

Editorial: Editorial practice at the *International Journal of Primatology*: The roles of gender and country of affiliation in participation in scientific publication

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Science benefits from diversity (Nielsen et al. 2017). Our background and experience have the potential to influence the way we do science, the topics we study, the questions we ask, the hypotheses we test, the way in which we test them, and the way we interpret our data. Hence, excluding groups reduces diversity in ways of thinking and thus impoverishes science.

Editors of scientific journals decide whether to accept or reject manuscripts and invite people to review manuscripts. Thus, they have a strong influence on the scientific record. Moreover, they can influence career prospects, because authorship is used to evaluate researcher productivity and ad hoc reviewing is a mark of esteem. Editors have the potential to address or perpetuate inequalities, thus it is their responsibility to examine and reflect on our practices and ensure that they are inclusive.

In theory, the editorial and peer review process is impartial and objective. However, in reality it is susceptible to many types of bias (Kaatz et al. 2014; Lee et al. 2013). These include both conscious (explicit) biases and unconscious (implicit) biases. The latter arise from the background, cultural environment, and personal experience of an evaluator and are more troubling than conscious biases because well-intentioned people may be unaware of influences on their decision-making. Unconscious bias means that people from some groups must achieve higher standards than those from other groups to be judged competent.

Perhaps the best studied example of bias in science relates to gender. For example, women are disadvantaged in hiring (Moss-Racusin et al. 2012; Wennerås and Wold 1997), pay (Shen 2013), funding (Bornmann et al. 2007; Ley and Hamilton 2008; Pohlhaus et al. 2011, but see Marsh et al. 2011), citations (Larivière et al. 2013), recommendation letters (Dutt et al. 2016) and invited presentations (Schroeder et al. 2013). Women are less likely than men to publish in, be invited to review for, or be profiled in, high impact journals (Nature: Anon 2012). Moreover, women are underrepresented at graduate and postdoctoral levels in the laboratories of “elite” male scientists in the life sciences (Sheltzer and Smith 2014), meaning that they miss out on the resources and opportunities associated with training in such laboratories.

Primatology is often cited as a field where women and men have equal opportunities (Fedigan 1994, 1997). There have been more women than men in primatology since the 1970s (Turner 2002). Moreover, primatology has strong female role models, women take prestigious roles such as president of the *International Primatological Society* (first female president 1992), and women have achieved significant recognition in our field (5 of 8 recipients of the *International Primatological Society* Lifetime Achievement Awards are women). However, evidence from several studies suggest that Primatology has not yet achieved gender neutrality. First, analysis of the membership of the *International Primatological Society* in 2008 showed that although women outnumbered men at graduate student and assistant professor levels, men outnumbered women among full professors (Addessi et al. 2012). Men also published more articles per individual than women, although their scientific “impact” (measured as their *h* index, Hirsch 2005) did not differ (Addessi et al. 2012). Second, Primatology symposia organised by men at the *American Association of Physical Anthropology* meetings had half the number of female first authors than symposia organised by women or by both women and men (Isbell et al. 2012). This equals half the proportion of female first authors of primatology presentations overall. The *American Society of Primatologists* showed similar patterns (Isbell et al. 2012). Third, the numbers of women and men giving podium presentations in invited symposia, open-call podium presentations and posters, and publishing articles still does not reflect the membership of the *American Association of Physical Anthropologists* and the percentage of female full professors remains low (Turner et al. 2018).

Other characteristics of the author that may bias manuscript evaluation include their affiliation. For example manuscripts by authors from countries where English is not the first language were less likely to be accepted in ecology and evolution journals (Tregenza 2002). This disadvantage may result from discrimination, the difficulties of writing in a foreign language, or both. Institutional prestige and personal networks can also influence evaluations (Lee et al. 2013). Potential biases particularly relevant to our field include undervaluation of the contributions of range-country scientists and those from low and middle-income countries. This is of particular concern as the contributions and promotion of scientists from range countries are critical to promote primate conservation in the face of the primate extinction crisis (Estrada et al. 2017, 2018).

The *International Journal of Primatology* adopted a double-blind reviewing policy in 2015 to address potential biases or perceptions of bias in the peer review process based on characteristics of the author rather than on the contents of the manuscript (Setchell 2015). This means that reviewers do not know the identities of the authors and the authors do not know the identities of the reviewers; although admittedly it is often possible to guess the identity of at least some authors. However, editors do know the identities of both authors and reviewers. Thus, editors’ unconscious bias may influence their decisions.

We investigated editorial practices at the *International Journal of Primatology* with respect to gender and country of affiliation. We first report the gender, country of affiliation and country

of origin of the editors since 2006, when our submission records begin. We then examine submissions, acceptance rates and who is invited to review with respect to gender and aspects of the author's country of affiliation, including the continent, whether the country is a primate range country, and World Bank income categories. We use the patterns we observe to reflect on practice at the journal and propose actions to improve it.

The data

We first compiled the gender and county of affiliation of Editors since the beginning of 2006 (when online manuscript records began) and the current Editorial Board. We then extracted data from the online Editorial Manager system for the *International Journal of Primatology* from the start of 2006 to April 2016 (when we began this study).

We extracted:

1. The manuscript ID number for all manuscripts submitted to the journal, with the names of all authors and the final disposition of the article (i.e., accepted or rejected). We also extracted the affiliation of the first author (the system does not store the affiliation of other authors).
2. All invitations to review sent, with the name and affiliation of the individual invited to review.

Manuscripts, first authors, and reviewers are assigned unique ID numbers in the Editorial Manager system. We merged records where we found repeats. We extracted the names of all other authors for each manuscript and matched them to system ID numbers when present (i.e., when those individuals also appeared as first authors or as reviewers elsewhere in the database).

We assigned individuals to the gender categories 'woman' or 'man' based on forenames, our knowledge of the individual, and images on personal websites and academic social media. In other words, we imposed binary 'gender' categories based on our perceptions of the individual, which may not reflect the person's gender identity. We recognise that gender is far more complicated than a binary system suggests. JMS completed all work with individual names then anonymised the data set prior to further analysis.

We assigned people to country categories, based on their affiliation in the database. The categories were (i) continent, (ii) primate range country vs. non-range country, and (iii) income group, based on World Bank categories low, lower-middle, upper-middle and high income. The affiliation of an author does not necessarily reflect their country or continent of origin, as primatologists are highly mobile. Moreover, affiliations in the Editorial Manager system may be

out-of-date because people enter their affiliation when they first create an account in the system and do not always update their information when submitting an article or a review.

We report numerical effect sizes in addition to results of significance testing because p values do not reflect the size of an effect. We set alpha at 0.05 for all analyses.

The editors

The Editor-in-Chief takes all final decisions of acceptance or rejection at the *International Journal of Primatology*. From the beginning of the study (2006) to 2008 the Editor-in-Chief was a man. Since 2009, the Editor-in-Chief has been a woman (JMS). Both Editors-in-Chief are from non-range, high-income countries.

