major factor in publication (e.g., Abramo *et al.,* 2009; Mauleón *et al*., 2012; Young, 2016).

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Against this background we investigated whether gender, geographical origins and lines of research and author-editor relationships might influence the number of publications on bryophytes and how these might have changed over the last 12 years.

2. Materials and Methods

2.1. Data sampling

We selected the botanical journals from three criteria: (i) broad spectrum (acceptance of all types of papers in any line of plant science and for any plant group); (ii) listing by SLA BioMedical & Life Sciences Division (DBIO 100); and (iii) impact factor above 1.0.

- Broad Scope — The scope must be such that it guarantees a wide spectrum of lines of research and the acceptance of all plant groups, with representativeness of papers focusing on bryophytes.
- Impact Factor (IF) — In general, the Impact Factor is a quantitative tool for evaluating journals. It represents the frequency with which the "average article" of a journal was cited in a given period. It is derived from dividing the number of citations in the current year for any publications in the journal during the previous two years by the number of items published in the same two previous years (Garfield, 1999). Naturally, higher IF values reflect greater visibility of papers and, thus, represent journals that should be sought more by scientists (Garfield, 1999). It is essential to remember that JCR impact factors for journals vary significantly throughout disciplines. Therefore, only journals in the same JCR subject category should be compared with one another. For Plant Biology discipline out of over 480 journals only 9% had between 1 and 1.9 citations per article in the last three years and 4% between 2 and above (http://www.scimagojr.com). For instance, an Impact Factor of 1.0 means that – on average – the articles published one or two year ago had been cited once.

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- DBIO 100 — This listing of the 100 most influential journals in biology and medicine (http://dbiosla.org/publications/resources/dbio100.html) is developed by a committee comprising prominent professionals in each three of major areas — 'Clinical Medicine & Allied Health Sciences', 'Molecular and Cellular Biology including Journals of Biotechnology' and 'Natural History'. The committee is responsible for evaluating 34 journals in each area and voting for journals based on a series of questions comparing them in categories of biology or medicine that fall within their areas of expertise. Publications in such journals should reflect a broad reach, consider results of peers and enhance citations.

In order these criterion data collection considered the period of 12 years from 2006 to 2017 selecting *International Journal of Plant Sciences* (DBIO 100, IF < 2.0)*, Journal of Plant Research* (DBIO 100, IF ≤2.0)*, American Journal of Botany* (IF > 2.0)*, and Annals of Botany* (DBIO 100, IF > 2.0). All four journals adopt the single-blind review policy.

We constructed matrices for each bryological paper containing the line of research, year of publication, and gender and origin of those responsible, this is, being the first or last author. We separated papers on bryophytes from those on other groups by analyzing each title, which also allowed us to identify the line of research for each. For cases of overlapping lines of research, we analyzed the classification section within the paper (if offered by the presentation layout of the journal) and/or analyzed the abstract and/or introduction in order to check the central question of the paper for subsequent classification. Finally, we identified the gender of each author by analyzing their first name and manually annotated the gender for the first and last author for each paper (Tomkins *et al.,* 2017). For cases of doubt (e.g., names used for both sexes), we confirmed gender by searching the Gender API platform (https://gender-api.com/). This free platform has a database of 6,084,389 names and uses an algorithm that allows searching either by a specific country or globally. In cases when the gender still could not be determined, several normalizations were made to the name to correct typos and correct all spelling variants.

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The result of searching for a name on the platform is the frequency of use for men or women based on sampling (in the order of thousands), which we used to determine gender.

For the purpose of statistical analysis, the first author of a paper is classified as the intellectual mentor and the last as the academic advisor, according to the concept of Volpato (2013) and Plume and van Weijen (2014). Although there are cultural variations to this classification, we know internationally that the positions of first (Budder *et al.,* 2008; Tomkins *et al.,* 2017) and last (Volpato 2013) author are prominent positions.

2.2. Description of journals editors

International Journal of Plant Sciences — Although the Chief editor is Canadian, most area editors are American.

Journal of Plant Research — The Chief editor is based in Japan and all area editors are Asian.

American Journal of Botany — The editorial board, including the chief editor, are mostly American.

Annals of Botany —The chief editor is American, but the editorial board is extremely diverse and composed of researchers based in various parts of the world including Argentina, Brazil, Japan, India and several European countries.

2.3. Statistical Analysis

Normality of the data was tested using the Shapiro-Wilk normality test, which is an excellent test for any sample size (Valentin, 2012).

Bryological publications and their representativeness over time. We counted all papers published over 12 years classified them as about bryophytes or about vascular plants. When the journal published a special issue, we analyzed it based on the same parameters

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(i.e., bryophytes vs. vascular plants) and counted the total number of articles per year. We analyzed each journal individually using linear regression (Altman *et al.,* 2015) to determine whether there is a greater number of papers on bryophytes for each journal over the years. To find a linear function we used the journal and the number of papers about bryophytes as independent and dependent variables, respectively.

