A persistent lack of international representation on editorial boards in environmental biology

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Key words: bias, editorial board, geographic diversity, peer review, scientific publishing, scientometrics

INTRODUCTION

There are currently over 28,000 peer-reviewed academic journals [1], and the scholars who serve on the editorial boards of these journals play a major role in defining the trajectory and boundaries of knowledge in their disciplines [2]. This is because board members are responsible for coordinating the evaluation by outside experts of a manuscript's technical aspects and the "importance" or "novelty" of the research it summarizes, i.e., peer review, on which the decision to publish a manuscript is ultimately based. Editors also play a central but underappreciated role in shaping the community of scholars contributing to the discourse in their field. First, by recommending the publication of an article the editor confers legitimacy not only on the research, but also upon the individuals who carried it out [3-5]. Second, editors help choose new editors. In doing so, they confer enhanced status and visibility on a select group of scholars who then benefit from the unique opportunities for professional advancement provided by board membership [6]. Editors are therefore a small but powerful group of "Gatekeepers" [2] that select the scientists and ideas shaping the direction of their discipline.

The increased recognition of editor power, along with the results of studies on workforce diversity [7], have heightened concerns about how the composition of editorial boards might influence the peer-review process [8]. For example, it has been suggested that boards whose members are demographically homogenous might converge on a narrow suite of research topics and approaches they consider worthy of publication [3,4]. This narrow vision – and the board structure driving it – could be perpetuated by editors nominating collaborators, whose perspectives and backgrounds

likely match their own, for board service [9]. Indeed, this is among the principal reasons put forward to explain why women remain severely underrepresented on editorial boards across academic fields [6], which has consequences for the selection of referees and other critical aspects of the editorial process [10].

Recent decades have seen the rapid globalization of research in science, technology, engineering, and math (STEM), resulting in greater representation in international journals of authors based in the 'Global South' [11,12]. i.e., the world's 'developing' or 'emerging' economies located primarily in Latin America, Asia, Africa, and the Middle East [13]. Having editorial boards that reflect this increasing 'geographic diversity' of the global scientific community is thought to benefit both journals and disciplines in ways that parallel the benefits resulting from other forms of diversity. In field-based sciences such as ecology or geology, for example, editors based in the region where studies are conducted will be more familiar with the environmental, social, and economic context and constraints under which they were carried out [14]. This could ensure both more rigorous review and a fairer assessment of reviewer criticisms and proposed improvements. Furthermore, scientists trained in different countries or regions can also have very different epistemological orientations. Increasing geographic diversity on an editorial board could therefore broaden the scope of theoretical and methodological approaches a journal publishes. Ultimately, these benefits of internationalizing editorial boards could help to minimize the apparent biases in the review, publication, and citation of articles based on an author's nationality or home-country [12,15].

The first systematic efforts to quantify the nationality of STEM editors – often by using the country in which they were based as a proxy for nationality – were carried out in the early 1980's [16,17]. Since then a small but growing number of studies have observed similar patterns to what these early ones did – individual editorial boards tend to be dominated by scholars from the United States of America (USA) and United Kingdom (UK) [8]. However, prior studies typically compared board composition of journals using data from only a single calendar year, which makes it impossible to evaluate how the community of gatekeepers has changed over time. Furthermore, most of the journals reviewed are from the physical sciences, medical fields, or lab-based biological sciences [4,18]. As a result, almost nothing is known about geographic diversity of editors in field-based STEM disciplines [19] such as ecology, evolution, and natural resource management (hereafter “environmental biology”, EB).

The term “diversity” is often used colloquially to mean “the representation of different groups in a focal population or workplace”. However, one can formally quantify the diversity of a community (e.g., an assemblage of editors) using a suite of indices derived from information theory. While the indices differ in their assumptions and applications, the most commonly used ones are calculated using two types of information: the number of categories found in a sample (i.e., “richness”) and the relative abundance of these categories (i.e., “evenness”). Most studies of editorial board composition to date only report the number of countries represented by editors, i.e., Geographic Richness. However, diversity indices permit a more nuanced evaluation of community composition. For example, using only Richness might lead one to conclude that the geographic representation of editors from different countries has remained

steady over time, when in fact one country has become numerically dominant. Another advantage of diversity indices is that they can be compared across groups (e.g., journals), even if the groups differ in richness or population size.