The journal has had 4-5 Associate Editors at a time since 2009. Overall, three women and five men have served as Associate Editors. Five Associate Editors are from North America (one of whom is originally from and trained in Europe, and another who is originally from Madagascar), two are from Latin America and one is from Europe. None are from Asia and Australasia or Africa. Three Associate Editors are nationals of primate range countries (one low income, two upper-middle income), two of whom now work in a non-range, high-income country. All other Associate Editors are nationals of and affiliated to organisations in non-range, high-income countries.

The current Associate Editors number three women and two men. Three work in North America, one in Europe and one in Latin America. Two are nationals of primate range countries.

The Editorial Board of the *International Journal of Primatology* serves to broaden the scope and range of expertise beyond that of the editors. We revised the Editorial Board in 2017 to improve representation. The members now comprise 18 women and 19 men. North America (13) and Europe (10) dominate, followed by Asia and Australasia (7), Africa (5) and Latin America (5), broadly reflecting the affiliations of articles published in 2009-11 (Setchell 2012). Eleven members are from range countries, 26 are from non-range countries. We have 24 members from high-income countries, 8 from upper-middle, 2 from lower-middle and 3 from low income countries.

Submissions

We received 1,313 manuscript submissions during the study period. Men were slightly more likely to submit a manuscript as first author than were women (men 53%, women 47%, **Fig 1**). This does not reflect the overall composition of our field, in which women outnumber men, but

does reflect the smaller proportions of women among academics at higher levels, who are more likely to publish than graduate students (Addessi et al. 2012).

Submitted manuscripts were far more likely to have first authors with affiliations in North America (36%) and Europe (29%) than in Asia and Australasia (19%), Latin America (16%), or Africa (4%) (**Fig 1**). Submitted manuscripts were more than twice as likely to be authored by people affiliated to institutions in non-range countries than by people affiliated to institutions in range countries (**Fig 1**, range 32%, non-range 68%). Finally, submitted manuscripts were also far more likely to be authored by people affiliated to institutions in high-income countries (69%) than by people from upper-middle (24%), lower-middle (7%) and low (1%) income countries (**Fig 1**). These patterns reflect those found in science more generally (e.g., Czerniewicz 2013; Schemm 2013) and are likely to reflect geographical differences in opportunities and access to resources, including training and mentorship, dearth of funding, a lack of recognition for our discipline in some countries and an associated lack of formal training programmes and shortage of academic positions (e.g., Bicca-Marques 2016; Fan et al. 2018; Hoàng 2016). Nevertheless, the progress made by dedicated primatologists in the face of these difficulties in Brazil, China and Vietnam, (Bicca-Marques 2016; Fan et al. 2018; Hoàng 2016), among other countries and the recent establishment of the African Primatological Society, gives us hope for the future.

We refrained from making comparisons between our data and the available population of primatologists, because it is difficult to identify a baseline for our data. The membership of the *International Primatological Society* is one possibility (e.g., Addessi et al 2012), but may be biased by some of the same variables we explore in terms of country of affiliation. For example, society membership is linked to conference attendance, which is biased in favour of those who can afford to attend and varies with the location of the conference. If, for example, researchers in range countries were less likely to be members of the *International Primatological Society* than those in non-range countries, comparing our data against this baseline would make the situation look more representative than it actually is.

FIGURE 1 HERE

Fig 1: Proportion of manuscripts accepted by author characteristics. Bar width is proportional to number of submitted manuscripts.

Acceptance

Of the 1,313 manuscripts submitted, 625 (47.6%) were accepted. We limited analysis of acceptance rates to the first author, so that each submission is counted once in a chi-squared test. This choice seems warranted, as the first author usually does most of the work in a study in our field and writes the first draft of the manuscript.

Of accepted manuscripts, the first author was a woman in 48% of cases and a man in 52% of cases (**Fig 2**). An analysis of global gender disparities in science found that there are 1.93 articles with a man as first author for every article with a female first author (Larivière et al. 2013), and women represent 23% of first authors in ecology and evolution papers in the JSTOR archive 1990-2011 (West et al. 2013; see <http://www.eigenfactor.org/gender/#> for an interactive online visualisation of the gender composition of authorship for fields and subfields of JSTOR). Thus, women are much better represented as first authors in manuscripts submitted to the *International Journal of Primatology* than they are in the scientific literature overall. As for submissions, the small gender difference does not reflect the overall make-up of primatology but does reflect primatologists at higher academic levels, based on membership of the *International Primatological Society* in 2008 (Addessi et al. 2012). However, it's not clear how well membership of the *International Society of Primatology* represents primatology overall.

Submissions from women as first author were numerically slightly more likely to be accepted than those with men as first authors, but this difference was not significant (**Fig 1**, $X^2_1 = 0.28$, $p = 0.595$). Findings for other journals also show no gender difference in acceptance rates (Fox, Burns, Muncy, et al. 2016; Lee et al. 2013; Tregenza 2002). If manuscripts authored by women and men do not differ in quality, as suggested by the finding that women and men do not differ in H index (Addessi et al. 2012), our findings suggest that the journal assesses manuscripts independent of the gender of the first author.

We found large effects of continent of affiliation, being affiliated to an institution in a range vs. non-range country and country income on manuscript acceptance. Acceptance rates varied significantly among continents ($X^2_4 = 86.53$, $p < 0.001$), apparently driven by manuscripts from first-authors with North American and European affiliations having much higher acceptance rates than those from first-authors affiliated elsewhere (North America: 59%, Europe: 56%, Asia and Australasia: 35%, Africa: 31%, Latin America: 28%; **Fig 1**). Manuscripts with non-range country first authors were much more likely to be accepted than manuscripts with range country first authors (**Fig 1**, $X^2_1 = 76.96$, $p < 0.001$). Not surprisingly, as range vs. non-range country is strongly correlated with income, results for income group show a similar pattern, with a significant difference ($X^2_3 = 78.16$, $p < 0.001$) driven by manuscripts with first authors from high-income countries being much more likely to be accepted than those whose first authors come from countries with any other income level (**Fig 1**).

There are many reasons why manuscript acceptance rates might vary with geography, some of which lie with the editorial and review process and some with the resources available to authors through their institutions and countries. For example, editors and reviewers are mainly from high income, non-range countries, giving those with similar cultural background an advantage over those who do not share that background. Authors from under-represented countries, who do not share the same cultural background, may be unfamiliar with the expectations of the communities that dominate academia. Moreover, funding severely limits the opportunities for highly competent researchers from low-income countries to conduct research.

The *International Journal of Primatology* seeks to accept articles, not to reject them, and the editors work with authors to improve language, analysis, context and interpretation (the number of revisions can reach 11, not including resubmission of manuscripts rejected with the possibility of resubmission). Nevertheless, some studies are deemed irretrievable because the conclusions that can be drawn from the data are too limited, due to limited sample size or other aspects of the study design. Resolving this issue requires intervention at a much earlier point than submission for publication, at the study design stage. Improving training and access to training in study design, facilitating and rewarding mentoring, promoting cross-national collaborations and expert peer review of study design would all contribute to improving studies and the resulting manuscripts. Pre-registration of study plans might facilitate this, in addition to addressing issues of transparency (Setchell et al. 2016). Like applying for funding (Mervis 2013), sharing study plans with reviewers entails the risk of plagiarism, but time-stamped submissions, and embargoes on public access help to mitigate such fears (e.g., the Open Science Framework, <https://osf.io/>).