2.3.1. Lines of research

Was assessed the number of publications with bryophytes over time (including all the years) through trend analysis. A trend is a behavior commonly found in time series — a times series shows a trend whenever it has a natural increase or decrease (Morettin, 2006), that is, linearity. We used Man-Kendall statistics to test whether the series of publications over the 12 years showed a linear trend in relation to the lines of research covered in each journal. We then used Correspondence Analysis to assess the profile of journals in relation to lines of research focusing on bryophytes.

2.3.2. Gender and author-editor relationship

We performed the Student's t-test, with 9999 randomizations, to assess whether there are differences between the averages of the data series for male and female advisors (last authors) and between male and female mentors (first authors) (Valentin, 2012). We explored the relationship between advisor gender, mentor gender and line of research through Correspondence Analysis, which aims to measure the degree of association among variables categorized in contingency tables (Greenacre, 2007).

Generalized Linear Model (GLM) analysis is a generalization of linear regression that allows the use of non-normal data, which we used to assess whether there is a relationship between geographic origin of editors and the geographic origin of authors with papers published in the studied journals. We used the Poisson distribution (count of occurrences in a fixed amount of time/space) with a logarithmic (canonical) link function, assuming that the response variable and the logarithm of its value are modeled by a linear combination

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of unknown parameters (McCullagh & John, 1989). To this end, we used editor origin as an independent variable and mentor origin, without the effect of gender, as a dependent variable. We performed this analysis individually for each journal. For the purpose of this analysis, we used only the origin of the last author that is the advisor, because the advisor has the greatest influence on the academic environment (Plume & van Weijen, 2014).

In order to assess whether men or women publish more papers in journals with higher impact factors, with a defined effect for gender versus journal status, we performed a Multivariate Analysis of Variance (MANOVA) (Valentin, 2012). For purposes of the analysis, we categorized the journals into two groups: Group A with journals with IFs above 2.0, and Group B with journals with IFs of less than or equal to 2.0 but greater than 1.0.

We used year as the independent variable and number of papers published in each year as the response variable. We performed all analyses using PAST 2.17 *software* (Hammer *et al.,* 2001).

3. Results and Discussion

3.1. 'Bryological' Representativeness

From the 7,279 papersin our four selected journals 143 (1-2%)were bryological. None of the 482 papers in special editions featured were bryophytes (Figure 1). Each journal has their own standard percentage for publications involving bryophytes, which ranged between 1 and 2% (Figure 2). This number of publications on bryophytes did not vary among years (Table 1).The percentage remained the same between years. Despite being the second most diverse group of terrestrial plants (Goffinet and Shaw 2009), and with great ecological (Ingerpuu *et al*., 2005; Silva & Santos 2011; Cardona-Correa, 2015) and pharmaceutical (Krzaczkowski *et al*., 2008) significance, the representativeness of 'bryological' studies in the studied broad-ranging journals is much lower than that for

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tracheophytes. The relatively few bryophyte specialists in the world (Forzza *et al.*, 2010), especially considering the great diversity of the group — about 21,000 species (Goffinet & Shaw, 2009).

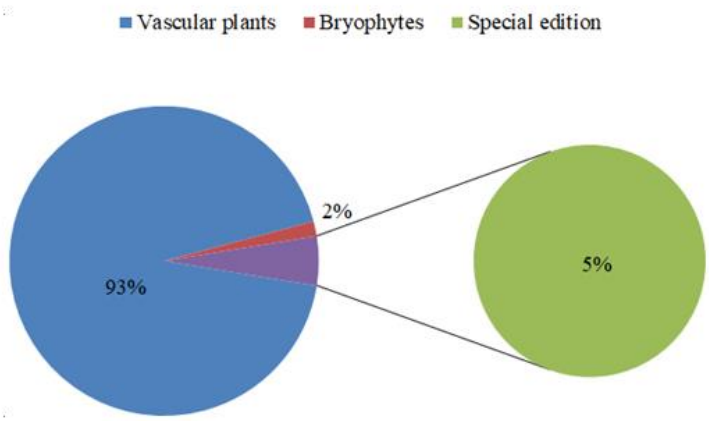

Figure 1. Representativeness (percentage) of vascular and bryophyte plants among publications in the four studied journals over the 12-year study period, with the exclusion of bryophytes in special editions.

The special editions of the four studied broad-ranging journals generally include morphological structures related to vascularization (due to the presence of tracheids) or to the flower, which are characters absent from bryophytes. However, some bryophyte species have a rudimentary vascular system with hydroma and leptoma, similar to xylem and phloem, respectively (Delgadillo & Cárdenas, 1990; Glime, 2015), which are especially important attributes for understanding the evolution of plants.

