



Do gender, nationality, or academic age affect review decisions? An analysis of submissions to the journal *Biological Conservation*

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ARTICLE INFO

Article history:

Received 12 June 2009

Accepted 19 June 2009

Available online 12 July 2009

Keywords:

Academic age

Double-blind

Gender bias

Nationality

Review process

ABSTRACT

Recent papers have considered whether the present system of single-blind reviewing results in bias against women or other groups of authors in biological journals. If so, double-blind reviewing might be an alternative approach that avoids such bias. We investigated the effects of gender, nationality (English-speaking countries only), academic age, year of review, and handling editor on the decisions made on a sample of 1856 papers submitted to the journal *Biological Conservation* between 2004 and 2007. There is no evidence of differences in acceptance rates among genders, nationalities, academic age, or year, nor is there evidence for interactions among these factors. Individual handling editors differed in the proportions of papers that they accepted, rejected following review, and rejected without review, but did not show biases based on any of the factors we examined. Overall, we did not find evidence supporting a change in the present review system, although the low rate of acceptance of papers from certain non-English-speaking countries is an issue that needs to be addressed. We believe that these types of audits of the editorial system are necessary, so that all submitting authors feel that the editorial process is fair, unbiased and rigorous.

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1. Introduction

Peer review of articles is the most commonly used method of evaluating the quality and originality of scientific research. In order to be effective, the scientific community must regard peer review as fair and without systematic bias. There has recently been a vigorous and wide-ranging debate among biologists and others about whether the present system of peer review facilitates gender bias against female authors and whether this bias necessitates a change in the current system of peer review (Budden et al., 2008; Engqvist and Frommen, 2008; Hammerschmidt et al., 2008; Webb et al., 2008; Whittaker, 2008). Before attempting to change the present system of reviewing, however, it is first helpful to determine whether gender bias or any other readily identifiable type of bias is occurring in the current review system.

In the most common method of peer review in ecological literature, reviewers are invited by an editor of a journal to evaluate a paper submitted for publication in a single-blind fashion: the reviewers know the name of the author, but the author does not

know the names of the reviewers, unless the reviewers choose to reveal their identity to the author. In this single-blind review system, reviewer prejudices based on the author's gender, nationality, and other factors could influence the final decision on whether to accept a manuscript (Wennerås and Wold, 1997; Link, 1998; Budden et al., 2008). A system of double-blind reviewing, such as adopted by the journal *Behavioral Ecology*, might help to eliminate existing biases, because reviewers would not automatically know the name and affiliation of the authors. However, the single-blind system, the system used today by most biological journals, has been used for many decades and is generally accepted. Additionally, a move to double-blind reviewing has some disadvantages. Most importantly, reviewers are expected to comment on issues such as double publishing, inappropriate use of data, inappropriate references, and other ethical issues, which may be difficult or impossible to comment on in a double-blind system. Many reviewers also believe that they can correctly identify an author even when his or her identity is hidden (Ware, 2008). Furthermore, there is an economical consideration; masking the identity of authors is a time consuming and expensive process. Thus, before this common method of reviewing is changed it is helpful to determine whether there is a systematic bias that could potentially be prevented by the introduction of the double-blind reviewing system.

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Recently, Budden et al. (2008) presented evidence that the percent of papers published by women increased by 8% over time in the journal *Behavioral Ecology* after it began using a double-blind system. However, subsequent analysis of this data set by another research team (Webb et al., 2008) showed that this increase in papers published by women in that journal was not significantly different from other journals in the same field, such as *Biological Conservation*, which do not use a double-blind review system. A problem with the analyses of gender bias in ecological journals presented by Budden et al. (2008) and Webb et al. (2008) was that they used the percent of papers published by women to evaluate reviewer bias. An increasing percentage of articles published by women could simply be caused by an increasing percentage of articles submitted by women, rather than a decline in gender bias. In order to determine whether there might be bias against women in the review process, we must evaluate the acceptance rate of articles submitted by women in comparison with the acceptance rate of articles submitted by men. Budden et al. (2008) and Webb et al. (2008) did not have access to this type of data, and the analyses that have been done so far suggest that there is no difference in the acceptance rate of articles submitted to biological journals by men and women (Tregenza, 2002; Whittaker, 2008).