Invitations to review

We next asked who is invited to review for the *International Journal of Primatology*. Reviewing provides an opportunity to see how manuscripts benefit from the review process and to practice constructive criticism. The *International Journal of Primatology* sends a copy of editorial decision letters to reviewers giving them access to the reports of other reviewers, offering the opportunity to read other experts' views of the manuscript. Reviewers also have access to authors' responses to reviewer comments, affording them experience of a part of the publication process that is usually hidden from view. Reviewing also provides possible career advantages in addition to improving the reviewers' own work. Ad hoc reviewing is included as service on curricula vitae and included in evaluations including job, funding and promotion applications.

Editors at the *International Journal of Primatology* identify potential reviewers based on author suggestions, the literature cited in the manuscript, personal knowledge, bibliographic database searches, suggestions from people who decline an invitation, requests for suggestions from Editorial Board members and other experts, and requests for volunteers made to the *International Primatological Society*. We seek both theoretical and taxonomic expertise. We include a request for information about alternative reviewers in invitation letters, particularly asking for suggestions of early career researchers whom we may not have come across.

Our dataset has almost no information for co-authors who had not previously been a first author or an invited reviewer, so we restricted our analysis to people who were either invited to review or were first or last authors on submitted manuscripts during the study period (meaning that they received one or more invitation to review, submitted one or more manuscript as first or last author in the dataset or both). We considered the resulting sample as a set of potential

reviewers. This makes some sense, as first and last authors are most likely to meet the criteria for a potential reviewer, first authors because they do the bulk of the work and last authors because they commonly oversee projects.

We considered the number of invitations that someone received during the study period as two processes: receiving one or more invitations to review (i.e., being included in the reviewer pool, a binary process) and the total number of invitations received (a negative binomial count process).

Entering the reviewer pool

Of the 1920 people who were either invited to review or were first or last authors on submitted manuscripts during the study period, 1353 were invited to review, 780 of whom were not an author in any position in the author list on any submissions during that period. Therefore, 567 people who appeared as first or last author were not invited as reviewers. The finding that many reviewers do not appear as authors in the database probably reflects the fact that editors often invite the authors of articles in other journals to review, rather than selecting among our own authors. Where editors do select authors from the journal, they select those whose manuscripts were accepted. We have already seen that manuscripts authored by people from range countries are more likely to be rejected, providing one possible explanation for the bias towards selecting reviewers with non-range and high-income country affiliations.

Overall, 55% of people invited to review at least once were men ($\chi^2_1 = 11.82$, $p < 0.001$, based on expected values of 50:50). Our figures are thus substantially better than those for *Nature*, where just 12% of reviewers invited in 2011 were women, rising to 16% in 2017 (Anon 2012, 2018), and for *eLife*, where only 21% of reviewers are women (Chawla 2018). As for manuscript acceptance, patterns of invitations to review at the *International Journal of Primatology* do not reflect the underlying population of primatologists overall, but they do reflect the greater proportion of men than women at full professor, based on membership of the *International Primatological Society* in 2008 (Addessi et al. 2012).

For the binary process of whether people in the dataset are invited to review or not, men were slightly and significantly more likely than women to be invited to review a manuscript, based on based on the sample of potential reviewers as identified above (**Fig 2**, $\chi^2_1 = 7.41$, $p = 0.006$). Gender bias in presentations at symposia at meetings of the *American Association of Physical Anthropologists* depends on the gender of the organiser, with symposia organised by men being biased towards men, while those organised by women are not (Isbell et al. 2012). The gender balance among editors at the *International Journal of Primatology* is roughly equal across the study period and the majority of final decisions in the dataset have been taken by the current Editor-in-Chief, a woman (83%). Nevertheless, our data reveal a small, but important, bias in favour of men. This bias may arise because men publish more than women both in general

(Larivière et al. 2013) and in primatology (Addessi et al. 2012) and are therefore more likely to be invited to review based on database searches. More men are full professors than women (Addessi et al. 2012), so men are more likely to be familiar to editors. Moreover, both women and men evaluate men more positively than they do women based on identical information (Moss-Racusin et al. 2012), so editors may be more likely to select a man from a list of potential reviewers. Unconscious gender bias is also likely to be facilitated by editors' use of personal knowledge and recommendations from other researchers to identify potential reviewers. When we use the first name that comes into our thoughts, that name may be more likely to be that of a man than of a woman.

By continent, North America (51%) and Europe (34%) dominate our reviewer pool, with much smaller proportions from Asia and Australasia (7%), Latin America (5%) and Africa (2%) (**Fig 2**). These findings are similar to those for *eLife*, where most reviewers are from the US (56%), UK and Germany (Chawla 2018). Compared with our database, we found significant variation in invitations to review across continents ($X^2_4 = 198.62$, $p < 0.001$). Authors with North American and European affiliations were much more likely to be invited to review a manuscript than those with other affiliations (North America: 80%, Europe: 76%, Africa: 49%, Asia and Australasia: 48%, Latin America: 39%; **Fig 2**).

The domination of researchers from North American and European affiliations and non-range and high-income countries in invitations to join the reviewer pool may largely reflect the English-language literature in Primatology (submission and acceptance are also skewed towards these groups). Moreover, English-language journals are over-represented in the databases we use to search for potential reviewers and may be perceived to be of higher quality. Editors may overlook, or be unable to read, publications in other languages when considering potential reviewers. Bias towards those who share characteristics with the inviting editor (homophily) is likely to reinforce this pattern, since the majority of our editors are from or work in non-range, high income countries in North America or Europe.

At the *International Journal of Primatology*, 90% of invitations to join the reviewer pool were to people affiliated to institutions in non-range countries and 90% of invitations were to people affiliated to institutions in high income countries. We do slightly better than *eLife*, where less than 2% of reviewers are from developing nations (Chawla 2018). Nevertheless, when we compared invitations to join the reviewer pool with our database, we found that people from range countries were much less likely to be invited to review a manuscript than people from non-range countries, and the difference was significant ($X^2_1 = 216.22$, $p < 0.001$). People from high income countries were most likely to be invited to review a manuscript. People from low income countries were more likely to be invited to review than those from middle income countries ($X^2_3 = 223.65$, $p < 0.001$, **Fig 2**). Examining the data shows that authors with affiliations in low-income countries well-known to primatologists (Madagascar and Uganda) are influential, appearing multiple times in the dataset.

The relative under-representation of researchers from range countries and middle and low-income countries suggests bias on the part of editors inviting people to review. Researchers affiliated to institutions in non-range and high-income countries may be more visible internationally than those affiliated to institutions in range countries, and thus more likely to be known to the editors or suggested by other scientists. This leads to cumulative disadvantage, whereby range-country scientists miss out on the opportunity to review, and thus the chance to learn from the reviewing process and improve their own manuscripts.

FIGURE 2 HERE

Fig 2: Proportion of potential reviewer sample invited to review by individual characteristics. Bar width is proportional to number of potential reviewers in the data set.

How often are reviewers invited to review once they are in the reviewer pool?