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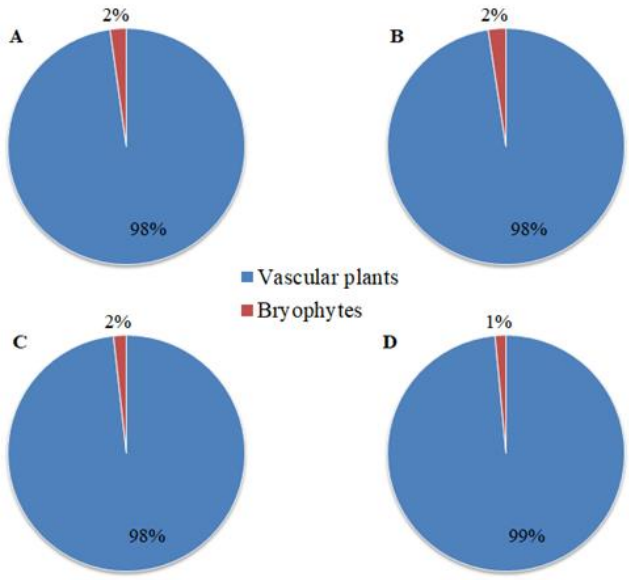

Figure 2. Percentage of papers published in each of the four studied journals over the 12-year study period. A. *International Journal of Plant Science*; B. *Journal of Plant Research*; C. *American Journal of Botany*; D. *Annals of Botany*.

Table 1. Simple Linear Regression (RLS) shows that there is no relationship between the passage of years and the increase or decrease of publications for each journal. The negative values of "t" show a tendency of greater volume of publications in the first years of sampling in detriment of the last ones.

Journal	R^2	t	P
Annals of Botany	2,80E-24	5,29E-10	1
International Journal of Plant Sciences	0,003	-0,186	0,856
American Journal of Botany	0,183	14,975	0,165
Journal of Plant Research	0,070	-0,872	0,403

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3.2. Lines of research over time

We identified 11 lines of research from the set of publications on bryophytes, among which Reproductive Biology, Ecology, and Physiology had the highest percentages of publications (Figure 3). Despite this, there was no linear trend for publications among the lines of research over time ($z = 0.09$; $P = 0.72$). Despite the broad scope of the journals, none of them had all the lines of research represented by 'bryological' studies (Figure 4).

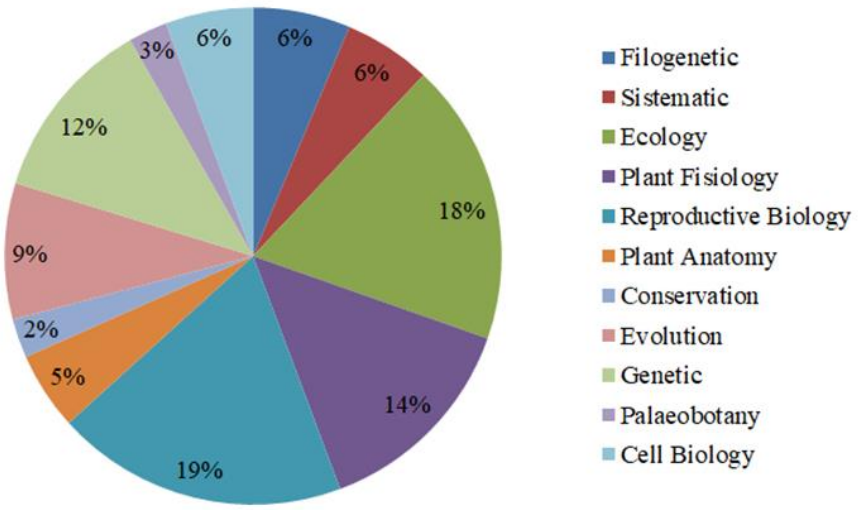

Figure 3. Percentage of the total pool of published papers focusing on bryophytes per line of research over the 12-year study period.