However, a further problem is that previous studies generally consider articles by male and female authors as two large categories, and simply compare these two groups to evaluate whether there might be bias against women in the review process. Such a gross comparison fails to consider other factors that might influence the acceptance rate of papers and obscure gender differences. Such differences include differences among handling editors, countries from which the papers are submitted, academic age and experience, and changes over time. For example, lumping authors from China and India, whose papers have low acceptance rates, with authors from countries such as Australia and Canada, whose acceptance rates are greater, might tend to obscure more subtle factors such as gender differences. These past studies also did not include variation among the handling editors of a journal, who often decide if a paper should be rejected without review or sent out for review. It is possible that a handling editor who favors men authors could create bias in the review process; or such an editor might be balanced by another handling editor who favors women authors. The purpose of this study is to evaluate what factors affect the acceptance rate of papers under a single-blind review system from one journal. These factors include differences among genders, countries, editors, years of submission, and the academic age of authors. The editors whose decisions were considered in the study agreed to this evaluation.

2. Methods

2.1. Journal and factors

For the purpose of analysis, we used scientific papers submitted to the journal *Biological Conservation* from 2004 to 2007. The journal began to use web-based submission in 2004, and from this period forward a comprehensive record of all journal actions is available for audit. *Biological Conservation* receives approximately 1000 submissions per year. For this study, we evaluated only those papers submitted from English-speaking countries, which totaled 1856 papers, roughly half of the submissions to the journal over the period of analysis. Submissions from English-speaking countries were used as they provided a sufficient sample size, author genders could be more easily identified, and the language skills of the authors were less likely to be an additional factor in the acceptance rate (Primack and Marrs, 2008).

Papers from English-speaking countries were assigned a gender based on the first name of the corresponding author. Names were

assigned to a category of unknown gender if the names were ambiguous as to gender (e.g., Robin) or were not readily recognized Western names (e.g., Sharda, Khoon Meng, etc.). Using only papers from English-speaking countries resulted in our being able to assign gender to a greater percentage of authors than in previous studies. In approximately 97% of the cases, the corresponding author is the same person as the first author of the article. We used corresponding authors, because these data were the most readily available from the journal's online submission system. The corresponding author's name is also the name used by handling editors in all of their correspondence. We did not consider separately those few papers in which the first author is different from the corresponding author, and we considered only one author per paper.

In addition to gender, we analyzed the effects of individual handling editors, country of the corresponding author based on address, and academic age of the corresponding author on whether papers were accepted, rejected following review, or rejected without review. Handling editors are a potentially important variable, as they have a greater influence over the review process than do individual reviewers, as each of the 7–8 editors handles 100–200 papers per year. Editors carry out a two step review process, whereby some papers are rejected without review, and the remainder are sent out for external review, typically to 2–3 reviewers. At *Biological Conservation* editors reject approximately 31% of papers without review, as their past experience has taught them that certain papers are not appropriate for the journal and will be recommended for rejection by the reviewers. Also, editors make the final decisions on borderline cases, such as when reviews are contradictory. For this study, we excluded temporary editors and guest editors of special issues for which there was an insufficient sample size for analysis. Such special issues also tend to have higher acceptance rates, which would bias the analysis.

We obtained a measure of each author's academic age by determining when he or she published his or her first scientific article, as indicated by Scopus (<http://www.scopus.com/scopus/home.url>). We then calculated each author's academic age by subtracting the year of the author's first publication (for example 1995) from the year the *Biological Conservation* paper was submitted (for example 2004). In some cases, the author's first published paper occurred after the submission to *Biological Conservation*, resulting in a negative academic age. For this analysis, we omitted certain individuals with common names, such as C. Smith, because we were not able to distinguish their publications from other people with similar names. Also, for analyses involving academic age, we used only authors from the United States, about half of the papers in the sample, due to the laborious nature of obtaining the data.