Once individuals were in the reviewer pool, we found no evidence of bias in how often they were invited to review in terms of gender, range vs. non-range country or country income. However, we did find an influence of continent of affiliation.

Women were asked to review a slightly higher number of manuscripts on average than men were (**Table 1**), while the person with the largest number of requests to review was a man (**Fig 3**), but gender differences are not significant (**Table 1**).

The number of review requests made of people in the reviewer pool differs significantly among continents (**Table 1**). This difference is apparently driven by people with African affiliations being asked to review fewer manuscripts on average than people with other affiliations (**Table 1**). To a lesser extent, people from Latin America receive more invitations, on average, than those from Europe, North America or Asia and Australasia (means Africa: 1.7, Asia and Australasia: 2.5, Europe: 2.8, Latin America: 3.2, North America: 2.8). Although inspection of invitation counts in **Fig 3** might suggest substantially higher number of invitations to reviewers in North America and Europe than Latin America or Asia and Australasia, groups with larger samples include more extreme values relative to smaller groups when samples sizes differ by nearly an order of magnitude among groups (as they do here).

People affiliated to institutions in non-range countries were asked to review slightly more manuscripts on average than people affiliated to institutions in primate range countries, but again this difference is not significant (**Table 1**). The four individuals asked to review the most manuscripts are all from non-range countries (**Fig 3**), but, as above, more extreme values for number of review requests are likely to occur in groups with substantially higher sample sizes.

On average, people affiliated to institutions in middle and high-income countries were asked to review more manuscripts than people in low income countries, although this difference is not significant (**Table 1**). As for continent and range status, more extreme values for number of review requests were observed in income groupings with higher sample sizes (upper middle income and high-income countries; **Fig 3**).

We also ran models that included all of the variables (gender, range country, income group) together with or without the interaction of gender and the two other variables. All these models were non-significant.

Overall, while there is a bias in who makes it into the reviewer pool, in terms of gender and country of affiliation, the *International Journal of Primatology* then succeeds in avoiding bias when inviting reviewers from a pool of recognised potential reviewers in terms of gender, range vs. non-range country and country income. However, this is not the case for continent. We have work to do to ensure that primatologists from different continents are called on equally to review, and that we do not overlook African primatologists, or (to a lesser extent) overburden Latin American colleagues.

Table 1. Overall model statistics and incidence rate ratios examining the influence of reviewer and characteristics of their country of affiliation on the number of invitations to review received (for people who received at least one invitation)

Model	Baseline	Comparison	Incidence rate ratio	95% confidence interval	n	df	Deviance	Model p
Gender	Women	Men	0.962	0.874-1.058	1353	1	0.652	0.412
Continent	Africa	Asia & Australasia	1.515	1.013-2.280	1350	4	11.164	0.025
		Europe	1.688	1.166-2.460				
		Latin America	1.925	1.275-2.924				
		North America	1.698	1.177-2.467				
Range status	Range	Non-range	1.059	0.901-1.245	1349	1	0.486	0.486
Income group	Low	Lower-middle	1.441	0.729-2.876	1349	3	3.72	0.294
		Upper-middle	1.650	0.949-2.904				
		High	1.640	0.968-2.817				

FIGURE 3 HERE

Fig 3: Number of review invitations received (for people who received at least one invitation) vs. by reviewer characteristics. Violin plot width is proportional to the number of individuals receiving a specific number of invites; black dots indicate the mean number of invitations.

Conclusions, actions and future research

Our findings for gender, and particularly for continent, range vs. non-range country of affiliation and country income in terms of identifying reviewers are troubling. Although we have addressed them separately here, the influences of gender and geography on disparities in manuscript submission and acceptance, and invitations to review are likely to intersect. For example, there is striking variation across countries in the relationship between gender and authorship on published papers (Larivière et al. 2013 includes an interactive map).

We found that manuscripts submitted to the *International Journal of Primatology* are slightly more likely to have a man as a first author than to have a woman, although women outnumber men in our field. We found no significant gender difference in manuscript acceptance. Our findings suggest a gender bias in favour of men when editors invite researchers to review for the first time, but no significant gender differences in invitations once researchers are in the reviewer pool.

We receive far more submissions from authors affiliated to institutions in North America and Europe than other regions, far more from authors affiliated to institutions in non-range than range countries, and far more from authors affiliated to institutions in high-income countries than from those affiliated to low and middle-income countries. These effects are compounded by lower rates of acceptance for groups with lower numbers of submissions, resulting in a highly skewed publication record, with low representation of authors affiliated to institutions in range countries, and in low or middle-income countries. Under-representation in the pool of published work, in turn, is likely to mean that researchers from range countries and low or middle-income countries are less likely to be invited to review for the journal, thus missing out on the benefits of understanding the review process, further compounding the skewed access to publication. Finally, under-representative in the reviewer pool may mean that researchers are less likely to be considered as candidates for the Editorial Board, Associate Editor or Editor-in-Chief. In other words, the under-representation of some groups of primatologists in the publication system is systematic and self-reinforcing. This has negative implications for our science, because of the lack of diversity of experience and approach and for the career prospects of researchers from under-represented groups.

FIGURE 4 HERE

Fig 4: The under-representation of researchers from primate range countries in the publication process

More positively, once people are in the reviewer pool, and “known” to us, we succeed in avoiding bias in terms of range vs. non-range country and country income, although we call on primatologists from different continents to review differentially.

The five current Associate Editors represent North America, Europe, Latin America and Africa, but not Asia and Australasia. In terms of nationality (but not affiliation), they reflect the percentage of submissions by researchers affiliated to institutions in non-range countries (three of five Associate Editors, 68% of submissions). Four of five Associate Editors are affiliated to institutions in high-income countries, a greater proportion than the 69% of submissions from such countries.

The Editorial Board of the *International Journal of Primatology* reflects patterns of submissions and acceptances well in terms of gender. The Board also broadly reflects submissions in terms of continent of affiliation and whether researchers are affiliated to an institution in a range country. It has a slightly lower proportion of researchers affiliated to institutions in high-income countries than the percentage of submissions from researchers affiliated to such institutions. The board does not represent acceptances in the journal, due to the skew in manuscript acceptance towards researchers affiliated to institutions in North America and Europe, non-range countries, and high-income countries. In other words, the board represents submissions more than it does acceptances, which is what we have aimed to achieve.

Some implications of our findings go beyond what we can hope to address as a journal and reflect systemic issues in science. However, others require action and monitoring of patterns in the data. Our findings lead us to propose the following actions for the Editor-in-Chief and Editorial Board of the *International Journal of Primatology* and the *International Primatological Society*:

1. The Editor-in-Chief should monitor and maintain gender balance among Associate Editors and on the Editorial Board and report this to International Primatological Society council meetings, held every two years.
2. The *International Primatological Society* and the Editorial Board should consider what we should aim for in terms of representation among the Associate Editors and on the Editorial Board, then rebalance the editors to achieve this if necessary. For example, we should consider whether we wish to represent the current state of publishing in Primatology (and in which venues), our society membership, or other criteria, and if so, what criteria.
3. The Editor-in-Chief should remind themselves and other editors that our judgement is susceptible to bias, including unconscious bias, and that we should account for this when making decisions. We must remember that haste increases the influence of unconscious bias.

