

**A peer-reviewed version of this preprint was published in PeerJ on 21 August 2014.**

[View the peer-reviewed version](https://doi.org/10.7717/peerj.542) (peerj.com/articles/542), which is the preferred citable publication unless you specifically need to cite this preprint.

Cho AH, Johnson SA, Schuman CE, Adler JM, Gonzalez O, Graves SJ, Huebner JR, Marchant DB, Rifai SW, Skinner I, Bruna EM. 2014. Women are underrepresented on the editorial boards of journals in environmental biology and natural resource management. PeerJ 2:e542

<https://doi.org/10.7717/peerj.542>

1 **Women are underrepresented on the editorial boards of journals in environmental biology**  
2 **and natural resource management**

3

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**ABSTRACT**

19 Despite women earning similar numbers of graduate degrees as men in STEM disciplines, they  
20 are underrepresented in upper level positions in both academia and industry. Editorial board  
21 memberships are an important example of such positions; membership is both a professional  
22 honor in recognition of achievement and an opportunity for professional advancement. We  
23 surveyed 10 highly regarded journals in environmental biology, natural resource management,  
24 and plant sciences to quantify the number of women on their editorial boards and in positions of  
25 editorial leadership (i.e., Associate Editors and Editors-in-Chief) from 1985-2013. We found that  
26 during this time period only 16% of editorial board members were women, with more  
27 pronounced disparities in positions of editorial leadership. Although the trend was towards  
28 improvement over time, there was surprising variation between journals, including those with  
29 similar disciplinary foci. While demographic changes in academia may reduce these disparities  
30 over time, we argue journals should proactively strive for gender parity on their editorial boards.  
31 This will both increase the number of women afforded the opportunities and benefits that  
32 accompany board membership and increase the number of role models and potential mentors for  
33 early-career scientists and students.

## INTRODUCTION

34  
35 Despite women in the United States and Europe earning similar numbers of graduate  
36 degrees as men do, they remain underrepresented in upper level positions in both academia and  
37 industry in these regions (European Commission 2012; National Science Foundation 2004;  
38 National Science Foundation 2012). Several mechanisms have been put forward to explain this  
39 disparity, including biases against women in hiring, promotion, and offers of compensation, the  
40 emphasis on productivity, journal placement, and citation rates as determinants of merit despite  
41 evidence of gender bias influencing all three, inflexible or even hostile work environments, and a  
42 lack of role models and mentors (reviewed in Budden et al. 2008; Lariviere et al. 2013; Leahey  
43 2007; Long 2001; Moss-Racusin et al. 2012). In response, universities, funding agencies, and  
44 other institutions have implemented strategies to address these issues, including making  
45 opportunities for professional advancement more broadly available and actively seeking gender  
46 diversity in leadership roles (Fox 2008). While these efforts have had some positive results,  
47 much remains to be done to ensure women in Science, Technology, Engineering, and Math  
48 (STEM) disciplines are afforded the same opportunities as their male counterparts.

49 The editorial boards of scientific journals act as gatekeepers that help maintain the  
50 scientific integrity and standards of a journal as well as identify emerging and innovative areas of  
51 research (Addis & Villa 2003; Mauleon et al. 2013). An invitation to serve as a Subject Editor is  
52 recognition that a scholar is respected in his or her discipline; it is also the path towards  
53 leadership positions because Associate Editors and Editors-in-Chief are typically selected from  
54 the Subject Editors. Serving on a board is also a means of advancing one's scholarship, both by  
55 becoming aware of the latest advances in the field and gaining insights into the writing and  
56 publication process. Finally, editorial boards are important professional networks – in serving on

57 a board one is able to develop relationships with reviewers, authors, and other editors (Addis &  
58 Villa 2003; Pearson et al. 2006). Serving on a board is therefore both an honor and a means of  
59 furthering one's research and career.

60 Previous studies have quantified the gender composition of editorial boards in the social  
61 sciences (Addis & Villa 2003; Green 1998; Stark et al. 1997), business administration and  
62 management (Metz & Harzing 2012), and STEM fields such as information systems (Cabanac  
63 2012) and medicine (Galley & Colvin 2013; Keiser, Utzinger & Singer 2003; Wilkes & Kravitz  
64 1995). To our knowledge, however, no such efforts have been made in ecology, natural resource  
65 management, plant sciences, or related disciplines (collectively referred to here as  
66 "environmental biology"). We therefore used ten highly regarded journals in environmental  
67 biology to address the following questions: 1) What proportion of editorial board members were  
68 women between 1985-2013? 2) How did the representation of women on editorial boards  
69 change over this time period? 3) How many women served in leadership positions, i.e., as  
70 Editors-in-Chief or Associate Editors?