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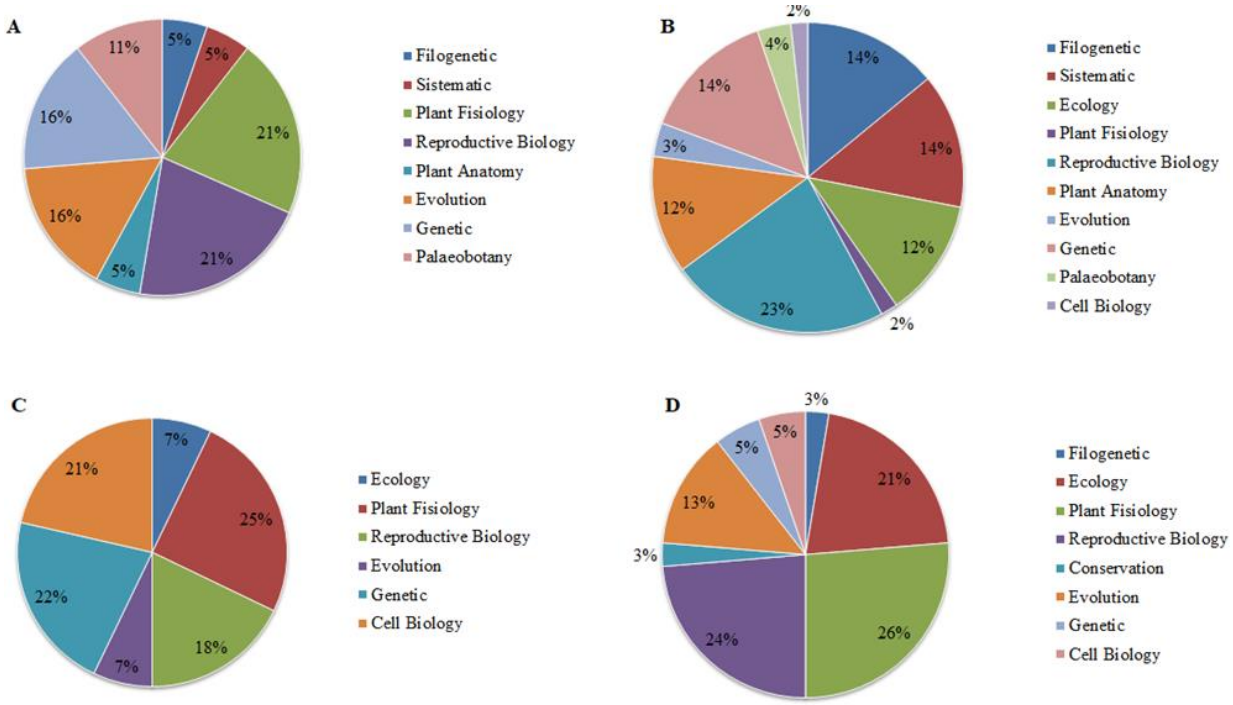

Figure 4. Representativeness of research lines per journal based on papers focused on bryophytes. A. *International Journal of Plant Research*; B. *American Journal of Botany*; C. *Journal of Plant Research*; D. *Annals of Botany.*

During the 12 years analyzed for 'bryology', the line of research of Reproductive Biology had publications in almost every year, with the exception of 2009, and between 2010 and 2017 there were at least three such publications per year (Figure 5). Physiology had the highest number of publications in the years 2007 and 2017. For each line of research there was at least one year without publications. Paleobotany had no publications recorded in the four analyzed journals for the first seven years, with the first such publication appearing in 2013. Worryingly, Conservation was the line of research with the lowest number of publications (Figure 5). Correspondence Analysis (axis 1 26.32%, axis 2 23.79%; Figure 6), revealed a greater number of publications for Systematics, Genetics, and Cellular Biology, while Physiology, Evolution, Anatomy, and Phylogenetics were more associated with the last years of the studied period (table 2).

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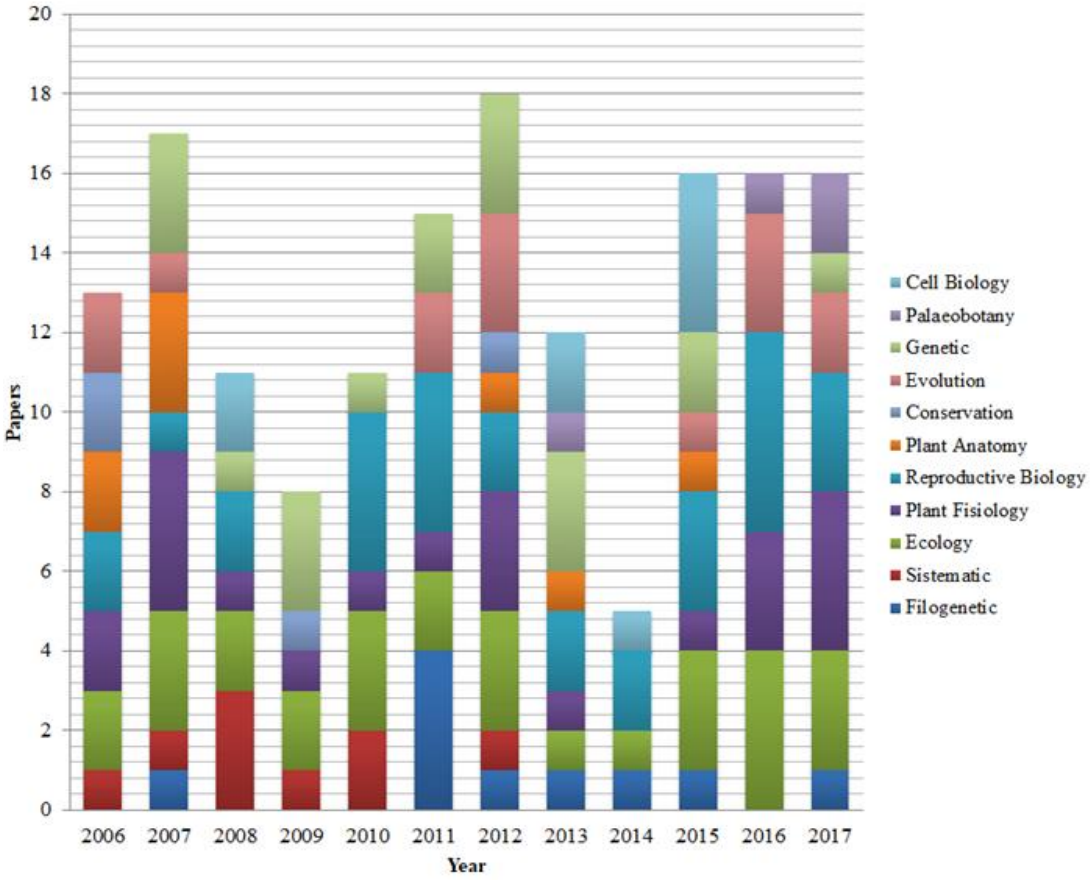