We identified all scientists serving from 1984-2015 on the editorial boards of 24 leading journals in Environmental Biology (Table S1) and the countries in which they were based during their board tenure. We then calculated the Geographic Richness and Geographic Diversity of this editor community and quantified how it has changed over the last three decades. Finally, we assessed the geographic distribution of editors at broader geographic and macroeconomic scales by comparing the representation of editors from different World Bank geographic regions and national income categories (details on data collection and analysis are in Text S1).

How geographically diverse is the editorial community?

Between 1985-2014, N = 3831 scientists served as editors for our N = 24 focal journals. The size of the editor community increased steadily over time, with 420% more editors serving in 2014 than in 1985 (Fig 1A). Not surprisingly, this led to an increase in the Geographic Richness of the editor community – the number of countries represented by editors in 2014 was 52% higher than in 1985 (N=52 vs. N = 34), and the number of countries to have been represented by at least one editor increased from 34 to 70 (an increase of 86%; Fig 1B). However, scientists based in the USA and UK made up an overwhelming majority of the editor community (55.29% and 11.77%, respectively; Fig 2A). Although there have been modest increases (>1%) from 1985 to 2014 in the proportion of editors based in five other countries (Fig D in S1 Text), the

continued concentration of editors in a very small number of countries is why the low Geographic Diversity observed in 1985 has remained unchanged through 2014 (Fig 1C, Table A in S1 Text).

These patterns are echoed when assessing representation at broader geographic or macroeconomic scales. The proportion of editors each year that were based in North America varied from 46%-59%, while 28-41% were based in Europe/Central Asia (Fig 2B-C). The number of editors from the East Asia/Pacific region doubled from 1985 to 2014 (5.6% and 11.9%, respectively; Text S1 Fig C), but most of these were in the high-income countries of Australia, New Zealand, Singapore, and Japan. This concentration of editors in the Global North – the group of economically developed countries with high per capita Gross Domestic Product (GDP) that collectively concentrate most global wealth [13] – was observed at all levels of the gatekeeper hierarchy: 94% of Subject and Associate Editors, and a remarkable 98.2% of Editors-in-Chief, are based in high-income countries or Western Europe (Table 1, Text S1). In contrast, only a fraction of editors have been based in the Global South (Fig 2B-C). Why this disparity persists despite the well-documented increases in the number and productivity of the region's scientists [12,19,20] remains unclear. A smaller scientific community may well have been a contributing factor thirty years ago, but it is no longer sufficient to explain why in 2014 Sweden, New Zealand, and the Netherlands were each home to more editors than Brazil, Mexico, India, or China (Netherlands = 40, Sweden = 25, New Zealand = 26, China = 22, Brazil = 15, India = 10, Mexico = 9).

What does this lack of diversity mean and why does it matter?

Although the increasing Geographic Richness of editors is a positive development, it is dispiriting that Geographic Diversity remains unchanged. Unfortunately, it will remain low until a greater proportion of editors are based outside of the USA and UK. But does a lack of geographic representation – be it at the national, regional, or macroeconomic level –have consequences for the process of evaluating manuscripts that could ultimately limit the scope and direction of research in environmental biology? Put bluntly, do editors and reviewers from high-income regions like the USA or UK have biases – implicit or otherwise – that affect how they evaluate submissions from scientists based in the Global South? Although one journal in our survey found no evidence that reviewer or author nationality influences the likelihood manuscripts are accepted [21,22], this contrasts sharply with the results of prior studies in other STEM fields [23]. There is also compelling evidence that the country in which authors are based affects where their papers are ultimately published and how much they are cited [12,24,25]. In light of these results, and the ample data on how gender and ethnic background influence other aspects of academic evaluation [26], we recommend Editors-in-Chief work to increase the geographic representation on their boards, make editorial board members and referees aware of how biases based on author nationality can affect their editorial judgement, and conduct internal analyses of the potential factors influencing manuscript fate.