71

## 72 METHODS

73 We selected for review 10 high profile environmental biology journals: *Annual Review of*  
74 *Ecology, Evolution, and Systematics*, *Biotropica*, *Agronomy Journal*, *North American Journal of*  
75 *Fisheries Management*, *American Journal of Botany*, *Conservation Biology*, *Biological*  
76 *Conservation*, *Ecology*, *Journal of Ecology*, and *Journal of Tropical Ecology*. We chose these  
77 journals because they are published by the primary professional organizations of which we (i.e.,  
78 the authors) are members (e.g., *Biotropica*, *Conservation Biology*) or are alternative, non-society  
79 outlets for similar research (e.g., *Journal of Tropical Ecology*, *Biological Conservation*). It was

80 not intended to be a random sample of journals or a subset of journals with similar impact  
81 factors. Rather, they were chosen because they are the journals many graduate students in  
82 environmental biology, natural resource management, and plant sciences, including the authors,  
83 target to publish some of their thesis research.

84 Our analyses were based on the years 1985-2013. We chose 1985 as a starting point  
85 because it is shortly after studies began demonstrating disparities in career advancement between  
86 male and female scientists (reviewed in Long 2001; National Science Foundation 2003) but a  
87 few years prior to major initiatives by the US National Science Foundation and others to rectify  
88 these disparities (e.g., the 2001 initiation of the ADVANCE Program, National Science  
89 Foundation 2014). As such, we expect our survey period to reflect potential shifts in editorial  
90 board composition resulting from increased awareness of gender biases in STEM and the results  
91 of efforts to rectify these biases. For each journal we selected the first issue published each year  
92 and recorded the names, institutions, and editorial positions of all editorial board members. We  
93 then used Internet searches, personal knowledge, and interviews of colleagues to determine the  
94 gender of each editorial board member. Because of library licensing issues were unable to obtain  
95 data for *Journal of Tropical Ecology* for the years 1986-1989.

96 Journals often have different names for positions with similar editorial responsibilities,  
97 these names frequently change over time, and editorial positions are frequently created or  
98 eliminated. We therefore assigned editorial board members to the following categories based on  
99 their responsibilities: (1) Editor-in-Chief (EIC). The EIC oversees the journal and is ultimately  
100 responsible for editorial policy, standards, and practice, including appointing members of the  
101 Editorial Board. Some journals (e.g., *North American Journal of Fisheries Management*) had co-  
102 Editors-in-Chief; in such cases all were included in the total EIC count. (2) Associate Editors

103 (AE). The AE assists the EIC with their responsibilities and may take the lead on some aspects of  
104 journal administration; in some cases they might oversee all submissions in a particular subject  
105 area or from a geographic region. Not all journals have AEs, while those that do may vary in the  
106 length of time they have had them. (3) Subject Editors (SE). The SEs, also commonly referred to  
107 as Handling Editors, oversee the process of manuscript review. For some journals they make  
108 final decisions on manuscripts after considering reviewer feedback (e.g., *Ecology*) while for  
109 others they provide recommendations based on which EICs or AEs make final decisions (e.g.,  
110 *Biotropica*). They also provide formal or informal feedback to the EICs/AEs on journal policy  
111 and administration. They are referred to collectively by a variety of titles, including Board of  
112 Editors (*Ecology*, *Biological Conservation*) and the Editorial Committee (*Annual Review of*  
113 *Ecology, Evolution, and Systematic*, *American Journal of Botany*). Note that two journals – the  
114 *American Journal of Botany* and *North American Journal of Fisheries Management* – used the  
115 title of “Associate Editor” for members of their Editorial Board with the responsibilities of SEs;  
116 we therefore included them in this category in our analyses. (4) Special Editors. Many journals  
117 have someone tasked with organizing special sections, reviewing data archives, soliciting  
118 reviews of recently published books of interest to the journal’s readers, etc. (e.g., Biological  
119 Florida Editors for the *Journal of Ecology*; Concept Section, Data Archive, Special Features, and  
120 Invited Papers Editors for *Ecology*).