Figure 5. Number of papers focusing on bryophytes per line of research per each year.

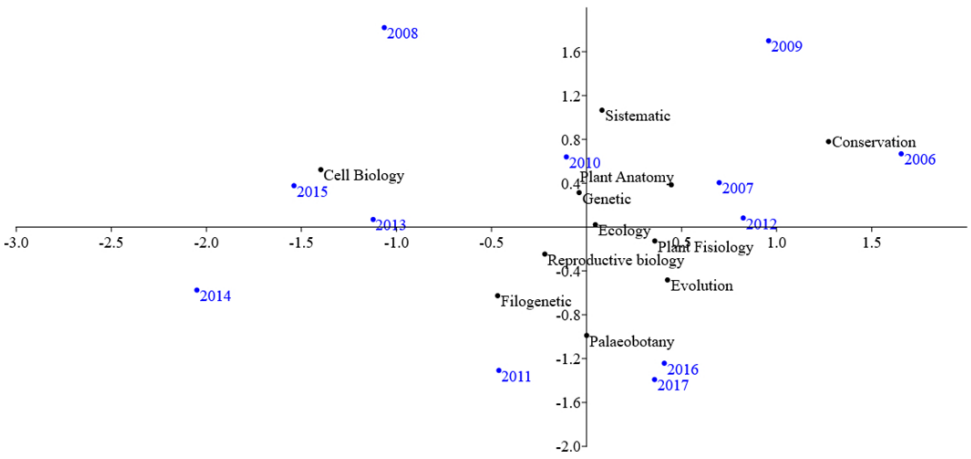

Figure 6. Correspondence Analysis showing the relationship between the number of publications and the identified research lines for the four studied journals based on year.

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Table 2. Correlation between years with their respective axes chosen (Axis 1 and Axis 2) for Correspondence Analysis (CA). The bold numbers indicate which axis the lines of research are most closely related to.

	Axis 1	Axis 2
2006	**1,655**	0,668
2007	**0,6978**	0,405
2008	-1,064	**1,819**
2009	**0,957**	-1,699
2010	-0,106	**0,640**
2011	-0,461	**-1,307**
2012	**0,824**	0,082
2013	-1,122	**0,069**
2014	**-2,049**	-0,574
2015	-1,539	**0,377**
2016	**0,408**	-1,241
2017	**0,35747**	-1,390

The number of publications on bryophytes has not changed over the past 12 years. Nonetheless, a weak trend was observed for two of the journals regarding the lines of research of most of the published papers on bryophytes: Evolution, Genetics, Systematics and Physiology for *International Journal of Plant Sciences*; and Reproductive Biology and Genetics for *Journal of Plant Research*. Apparently, these two journals are more likely to

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publish works in these lines of research for any plant group, which may explain this trend despite their broad scopes.

3.3. Gender and author-editor relationship

The number of papers produced with a male or female mentor did not differ (t = -0.45; P = 0.65), while the number of publications with a male advisor (94) was greater than the number having a woman advisor (43) (t = -2.11; P = 0.04).