Internationalizing editorial boards can also have positive impacts for journals in addition to mitigating possible implicit biases. First, scientists who presume their work will not be judged fairly because of their nationality or the country in which they are based [i.e., the “biased author effect”, 27] may be more likely to submit their

manuscripts to journals that have editors representing their region. This both increases the number and scope of submissions a journal receives, and the size and expertise of its reviewer pool. Second, a globally diverse editorial board can serve as an important signal of journal quality and connote prestige [28], especially to those tasked with evaluating individual, institutional, or national scientific productivity [18]. Third, it can enhance the profile and impact of the journal and articles published (to say nothing of justification for editors to demand more support or resources from their publishers). Finally, capacity building is often central to the mission of the academic societies. By providing editorial opportunities to scholars from emerging scientific regions, society journals can play a pivotal role in achieving this goal.

Decades of research have highlighted the positive influence of diversity on scientific research teams [29]. Although we recognize editorial boards do not operate in precisely the same way workplace teams do, we believe that geographic diversity can similarly enhance the creativity and impact of scholarship published in scientific journals. While we by no means advocate a quota system for countries or regions, we reiterate prior calls for journal leadership to strive for more geographically diverse editorial boards [19] whose composition mirrors that of their authors (Fig 3) and where they work [14,20]. These efforts, however, must be guided by specific plans and timetables to provide both guidance to editors and hold them accountable for their commitments [30]. Whether such plans underlie the geographic diversity we observed on a few of the editorial boards we reviewed is unknown (Appendix A). Nevertheless, these examples of journals with geographically widespread editors undermine the frequent argument that it is challenging to find and recruiting board members from the

Global South with the requisite academic background, editorial experience, and time to serve. We believe that recruiting these editors is the ethical duty of a journal's leadership, especially given the impact their presence on the board can have on the global scientific community and the diffusion of the knowledge they create in the service of society. Where to find them? We humbly suggest their large and geographically diverse pool of authors (Fig 3) is an ideal place to start.

ACKNOWLEDGEMENTS

We thank Juan Pablo Gomez for helpful discussions and assistance with data collection and T. Bloom, L. Bero, and an anonymous reviewer for comments on the manuscript. This manuscript was completed while EB was Faculty-in-Residence at the University of Florida Marston Science Library.

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Table 1: Percentage of the editorial board members from N = 24 environmental biology journals based in different (A) World Bank Country Income Categories and (B) Global Regions. Between 1985-2014 there were N = 3831 unique editors from 70 countries. The total number of editors in each region and national income category differs due to some editors having moved between 1984-2015; similarly, one person may serve multiple editorial roles. Numbers in parentheses are the number of unique editors in each category. Abbreviations: EIC: Editor-in-Chief, AE: Associate Editor, SE: Subject Editor, SpE: Special Category Editor.

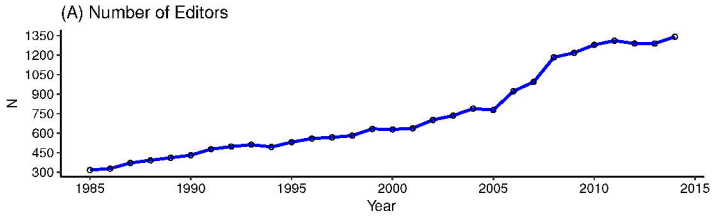
(A) World Bank National Income Category	**Total No. of Editors**	**% of EIC** (N = 171)	**% of AE** (N = 247)	**% of SE** (N = 3690)	**% of SpE** (N= 80)
High income OECD	3608	97.66	92.71	93.36	97.50
High income Non-OECD	51	0.58	1.62	1.33	1.25
Upper-middle income	152	1.75	4.45	4.01	1.25
Lower-middle income	44	0.0	1.21	1.17	0
Low income	5	0.0	0.0	0.14	0
	Total = 3860				
(B) Global Region	**Total No. of Editors**	**% of EIC** (N = 171)	**% of AE** (N = 251)	**% of SE** (N = 3729)	**% of SpE** (N = 82)
North America	2376	50.29	49.00	61.22	67.07
Europe & Central Asia	1025	45.03	35.86	25.69	23.17
East Asia & Pacific	312	2.34	8.76	7.91	7.32
Latin America & Caribbean	108	0.58	4.38	2.82	1.22
Sub-Saharan Africa	50	1.75	1.59	1.26	1.22
South Asia	24	0.0	0.40	0.62	0
Middle East & North Africa	18	0.0	0.00	0.48	0
	Total = 3911				