121 We conducted our analyses using only EICs, AEs, and SEs, and throughout our  
122 manuscript and analyses we use the term ‘Editorial Board’ to refer to the group collectively  
123 made up of these three categories. Special Editors were not included in our analyses unless they  
124 were also identified as EICs, AEs, or SEs because very few journals had these positions and they  
125 rarely existed for the entire survey period. We also excluded from our analyses production staff

126 (e.g., production editors, managing editors, editorial assistants) and the *American Journal of*  
127 *Botany*'s "Section Representatives", which were only present in our survey in 1985 and whose  
128 primary function was to help identify journal priorities and suggest reviewers if asked – they did  
129 not make editorial decisions on individual manuscripts (Dr. Judith E. Skog, pers. comm., 2014).

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131

## RESULTS & DISCUSSION

132 We found that from 1985-2013 only 16% of editorial board members were women (N =  
133 332 of 2065, Fig. 1A). The disparity also extends to leadership positions: since 1985 only 14% of  
134 Associate Editors (N = 18 of 125, Fig. 1B) and 12% of the Editors-in-Chief of our focal journals  
135 were women (N = 7 of 59, Fig. 1C). Not surprisingly, the proportions of male and female editors  
136 were significantly different for all of groups of Editors (proportion tests with continuity  
137 corrections, null probability = 0.5, SE:  $\chi^2 = 946.44$ , df = 1, p <0.0001; AE:  $\chi^2 = 61.952$ , df = 1,  
138 p <0.0001; EIC:  $\chi^2 = 32.81$ , df = 1, p <0.0001).

139 While there was a general increase in the representation of women on editorial boards  
140 over time, for most journals the percentage of women on the board rarely exceeded 20% (Fig. 2).  
141 Nevertheless, there was notable variation among journals in the representation of gender on their  
142 editorial boards during the time period surveyed. For several journals, the proportion of women  
143 editors increased from zero in the mid-1980's to ~40% by 2013 (e.g., *Biotropica*, *American*  
144 *Journal of Botany*, *Conservation Biology*). Others, however, had consistently few women on  
145 their boards throughout the period surveyed (e.g., *Agronomy Journal*, *North American Journal of*  
146 *Fisheries Management*, *Biological Conservation*). A similar pattern of underrepresentation was  
147 observed for Associate Editors and Editors-in-Chief. While most journals had female Associate  
148 Editors at some point during the period surveyed, only 5 of the 10 journals we reviewed had ever



149 had a woman as Editor-in-Chief (Fig. 3). Of these, only one – the *North American Journal of*  
150 *Fisheries Management* – had multiple women serve as EICs.

151 We recognize that determining the extent of gender bias in the composition of editorial  
152 boards in environmental biology will require evaluating many more journals from multiple  
153 subfields. However, the results of similar surveys in fields ranging from economics to  
154 anthropology have found disparities comparable to those we document (Addis & Villa 2003;  
155 Cabanac 2012; Galley & Colvin 2013; Green 1998; Keiser, Utzinger & Singer 2003; Metz &  
156 Harzing 2012). Assuming the results for the journals we reviewed are representative of others in  
157 environmental biology, our observations suggest two questions to be addressed by this scientific  
158 community. First, why are women underrepresented on editorial boards and in positions of  
159 editorial leadership? Second, for what gender composition on editorial boards should journals  
160 strive?

161 While our study was not designed to elucidate why women are underrepresented on  
162 editorial boards, potential mechanisms include many of the same ones invoked to explain why  
163 women are lacking in leadership positions in other spheres of academia (Fox 2008; Long 2001).  
164 It may also be that men continue to be more visible and hence more likely to be identified as  
165 potential board members because they have greater productivity, have more first- or last-authors  
166 of papers (West et al. 2013), and tend to be “citation elites” (sensu Parker, Allesina & Lortie  
167 2013; Parker, Lortie & Allesina 2010). It may be that using these metrics to screen for editors  
168 might eventually – albeit slowly – result in increased numbers of women on editorial boards.  
169 This is because gender-based disparities in rates of publication (West et al. 2013) and citation  
170 (Borsuk et al. 2009) are diminishing (but see Lariviere et al. 2013), although this does not appear  
171 to be the case for all disciplines (West et al. 2013). More difficult to overcome might be the

172 reliance on using the social and research networks of (mostly male) editorial board members to  
173 identify potential new editors (Addis & Villa 2003), since women scientists are frequently  
174 excluded from such networks or on their periphery (Fox 2008). This is where proactive  
175 measures, including the promotion of women to positions of editorial leadership, may have the  
176 greatest impact (Galley & Colvin 2013). Indeed, at least one study has found that having a  
177 female Editor-in-Chief is correlated with a greater proportion of women on editorial boards  
178 (Mauleon et al. 2013).