Geographical diversity of the editorial board affected the geographical diversity of works published in the journals (GLM-L = 31.25, P = 0.0002, Figure 7); however, the model fit was weakest for *Annals of Botany*. For all the journals, published scientific papers with no geographic correspondence with any editor mainly had male mentors. *International Journal of Plant Sciences* had one article published with a female advisor and seven with a male advisor; *Journal of Plant Research* had two publications with a female advisor and four with a male advisor; *American Journal of Botany* had one with a female advisor and 10 with a male advisor; and *Annals of Botany* with two with a female advisor and three with a male advisor.

We found no relationship between the placement of the papers by impact factor and advisor gender (Table 3).

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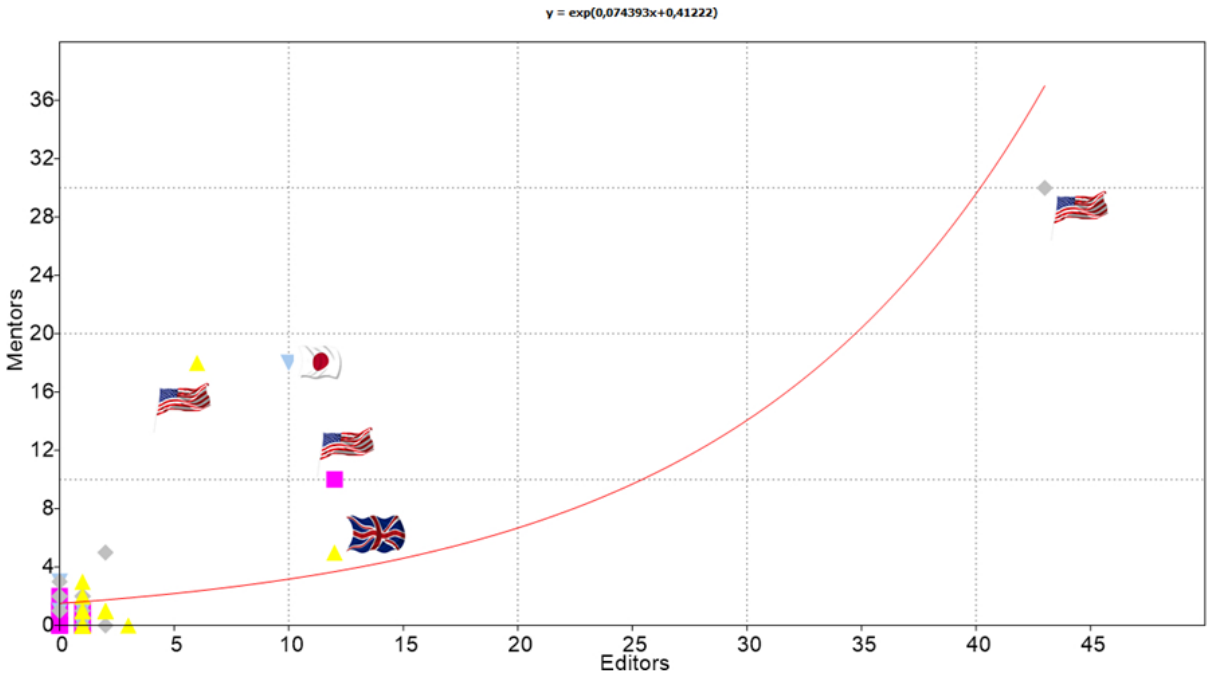

Figure 7. Relationship between the geographical diversity of the editorial board and the diversity of the geographical origin of publications. Model based on the Poisson distribution and logarithmic connection method for unprocessed data. We used the mentor to base the source of the paper. Gray rhombus = *American Journal of Botany*; yellow triangle = *Annals of Botany*; inverted blue triangle = *Journal of Plant Research*; pink square = *International Journal of Plant Science*.

Table 3. Analysis of Multivariate Variance (MANOVA) with interaction of factors showing that there is no difference in publications of bryophytes in journals of greater or lesser impact factor according to gender.

MANOVA						
	G.L.	*Wilks statistic*	*F statistic*	*G.L. Numerator*	*G.L. Denominador*	*P-value*
Gender (G)	1	0,391	1,038	3	2	0,524
Impact factor	1	0,605	0,433	3	2	0,752
G:Impact Fator	1	0,657	0,347	3	2	0,799
Residues	4					

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According to the present results, men and women in their first academic positions should publish in an equivalent way, which differs from what was found by West *et al.* (2013). However, studies advised by men appear to be double that of those advised by women. According to Wennerås and Wold (1997) and West *et al.* (2013), men are the vast majority among the most renowned positions in academy. These researchers, referred to as the 'stars', have great productivity in a global scenario (Abramo *et al.,* 2009). Despite this situation, under allegations about women's preferences for non-scientific disciplines and household chores (Ceci & Williams 2011), and that there is no gender bias in academy (Dickey, 2011), Moss-Racusin *et al.* (2012) show that gender bias (disadvantaging women) in the Biological Sciences and Physics starts at the undergraduate level. Even if not intentionally done by faculty, it still reflects a set of culturally shaped attitudes (Devine, 1989). Nonetheless, gender was not found to be the source of bias for the publication of studies of bryophytes in the studied botanical journals.