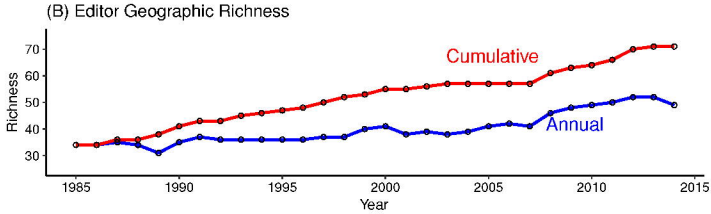
FIGURE LEGENDS

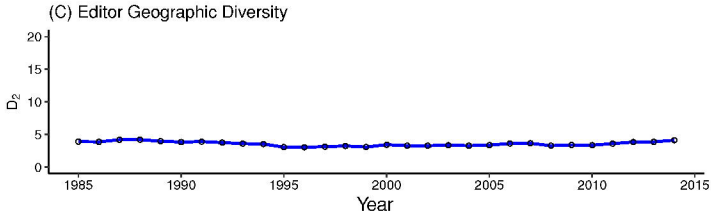
Fig 1. Community composition of editors in environmental biology (1985-2014). (A) Geographic Richness: Cumulative Richness is the total number of countries represented by at least one editor through a given year; Annual Richness is the total number of countries represented by editors in each year (B) The total number of unique editors serving each year from 1985-2014 (C) the Geographic Diversity of editors in environmental biology each year from 1985-2014. We measured diversity using the reciprocal of Simpson's index, D_2. Larger values of D_2 indicate greater diversity, with the maximum potential diversity (MPD) equal to the greatest number of countries represented in any one year of the survey (MPD Editors = 52). For additional details see S1 Text.

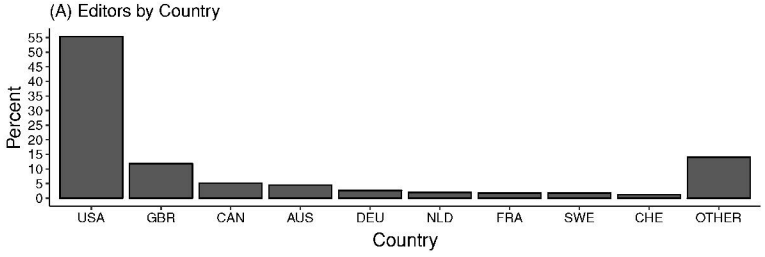
Fig 2. The percentage of environmental biology editors based in different countries, global regions, and World Bank national income categories. (A) Countries; Abbreviations: USA: United States of America, GBR: United Kingdom, CAN: Canada, AUS: Australia, NLD: Netherlands, FRA: France, SWE: Sweden, CHE: Switzerland. (B) World Bank global regions (C) World Bank Gross National Income categories.

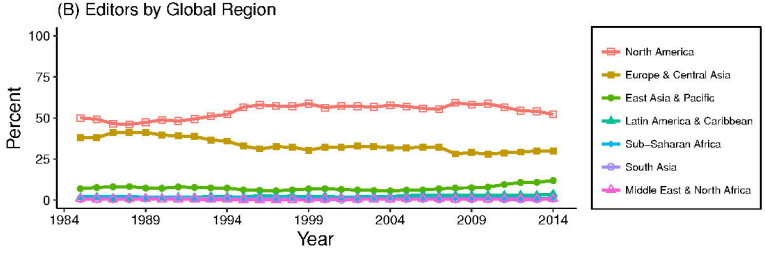
Fig 3. Cumulative Geographic Richness of editors and authors in environmental biology (1985-2014). Rarefaction curves were generated using data on the editorial board membership of 24 environmental biology journals (Table S1) and the institutional addresses of authors publishing in those journals (N = 100,031 articles; S1 Text).