179         For what gender composition on editorial boards should journals in environmental  
180 biology strive? We propose they should proactively seek gender parity, rather than simply mirror  
181 the proportion of women earning doctoral degrees in a specialization, conducting research in  
182 particular disciplines, or who are members of academic societies – numbers which, in contrast to  
183 other fields (e.g., Morton & Sonnad 2007), we were surprised to find are extremely difficult to  
184 ascertain for environmental biology. Some might argue that the relatively lower number of  
185 female senior scholars in certain fields (e.g., agronomy) might make parity a challenge.  
186 However, it is important to emphasize that the issue is not whether there is parity in the number  
187 of women earning PhDs, but whether there are sufficient qualified women worldwide to  
188 comprise half an editorial board, which is a much smaller number (mean number of board  
189 members in 2012 =  $56 \pm 41.3$  SD, range = 9-127). It is difficult to argue that there are not, given  
190 the global reach of academic societies (Carroll 2014), the internationalization of research  
191 programs (Stocks et al. 2008), increases in research productivity in developing countries  
192 (Holmgren & Schnitzer 2004), and the time elapsed since issues of gender & STEM came to the  
193 fore (though we concede that for highly specialized or national journals parity may be a greater  
194 challenge). We argue that Editors must work harder to proactively identify these potential board



217

## FIGURE LEGENDS

218 **Fig. 1.** The proportion of men and women who served as (A) Subject Editors, (B) Associate  
219 Editors, and (C) Editors-in-Chief of 10 environmental biology journals from 1985-2013.

220

221 **Fig. 2.** Change in the percentage of women on 10 Editorial Boards from 1985-2013. Editorial  
222 boards comprise Editors-in-Chief, Associate Editors, and Subject Editors.

223

224 **Fig. 3.** Total number of men and women who served as (A) Editors-in-Chief (B) Associate  
225 Editors or (C) Subject Editors of 10 environmental biology journals from 1985-2013. Note that  
226 we categorized the Associate Editors of the *American Journal of Botany* and *North American*  
227 *Journal of Fisheries Management* as Subject Editors given their responsibilities, and hence are  
228 depicted with that category.

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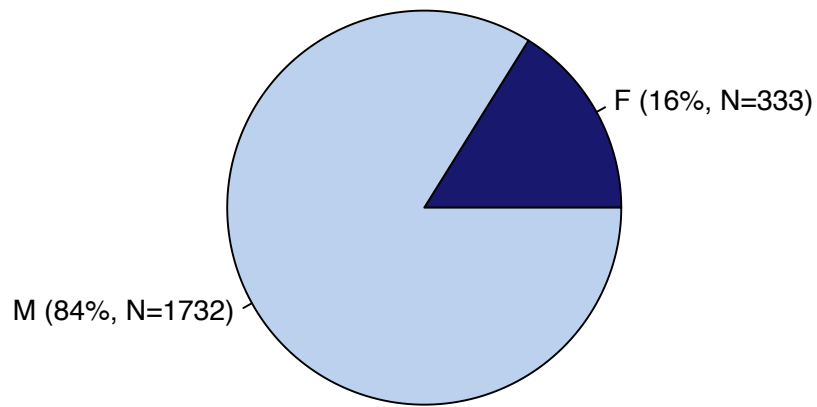
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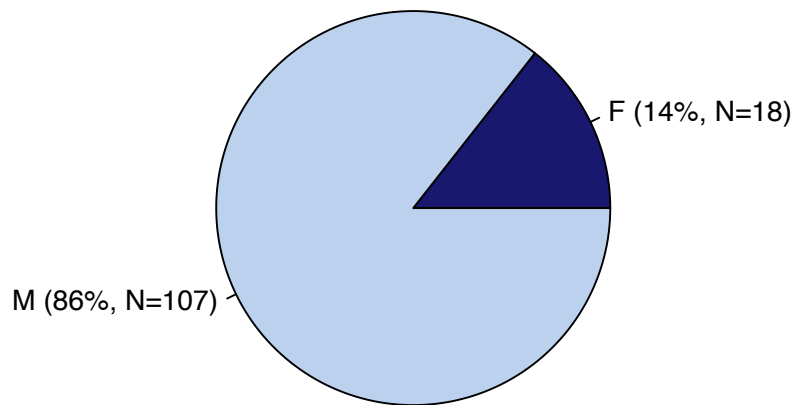