Although studies have demonstrated equivalency in the quality of publications by men and women (e.g., Lewison, 2001; Tower *et al.,* 2007; Hildrun *et al.,* 2012), female opinion continues to be underrepresented in academics (Wennerås & Wold 1997; Symonds *et al.,* 2006; Sidhu *et al.,* 2009; Jagsi *et al.,* 2011). This is partly due to the belief that papers from female first authors are associated with low quality work, that is, the 'Matilda Effect' (Knobloch-Westerwick *et al.,* 2013). According to Plume and van Weijen (2014), although there are differences for large fields (e.g., exact and health sciences, humanities), the first/last author are conventionally identified as the those with central roles in the study as a mentor or advisor. The 'Matilda Effect' does not apply to our results because men (more than 50% of all the papers) advise the great majority of studies; however, there is no significant difference in the number of papers published with men or women as the mentor (first author). On the other hand, our results may be influenced by the review policies of the journals. Although our study was not designed to compare review policies, all four of the journals evaluated here use the single-blind policy. This policy, which allows

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editors and reviewers to know the authors, but not the other way around, presents biases in gender, style of papers (Tomkins *et al.,* 2017) and the reputation and geographical location of universities and companies (Wennerås & Wold 1997). An attempt to ease such bias during the review process is the adoption of the double-blind policy. Nevertheless, in addition to the various criticisms (e.g., preventing the identification of conflicts of interest; Hill & Provost 2003), the editor, who decides whether to accept or reject the paper, knows both reviewers and authors.

For García *et al.* (2015), the response of the editor influences the satisfaction and motivation of authors who submit their results, which can also end up influencing other researchers. This can occur through the relationship between peers locally (same institution) and regionally (e.g., same country). The latter without considering the position of each researcher (i.e., mentor or advisor). Editors are considered "Gatekeepers", that is, a group capable of affecting and guiding the control of information (for the effect of "Gatekeeping" see Barzilai-Nahon, 2009). It is known that the composition of a journal's editorial team can influence academic production by geographical bias and intellectual pluralism (Mendonça *et al.,* 2018). It seems that, for the journals analyzed here, publication does not depend on line of research; however, coincidence between the origin of the mentor and the majority of the editors can be seen as a determining factor. *American Journal of Botany*, *Journal of Plant Research* and *International Journal of Plant Sciences* show this trend the strongest, while a weaker bias may exist for *Annals of Botany* due to the diversity of the editorial team, which has global representation. Interestingly, these results are contrary to those of Wennerås and Wold (1997), who found no geographic bias in their study. Such editor bias must be resolved by using the triple-blind policy (i.e. editors, reviewers and authors do not know each other); however, this policy is not popular among authors from developed nations or renowned institutions (Shah, 2018).

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3.4. Female representativeness by line of research

Correspondence Analysis (axis 1 49.36%, axis 2 42.94%; Figure 8) showed that women typically had female advisors, while men had either male or female advisors (Table 4). Thus, although male advisors contributed more to the lines of research of Systematics, Genetics and Cell Biology in terms of guidance, men have representativeness for all lines of research since they also associated with female advisors who work in the other lines of research identified here.