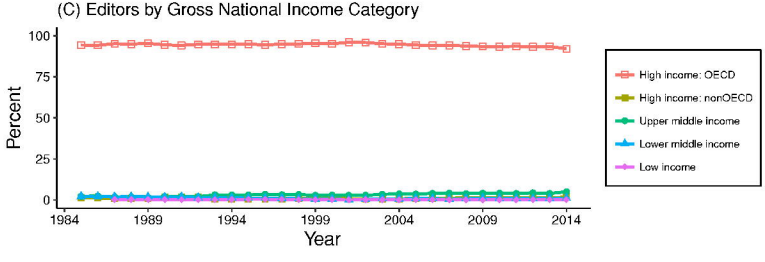

(A) Number of Editors
N
1350
1200
1050
900
750
600
450
300
1985
1990
1995
2000
2005
2010
2015
Year

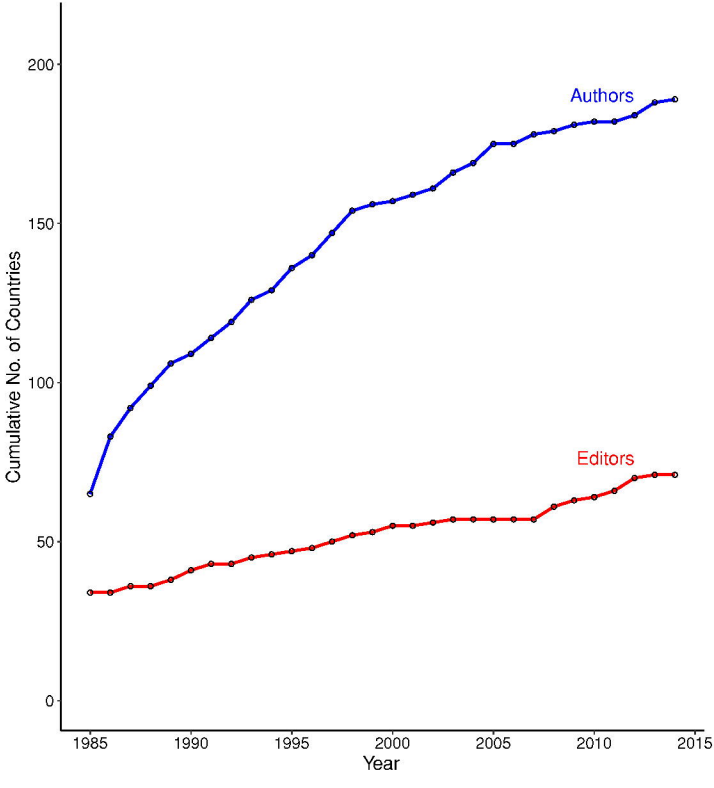

(B) Editor Geographic Richness
Richness
70
60
50
40
30
Cumulative
Annual
1985
1990
1995
2000
2005
2010
2015
Year


(C) Editor Geographic Diversity
D_2
20
15
10
5
0
1985
1990
1995
2000
2005
2010
2015
Year


(A) Editors by Country
Percent
55
50
45
40
35
30
25
20
15
10
5
0
USA
GBR
CAN
AUS
DEU
NLD
FRA
SWE
CHE
OTHER
Country


(B) Editors by Global Region
Percent
100
75
50
25
0
1984
1989
1994
1999
2004
2009
2014
Year
North America
Europe & Central Asia
East Asia & Pacific
Latin America & Caribbean
Sub−Saharan Africa
South Asia
Middle East & North Africa


(C) Editors by Gross National Income Category
Percent
100
75
50
25
0
1984
1989
1994
1999
2004
2009
2014
Year
High income: OECD
High income: nonOECD
Upper middle income
Lower middle income
Low income


Authors
Editors
Cumulative No. of Countries
Year
0
50
100
150
200
1985
1990
1995
2000
2005
2010
2015