4. Editors should be aware of disparities in the resources available to different groups of researchers and should continue to work extensively with authors to improve language, analysis, context and interpretation, and to provide constructive feedback and encouragement to all authors. This support should be particularly targeted to authors from under-represented groups.
5. Our double-blind policy protects authors from negative discrimination based on aspects of their identity. However, it also means that reviewers are unable to tailor their comments to the author, for example by providing more detailed advice or English language correction to authors that might need this in comparison to those who have co-authors who should provide that advice. We should consider ways to address this.
6. Editors should explicitly consider gender and country of affiliation when selecting reviewers to evaluate a manuscript. For example, the “gender loop” adopted by *Nature* commits editors to asking themselves who the five women they could ask are before commissioning an article (Anon 2012). Subsequent studies show some progress in diversity and inclusion, although much remains to be done (Anon 2018). Editors should commit to asking themselves who the five primatologists from outside North America and Europe, range-country primatologists, and primatologists from low and middle-income countries are that they could ask to review any given manuscript. We should monitor patterns of reviewer invitations to assess the success of this action.
7. When we ask for suggestions of reviewers, we already ask for names of early career researchers that we may not yet know of. We should also explicitly request recommendations of primatologists from outside North America and Europe, range-country primatologists, and primatologists from low and middle-income countries.
8. In attempting to improve the diversity of reviewers, we must guard against focussing heavily on a relatively low number of highly visible scientists from under-represented groups, to avoid possible overload for those individuals and a concentration of influence on the field.
9. Editors should encourage authors and reviewers to keep their information in the database up-to-date to facilitate future analyses.
10. The Editorial Board should encourage the publisher to collect additional information, including affiliations for all authors, so that we can examine patterns of authorship in more depth.

In addition to these actions for the journal, Primatology in general should seek additional ways to mentor researchers in study design and encourage our institutions to value this sort of mentoring when evaluating researchers. We need to promote more people from under-represented groups to highly visible positions.

Although the data in the Editorial Manager system for the *International Journal of Primatology* have some limitations (e.g., we have very little information about middle authors, information about authors may be out-of-date) they can facilitate further studies. For example, we might examine patterns of authorship and co-authorship, including who publishes as sole or last author and author order (e.g., Fox, Burns, Muncy, & Meyer, 2016). For rejected manuscripts, we might examine at what point manuscripts are rejected, and for what reasons. We might also examine the influence of editor gender on choice of reviewer and outcomes, and the influence of reviewer gender on recommendations (e.g., Fox, Burns, & Meyer, 2016). For example, reviewers for *Functional Ecology* were less likely to accept invitations to review from women than they were from men (Fox, Burns, and Meyer 2016). We might also examine whether comments by reviewers and editors vary in relation to the authors' country of affiliation. Finally, we could examine patterns in authorship, reviewing and editorial decisions across years, including any changes that may be linked to the introduction of double-blind reviewing in 2015.

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Data availability statement

The datasets analysed here are not publicly available because it is not possible to completely anonymize the data but are available from JMS on reasonable request.

Literature cited

- Addressi, E., Borgi, M., & Palagi, E. (2012). Is primatology an equal-opportunity discipline? *PLoS ONE*, 7, 1–6. doi:10.1371/journal.pone.0030458
- Anon. (2012). Nature's sexism. *Nature*, 491, 495.
- Anon. (2018). Bias revisited. *Nature*, 558, 344.
- Bicca-Marques, J. C. (2016). Development of Primatology in Habitat Countries: A View from

- Brazil. *American Anthropologist*, 118, 140–141. doi:10.1111/aman.12503
- Bornmann, L., Mutz, R., & Daniel, H.-D. (2007). Gender differences in grant peer review: A meta-analysis. *Journal of Informetrics*, 1, 226–238. doi:10.1016/J.JOI.2007.03.001
- Chawla, D. (2018). Peer review fails equity test. *Nature*, 561, 295–6.
- Czerniewicz, L. (2013). Inequitable power dynamics of global knowledge production and exchange must be confronted head on. *LSE Impact Blog*.
- Dutt, K., Pfaff, D. L., Bernstein, A. F., Dillard, J. S., & Block, C. J. (2016). Gender differences in recommendation letters for postdoctoral fellowships in geoscience. *Nature Geoscience*, 9, 805+. doi:10.1038/NGEO2819
- Estrada, A., Garber, P. A., Mittermeier, R. A., Wich, S., Gouveia, S., Dobrovolski, R., et al. (2018). Primates in peril: the significance of Brazil, Madagascar, Indonesia and the Democratic Republic of the Congo for global primate conservation. *PeerJ*, 6, e4869. doi:10.7717/peerj.4869
- Estrada, A., Garber, P. A., Rylands, A. B., Roos, C., Fernandez-duque, E., Fiore, A. Di, et al. (2017). Impending extinction crisis of the world's primates: Why primates matter. *Science Advances*, 3, e1600946. doi:10.1126/sciadv.1600946
- Fan, P.-F., Ma, C., Fan, P.-F., & Ma, C. (2018). Extant primates and development of primatology in China: publications, student training, and funding. *Zoological Research*, 39, 249–254. doi:10.24272/j.issn.2095-8137.2018.033
- Fedigan, L. (1994). Science and the successful female: Why there are so many women primatologists. *American Anthropologist*, 96, 529–540. doi:10.1525/aa.1994.96.3.02a00050
- Fedigan, L. (1997). Is primatology a female science? In L. Hager (Ed.), *Women in Human Evolution* (pp. 56–75). London: Routledge.
- Fox, C. W., Burns, C. S., & Meyer, J. A. (2016). Editor and reviewer gender influence the peer review process but not peer review outcomes at an ecology journal. *Functional Ecology*, 30, 140–153. doi:10.1111/1365-2435.12529
- Fox, C. W., Burns, C. S., Muncy, A. D., & Meyer, J. A. (2016). Gender differences in patterns of authorship do not affect peer review outcomes at an ecology journal. *Functional Ecology*, 30, 126–139. doi:10.1111/1365-2435.12587
- Hirsch, J. (2005). An index to quantify an individual's scientific research output. *Proc Nat Acad Sci USA*, 102, 16569–16572. doi:10.1073/pnas.0507655102
- Hoàng, T. M. (2016). Development of Primatology and Primate Conservation in Vietnam: Challenges and Prospects. *American Anthropologist*, 118, 130–137. doi:10.1111/aman.12515
- Isbell, L. A., Young, T. P., & Harcourt, A. H. (2012). Stag parties linger: Continued gender bias in