2.2. Analysis

Because our data were primarily count data with categorical explanatory variables we used chi-squared tests and generalized linear models (GLM) for most of our analyses. For our most broad test, we tested the relationships among gender, nationality, handling editor, and the final decision (accepted, rejected following review, or rejected without review). We created a GLM with each of those four factors and their interactions as explanatory variables and count as the response variable. We tested for significant interactions among variables by removing each interaction from the model in a stepwise fashion, and in each instance we used ANOVA to test whether there was a significant difference in the explanatory power of the simpler model relative to the more complex model. Because of the large number of contingencies included in this model, we were able to include only handling editors and nationalities that were associated with at least 100 papers (1411 papers; 80% of the total).

We used chi-squared tests to examine the relationship between most factors (gender, nationality, and handling editor) and the final decision on each paper using the full data set of 1856 papers. For academic age, a quantitative variable, we used linear regression to test the relationship between academic age and the rates at which papers were accepted and rejected without review. We also used GLM to test for changes in the relationship between each factor and decisions over time. All tests were done using R (R Development Core Team, 2007).

3. Results

Of our total data set of 1856 papers, we could not assign about 104 authors (6%) to a gender, because their first name was ambiguous or was not a typical western name. This percentage of ambiguous names is less than other comparable studies (e.g. Budden et al., 2008) and was lower because we used only papers submitted from English-speaking countries. Of the remaining 1752 papers, men submitted 1166 (67%) and women submitted 586 (33%).

For the set of papers for which we could determine the authors' gender, papers submitted by men (38% accepted) and women (34% accepted) were accepted roughly in proportion to those that were submitted, as determined by a chi-squared test ($X^2 = 1.88$, $df = 1$, $P = 0.17$) (Table 1). We found no evidence of differences in the acceptance rate of papers by men and women authors. Similarly, papers submitted by men (29% immediately rejected) and women (34% immediately rejected) were rejected without review roughly in proportion to those that were submitted ($X^2 = 2.23$, $df = 1$, $P = 0.13$) (Table 1). Even though there were no significant differences based on gender, the differences between men and women are getting smaller each year, with women having a slightly higher acceptance rate than men in 2007. It is also interesting to note that the immediate rejection rate for authors with ambiguous names (41%) was larger than that for men (29%) and women (34%), possibly because English was not the first language for many of them.

Editors both accepted and rejected papers without review at different rates from one another (accepted: $X^2 = 59.4$, $df = 11$, $P < 0.001$; rejected without review: $X^2 = 59.8$, $df = 11$, $P < 0.001$). For example, one editor accepted 52% of papers and rejected just 20% without review, compared to another editor who accepted just 27% of papers and rejected 47% without review. Papers submitted by authors from different English-speaking countries tended to be accepted and rejected without review roughly in proportion to those that were submitted (accepted: $X^2 = 9.81$, $df = 7$, $P = 0.12$; rejected without review: $X^2 = 4.57$, $df = 7$, $P = 0.71$).

The academic age of the corresponding author did not have a significant impact on the rate at which papers were accepted or rejected without review, as indicated by linear regression (accepted: $P = 0.20$; immediately rejected: $P = 0.66$); there was no evidence that older and presumably more experienced authors had a higher acceptance rate than younger and presumably less experienced authors or even authors submitting their first paper. Among these

authors, the academic age of men (median = 7 years; range –4 to 47) is significantly greater than that of women (median = 3 years; range –4 to 41), using a Wilcoxon signed rank test.

The relationships between each of the factors—author gender, author nationality, and handling editor—and decisions were relatively constant over time; that is, none had significant interactions with year ($P > 0.05$ in all cases). When we considered gender, nationality, handling editors, and final decisions together, there were no significant interactions among the explanatory variables, except between editors and decisions ($P < 0.001$), indicating that different editors accept, immediately reject, and reject papers following review in different proportions.

4. Discussion

We found that there was no overall influence of gender, nationality, academic age, or year of submission on the proportion of articles accepted by the journal *Biological Conservation* from English-speaking countries. The only factor that affected the proportion of papers accepted and rejected without review was the handling editor; some editors accepted a greater proportion of articles than others and some rejected a greater proportion of papers without review than did other editors. The differences among editors are confounded by the fact that editors cover different geographical regions, review articles in different topic areas, have worked in different years of the four year study period, and have differing levels of experience at assessing papers prior to review (and slightly different strategies for rejecting papers without review). Also, certain editors tend to handle more papers for special issues, which generally have higher acceptance rates. However, there is no evidence that any of the individual editors showed any bias in the handling of papers based on gender, nationality, or academic age.