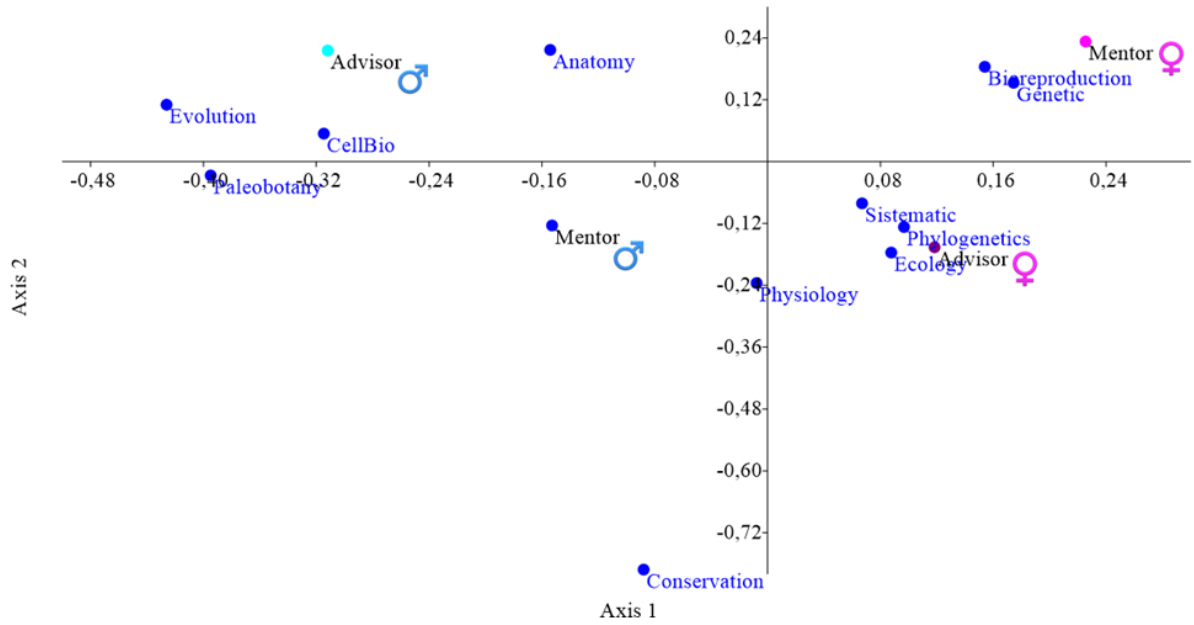

Figure 8. Correspondence Analysis showing the relationship between the number of publications and the identified research lines for the four studied journals based on gender.

Among lines of research, there is a higher rate of publication for Reproductive Biology, which is probably due to the continuous progress and development of this line of research in many areas of the planet (González-Alcaide *et al.,* 2008). On the other hand, Ecology is an old science, which can explain the large number of publications on the recognized ecological importance of bryophytes, although the boom in this line of research occurred only since the last century as a result of growing environmental and human needs (Radkau,

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2014). Despite this, no linear trend was found for any of the lines of research. There is a male-oriented trend for Systematics, Ecology and Genetics; however, since the beginning of their careers (in bryology), men associate with both women and men, resulting in a random effect of gender on the distribution of the lines of research.

Table 4. Correlation between research lines with their respective axes chosen (Axis 1 and Axis 2) for Correspondence Analysis for association between genders and their respective lines of research. The bold numbers indicate which axis the lines of research are most closely related to.

	Lines of research			Gender	
	Axis 1	Axis 2		Axis 1	Axis 2
Reproductive biology	**0.153**	0.184	Male mentor	0.153	**0.184**
Plant fisiology	**-0.007**	-0.235	Male advisor	**-0.007**	-0.235
Genetic	**0.174**	0.153	Famale mentor	**0.174**	0.153
Ecology	**0.087**	-0.176	Famale advisor	**0.087**	-0.176
Evolution	-0.426	**0.110**			
Filogenetic	**0.096**	-0.126			
Plant anatomy	0.154	**0.216**			
Sistematic	**0.066**	-0.080			
Cell biology	-0.314	**0.054**			
Palaeobotany	-0.394	**-0.026**			
Conservation	**-0.087**	-0.791			

These results must be explained from a historical perspective. Although variation exists, different cultures around the world have impeded women in academics. As an ancient science, Ecology is notoriously male dominated (Radkau, 2014). For Genetics, although Mendelian studies during the 1890s already had a group of female scientists under the

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guidance of William Bateson, their studies suffered many protests by several other male professors and for many years since women have struggled to obtain undergraduate degrees for their legitimation in science (Richmond, 2001). Although women began to undertake botanical investigations in the 19th century, especially with floristic and systematic studies, and especially in North America and Europe (Rudulf, 1982; 1990), the allegation of female incompetence in view of the biological differences between genders, soon led men (Rudulf, 1982; Shteir, 1993) to dominate these lines of research. On the other hand, women have gained more space in botany as new sub-areas have emerged (Rudolf, 1990), which our analyses demonstrate (i.e., in general, areas dominated by women are younger than those dominated by men; Rudolf 1982). These findings emphasize that in addition to the long battle females have had for their space in academy, culminating in the contemporary difference in the number of men and women (Huyer, 2015; Young, 2016), male advisors were important for the conquest of this space.

4. Conclusion

In general, our study corroborates a global trend of inequality based on the filters of gender and geographic origin, despite the trend of equity over the years (Dehdarirad *et al.*, 2015). The great number of publications from the United States of America and the United Kingdom follows the same trend for areas other than bryology (Dehdarirad *et al.*, 2015). However, for the present results, the Japanese Journal of Plant Research follows a similar pattern, which further highlights the relationship between the geographic origin of the editorial board and that of the authors. In addition, in view of the pioneering nature of this article, we suggest continued evaluation of the parameters studied here for journals specific to bryophytes, as well as for other journals of broad scope covering all groups of plants. If these trends are confirmed, future research should decrease the rate of rejection of submissions. Such studies would assist in making decisions about the transformation of the system in search of fairness of assessments, which, for the present case, is indicated by

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the pluralization of the geographic diversity of the editorial staff of journals and by the gender filter.

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