- a female-rich scientific discipline. *PLoS ONE*, 7, 2–5. doi:10.1371/journal.pone.0049682
- Kaatz, A., Gutierrez, B., & Carnes, M. (2014). Threats to objectivity in peer review: The case of gender. *Trends in Pharmacological Sciences*, 35, 371–373. doi:10.1016/j.tips.2014.06.005
- Larivière, V., Ni, C., Gingras, Y., Cronin, B., & Sugimoto, C. R. (2013). Bibliometrics: Global gender disparities in science. *Nature*, 504, 211–213. doi:10.1038/504211a
- Lee, C. J., Sugimoto, C. R., Zhang, G., & Cronin, B. (2013). Bias in peer review. *Journal of the American Society for Information Science and Technology*, 64, 2–17. doi:10.1002/asi.22784
- Ley, T., & Hamilton, B. (2008). The gender gap in NIH grant applications. *Science*, 322, 1472–1474. doi:10.1126/science.1165878
- Marsh, H. W., Jayasinghe, U. W., & Bond, N. W. (2011). Gender differences in peer reviews of grant applications: A substantive-methodological synergy in support of the null hypothesis model. *Journal of Informetrics*, 5, 167–180. doi:10.1016/J.JOI.2010.10.004
- Mervis, J. (2013). NSF Audit of Successful Proposals Finds Numerous Cases of Alleged Plagiarism. *Science*. <https://www.sciencemag.org/news/2013/03/nsf-audit-successful-proposals-finds-numerous-cases-alleged-plagiarism>. Accessed 1 October 2018
- Moss-Racusin, C. A., Dovidio, J. F., Brescoll, V. L., Graham, M. J., & Handelsman, J. (2012). Science faculty's subtle gender biases favor male students. *Proceedings of the National Academy of Sciences*, 109, 16474–16479. doi:10.1073/pnas.1211286109
- Nielsen, W., Alegria, S., Börjeson, L., Falk-krzesinski, H. J., Joshi, A., Leahey, E., et al. (2017). Opinion: Gender diversity leads to better science. *Proceedings of the National Academy of Sciences*, 114, 1740–1742. doi:10.1073/pnas.1703146114
- Pohlhaus, J. R., Jiang, H., Wagner, R. M., Schaffer, W. T., & Pinn, V. W. (2011). Sex differences in application, success, and funding rates for NIH extramural programs. *Academic Medicine*, 86, 759–767. doi:10.1097/ACM.0b013e31821836ff
- Schemm, Y. (2013). Africa doubles research output over past decade, moves towards a knowledge-based economy. *Research Trends*.
- Schroeder, J., Dugdale, H. L., Radersma, R., Hinsch, M., Buehler, D. M., Saul, J., et al. (2013). Fewer invited talks by women in evolutionary biology symposia. *Journal of Evolutionary Biology*, 26, 2063–2069. doi:10.1111/jeb.12198
- Setchell, J. M. (2012). Editorial: On editing the International Journal of Primatology. *International Journal of Primatology*, 33, 1–9. doi:10.1007/s10764-012-9578-3
- Setchell, J. M. (2015). Editorial: Double-blind peer review and the advantages of sharing data. *International Journal of Primatology*, 36, 891–893. doi:10.1007/s10764-015-9860-2
- Setchell, J. M., Fernandez-Duque, E., Higham, J. P., Rothman, J. M., & Schülke, O. (2016). Editorial: Changes and clarifications to the policies of the International Journal of

Primateology to promote transparency and open communication. *International Journal of Primateology*, 37, 617–627. doi:10.1007/s10764-016-9948-3

Sheltzer, J. M., & Smith, J. C. (2014). Elite male faculty in the life sciences employ fewer women. *Proceedings of the National Academy of Sciences*, 111, 10107–10112. doi:10.1073/pnas.1403334111

Shen, H. (2013). Inequality quantified: Mind the gender gap. *Nature*, 495, 22–24. doi:10.1038/495022a

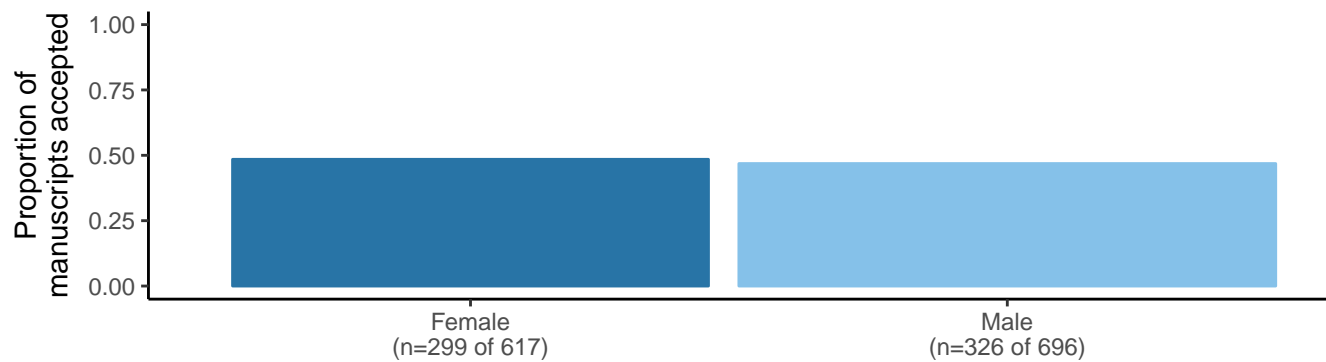
Tregenza, T. (2002). Gender bias in the refereeing process? *Trends in Ecology & Evolution*, 17, 349–350. doi:10.1016/S0169-5347(02)02545-4

Turner, T. R. (2002). Changes in biological anthropology: Results of the 1998 American Association of Physical Anthropology Membership Survey. *American Journal of Physical Anthropology*, 118, 111–116. doi:10.1002/ajpa.10062

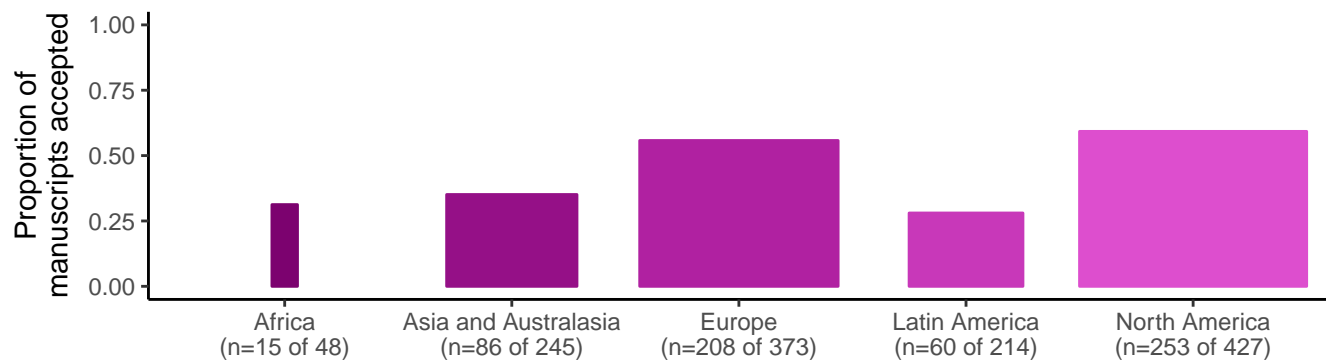
Turner, T. R., Bernstein, R. M., Taylor, A. B., Asangba, A., Bekelman, T., Cramer, J. D., et al. (2018). Participation, representation, and shared experiences of women scholars in biological anthropology. *American Journal of Physical Anthropology*, 165, 126–157. doi:10.1002/ajpa.23386