We found it particularly surprising that academic age had no significant effect on whether a paper was accepted, rejected following review, or rejected without review. We expected that papers with more senior authors would tend to be accepted more frequently than those with relatively junior authors. It seems quite reasonable to expect that older and therefore more experienced authors would have a higher likelihood of having their papers accepted for publication than younger and presumably less experienced authors. However, this was not the case. The number, academic age, and identity of other coauthors on each paper may have played a role in masking any affect of the academic age of the corresponding author. Papers with more than four authors and papers with authors who have published many papers tend to be cited more frequently (Leimu and Koricheva, 2005a, 2005b; Leimu et al., 2008), and perhaps also fare better in the review process. We did see in our sample that men had a greater average age than women, reflecting the fact that in the past the majority of ecologists were men.

It is important to recognize that we found no impact of nationality on acceptance rates among authors from English-speaking

Table 1

Proportions of papers accepted, rejected following review, and rejected without review in each year of our study according to the gender of the corresponding author.

Year	Gender	Accepted	Rejected following review	Rejected without review	Total number of submissions
2004	Female	0.34	0.43	0.23	122
	Male	0.43	0.31	0.25	263
2005	Female	0.40	0.27	0.33	131
	Male	0.46	0.30	0.23	296
2006	Female	0.31	0.33	0.36	170
	Male	0.36	0.32	0.32	306
2007	Female	0.32	0.28	0.40	163
	Male	0.28	0.36	0.36	301

countries. However, authors from non-English-speaking countries have much lower rates of acceptance than authors from English-speaking countries (Primack and Marrs, 2008). Approximately 30% or more of manuscripts submitted by authors from English-speaking countries are accepted for publication, whereas about 20% of submissions from authors from non-English-speaking developed countries are accepted (Primack and Marrs, 2008). This difference suggests that there is substantial disadvantage of not having English as a first language; this disadvantage could result in a decrease of around 30% in the chance of acceptance. Rates of acceptance from many developing countries, such as China and India, are less than 5%. Problems with language, funding for research, training, lack of familiarity with current ideas of research topics and experimental design and analysis, and lack of access to current literature, are some of the factors that may reduce the chance of papers being accepted. We believe it is important to address these shockingly low acceptance rates, and consider what can be done to improve the situation. If the low acceptance rates are due to reviewer or editor bias against authors from these countries, then double-blind reviewing might provide a way to address the problem. However, if the problem is due to poor science, limited access to scientific literature, poor writing, or ineffective preparation of the manuscripts, then other mechanisms would need to be put into place to address the problem. Programs that encourage long-term partnerships between researchers from different countries might be one useful approach.

In summary, we investigated the possibility of a link between the gender of the corresponding author and other factors and the chances of manuscript acceptance in a single journal. We found no evidence to suggest that single-blind reviewing is biased against women, at least in the journal *Biological Conservation*. We believe that the review process is complex, and involves multiple factors, including different editors, countries, and subdisciplines, and that these factors and journal policies change over time. A major value of the recent debate over bias in the review process (Budden et al., 2008; Engqvist and Frommen, 2008; Hammerschmidt et al., 2008; Whittaker, 2008) has been to highlight a potential problem and to stimulate editors (ourselves and others) to assess their performance and review process (e.g., Anon, 2008; Cooke, 2008; Primack and Marrs, 2008). It is reasonable that the editorial process should be audited and it is likely, given the almost universal use of electronic submissions, that editors will perform audits more thor-

oughly in the future. It is essential that all authors feel that the editorial process is fair, unbiased and rigorous.

Acknowledgements

Funding for this research was provided by Elsevier. Comments on the research and manuscript were provided by the editors: Richard Corlett, Markus Fischer, Andrew Gill, Julie Lockwood, Jean Paul Metzger, Andrew Pullin, Denis Saunders, Navjot Sodhi, and Kim With. Additional comments came from Heather Leeb, Krista McGuire, Farah Mohammadzadeh, Caroline Polgar, Tom Webb, and Robert Whittaker.

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