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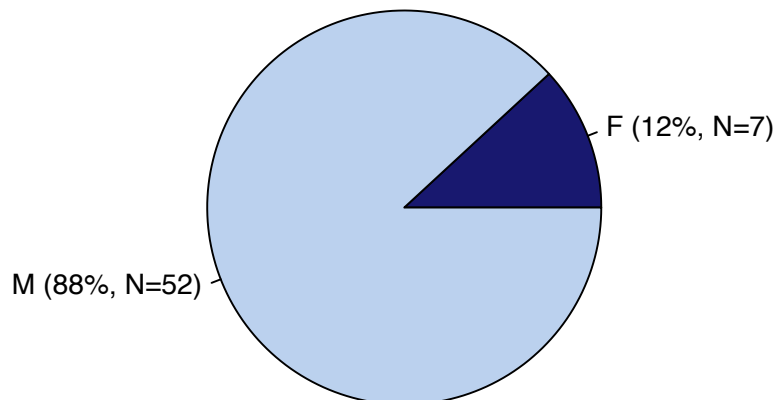
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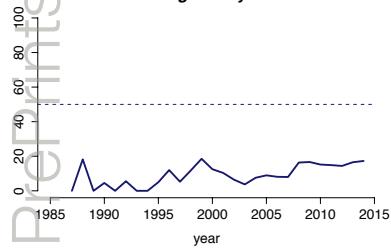
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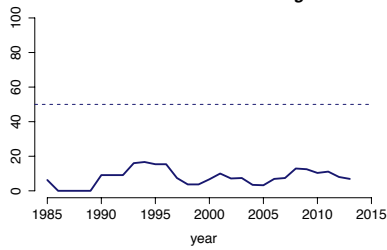
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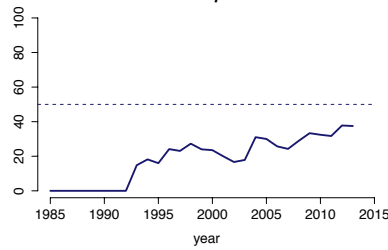
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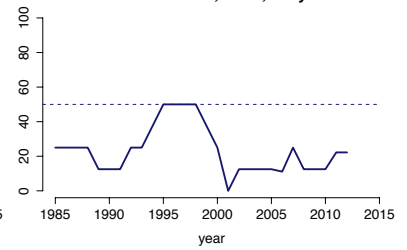
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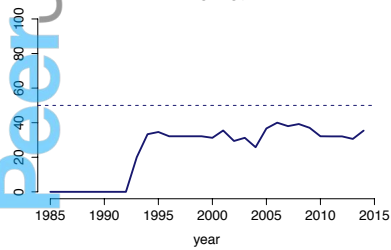
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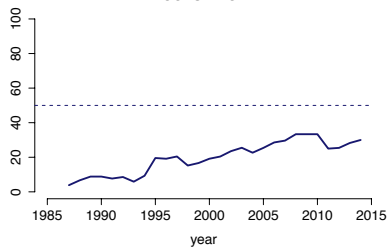
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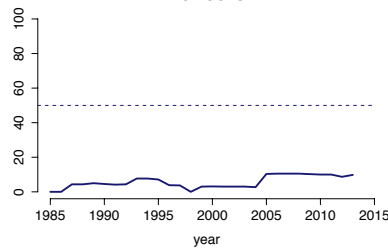
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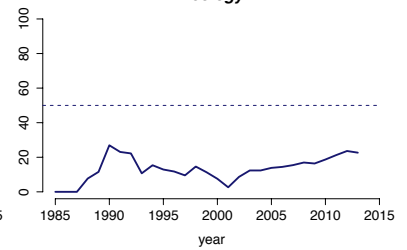
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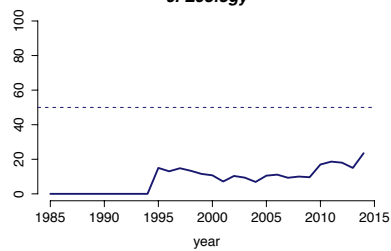
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**Ecology**



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**J. Trop. Ecology**