Wennerås, C., & Wold, A. (1997). Nepotism and sexism in peer-review. *Nature*, 387, 341. doi:10.1038/387341a0

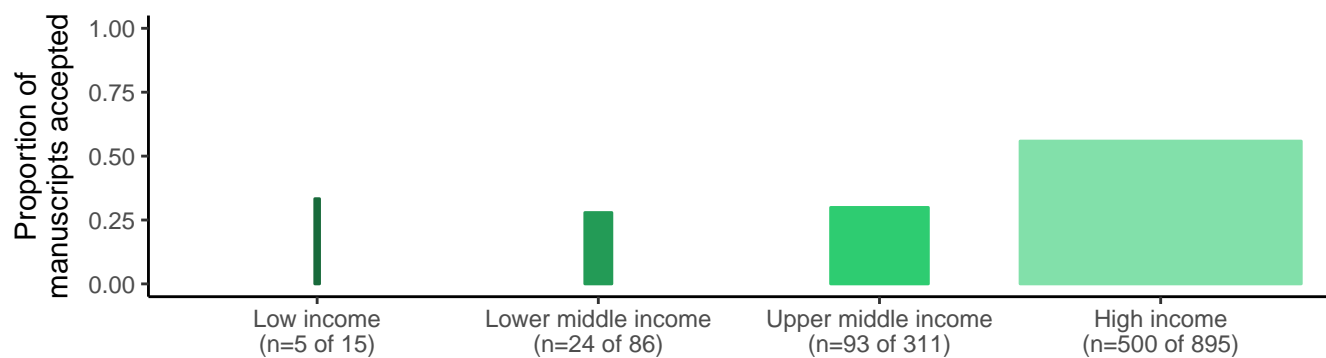
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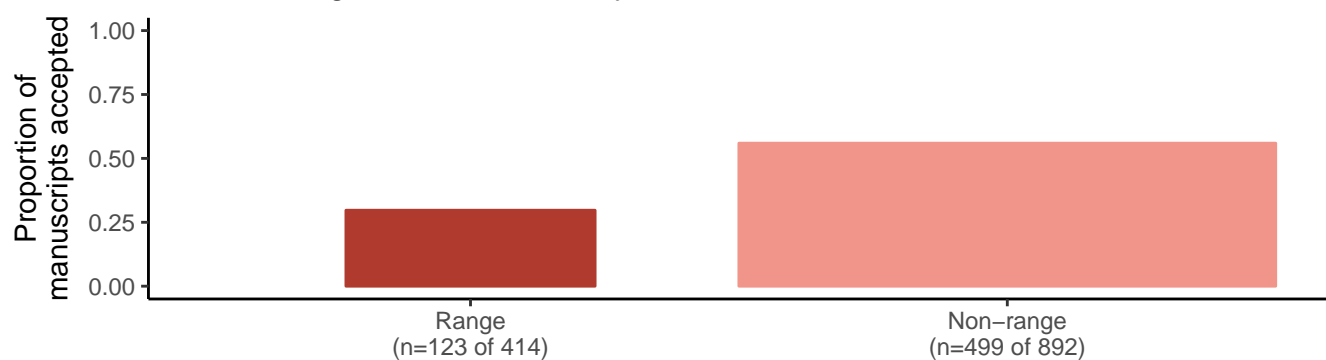
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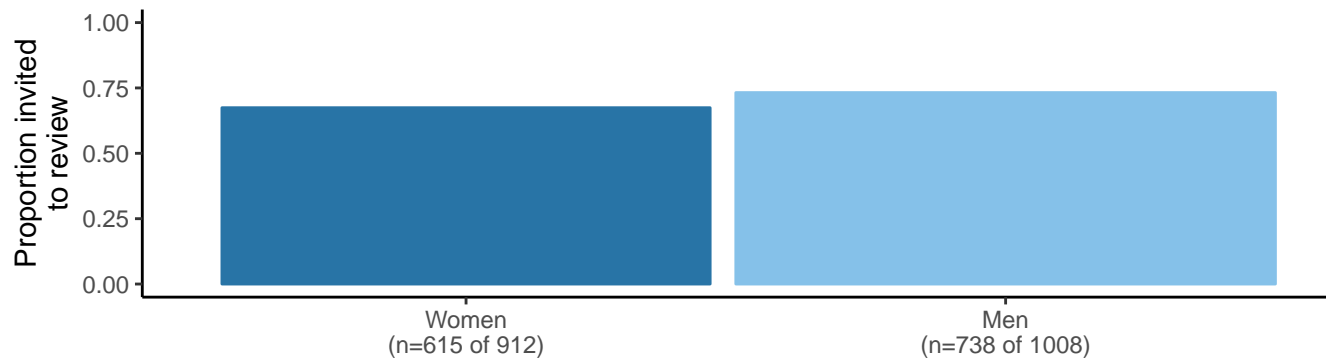
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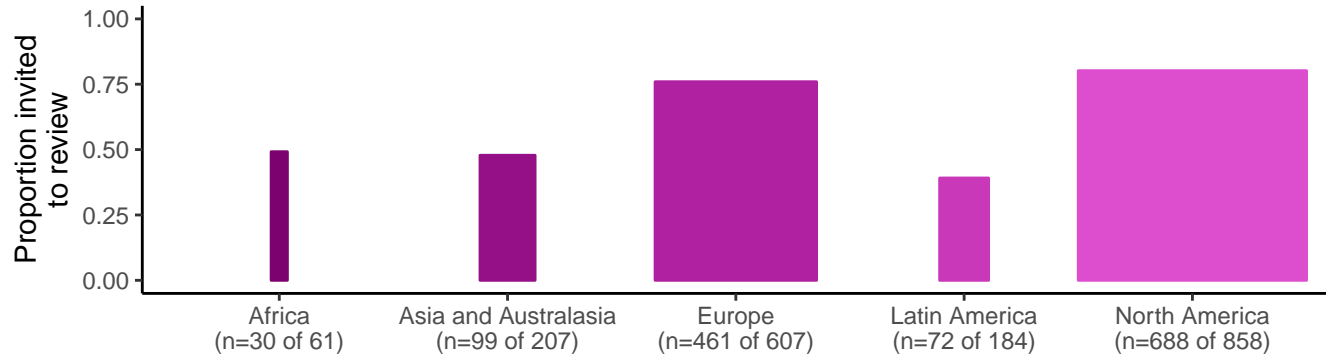
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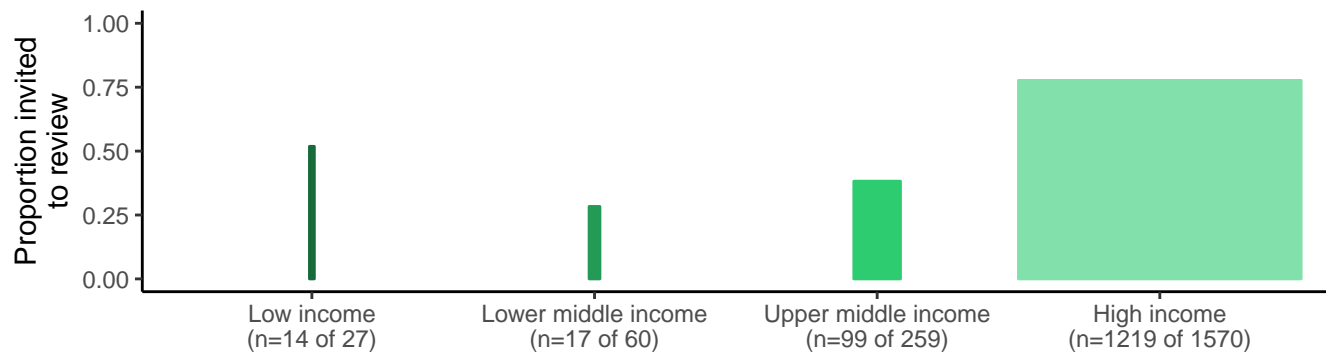
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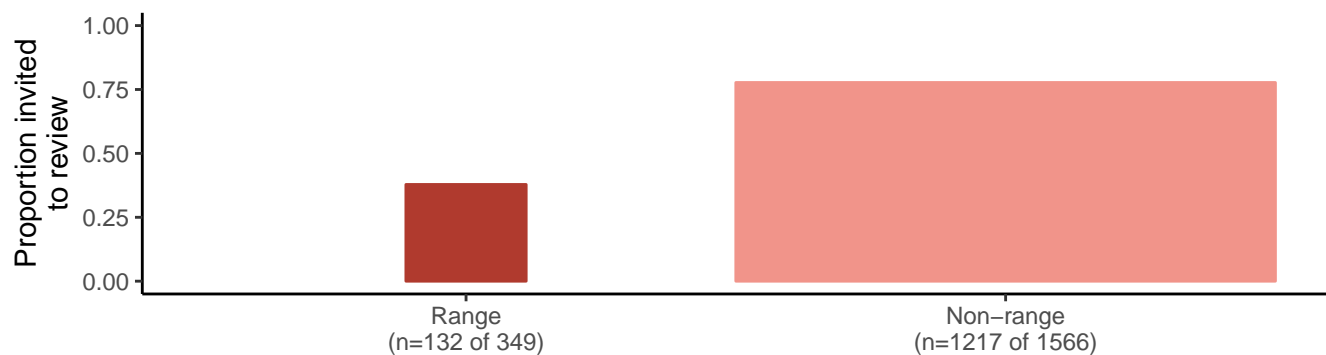
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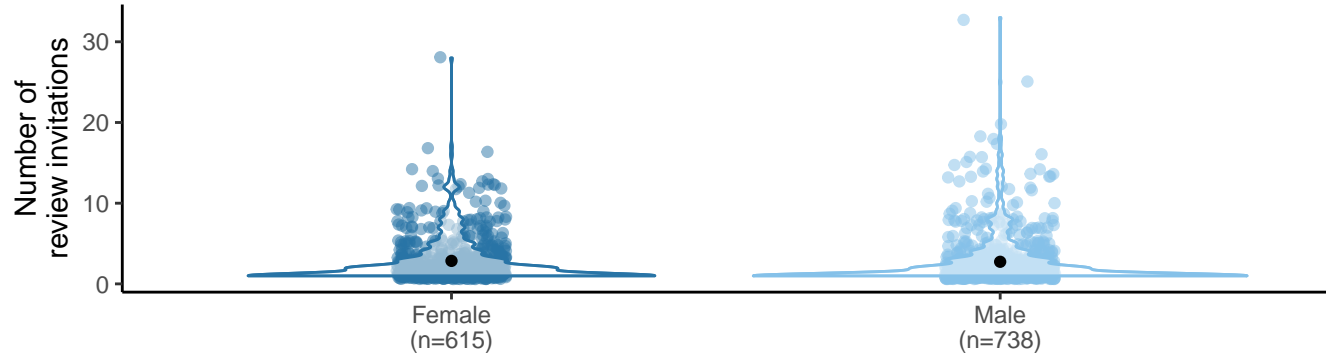
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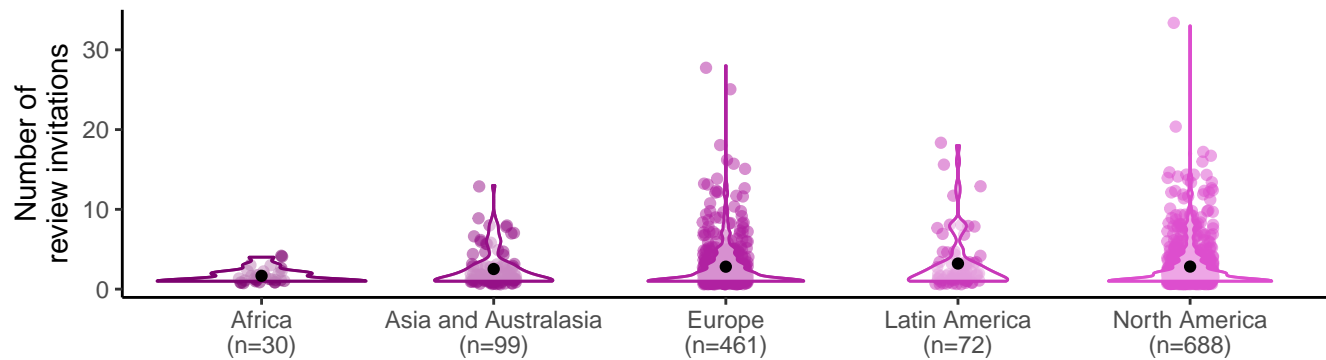
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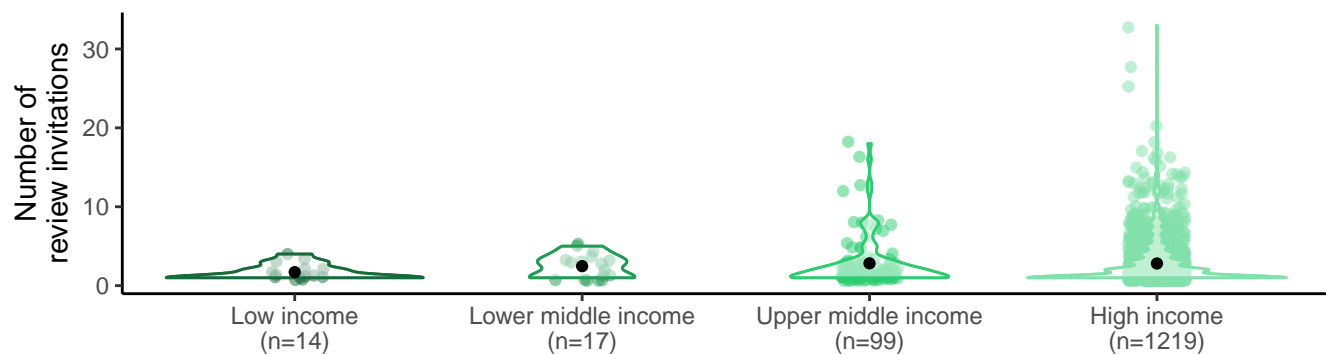
Gender of reviewer



Continent of affiliation of reviewer



World Bank income group designation for country of affiliation of reviewer



Primate range status of country of affiliation of reviewer

