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# Last and corresponding authorship practices in ecology

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**Abstract**

Authorship is intended to convey information regarding credit and responsibility for manuscripts. However, while there is general agreement within ecology that the first author is the person who contributed the most to a particular project, there is less agreement regarding whether being last author is a position of significance and regarding what is indicated by someone being the corresponding author on a manuscript. Here, I use a combination of a survey and an analysis of the literature to show that: 1) most ecologists view the last author as the "senior" author on a paper (that is, the person who runs the lab in which most of the work was carried out), 2) 82% of papers published in 2016 in the first and/or second issues of *American Naturalist*, *Ecology*, and *Evolution* had the first author as corresponding author, and 3) most ecologists view the corresponding author as the person taking full responsibility for a paper. However, there was substantial variation in views on authorship, especially corresponding authorship. Given these results, I suggest that discussions of authorship have as their starting point that the first author will be corresponding author and the senior author will be last author, while noting that it will be necessary in some cases to deviate from these defaults.

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## Introduction

Who is the last author on a paper? Depending on authorship conventions in a field, the last author might be the person whose surname comes last alphabetically, the person who runs the lab group where the research was done, or simply the person who did the least work on the project (Tscharntke et al. 2007). In math, for example, authorship tends to be determined alphabetically (Waltman 2012), whereas in biomedical fields, the last author position is one that tends to carry extra weight (Moulopoulos et al. 1983, Wren et al. 2007, Venkatraman 2010). In ecology, alphabetical author lists are not the norm, but standard authorship practices have received relatively little study. Thus, we are in a similar situation to the one described in 1997 by Rennie et al. when they discussed order of authorship and what it conveys: "Everyone is equally sure about their own system; the point is that none of these schemes is actually disclosed, so the readers, to whom this should be addressed, are not let in on the secret: they have not been told which code book to use and how it works." The goal of this study is to describe the current systems in use by ecologists regarding last and corresponding authorship, to see whether certain factors (e.g., research area, career stage) are associated with those views, and to see if the number of authors and the position of the corresponding author have changed over time.

As noted in an earlier publication on this topic (Tscharntke et al. 2007), the first author of an ecology paper is generally the person who made the greatest overall contribution to the work, but there is no consensus on how to determine the order of the remaining authors. In a survey of 57 ecologists at the 2004 meeting of the Ecological Society of America, respondents gave ten unique authorship order combinations for a scenario involving only three potential coauthors (Weltzin et al. 2006). There is also confusion over what is signified by corresponding authorship (Laurance 2006).

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This is problematic for two reasons. First, people are judged based on their publication records, meaning that unclear authorship criteria make it difficult to determine how much credit an author should get for a publication (Tscharntke et al. 2007, Wren et al. 2007, Eggert 2011). Job applications, grant proposals, and tenure and promotion decisions are all impacted by publication records. If people judging these applications, proposals, and dossiers have different views on what it means to be last or corresponding author, that means those are not reliable signals. This can be problematic if, for example, an assistant professor puts herself as last author as an indicator of having led the work, but a tenure letter writer perceives her as last because she did the least work. Second, authorship on a publication entails not just credit for the work, but responsibility for it as well (Rennie et al. 2000, Venkatraman 2010, Eggert 2011). In cases where concerns about research are raised, it is important to know, for example, if corresponding authorship indicates that someone is taking full responsibility for the publication.

In this study, I first present results of a survey of scientists (80% of whom identified ecology as their primary research area) that asked about views on last and corresponding authorship. In addition to giving information on overall views of ecologists on last and corresponding authorship, the survey allowed me to explore whether factors such as research subfield, time since PhD, geographic location, and amount of interdisciplinary work were associated with views on last and corresponding authorship. I also present data on the number of authors over time as well as the position of the corresponding author over time in three journals (*American Naturalist, Ecology*, and *Evolution*). I end by suggesting that, since most readers expect authors to use a first-last author emphasis (FLAE, sensu Tscharntke et al. 2007) and since the vast majority of papers in *American Naturalist, Ecology*, and *Evolution* have the first author as the corresponding author, those are good starting places for discussions regarding author order

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and corresponding authorship (while recognizing that there will be situations where it is desirable or necessary to deviate from this).

## Methods

### *Poll*

I carried out a poll of readers of the *Dynamic Ecology* blog. In addition to appearing on the blog, the poll was advertised via social media and thus likely reached a wider readership than a typical blog post. The poll first appeared on 6 April 2016 and ran for two weeks. After removing four blank responses, there were 1122 responses to the poll.

The poll had four main questions: 1) For ecology papers, do you consider the last author to be the senior author? 2) Which of the following statements most closely matches the current norms in ecology in terms of who is corresponding author? 3) Which of the following statements would be best practice in terms of who is corresponding author? and 4) If someone includes a statement on his/her CV indicating they have used a first/last author emphasis, do you pay attention to that? The poll also asked about the respondent's primary research area, whether their research is primarily basic or applied, how frequently they conduct interdisciplinary research, how many years post-PhD they are, where they live, and what their current department is. The full survey, including the questions and all the answer options, is given in the Supplement.

In addition to presenting the overall responses to the four main questions, I used the additional information on research area, geographic location, years since degree, department type, and amount of interdisciplinary work to look for factors associated with views on last and corresponding authorship. Prior to doing those analyses, I decided that a difference between two groups in their views on authorship had to be at least 10% in order to be considered notable.

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While this threshold is somewhat arbitrary, it helped ensure that small differences weren't overinterpreted.

*Literature survey*

I reviewed the first or second issue of the journal *Ecology* every ten years from 1956-1996 and every five years thereafter. In most years, I looked at the first issue but, in two cases, the first issue contained a special feature. In order to avoid any potential confounding effects of those features, I looked at the second issue in those two cases. I supplemented this analysis with a similar analysis of papers in the first issue of *Evolution* and the first and second issues of *American Naturalist* every five years from 2001-2016. (Each *American Naturalist* issue contains fewer papers, hence using two issues per year.) For each paper, I recorded the number of authors as well as the position of the corresponding author. *Ecology* began including author email addresses in the late 1990s. Thus, for 1956-1996, I noted whether there was a note indicating to whom correspondence (or reprint requests) should be sent. For 2001-2016, I determined corresponding authorship based on the following criteria: 1) If an email address was given for only one author, I indicated that person as the corresponding author. 2) In some cases, email addresses were given for multiple authors but one author was indicated as the one to whom correspondence should be addressed; in these cases, only the author designated for correspondence was considered the corresponding author. 3) If the email addresses were given for multiple authors and there was no note regarding correspondence, I considered all the authors who had email addresses as corresponding author. 4) In a few cases, no author had an email address; in these cases, I said that the corresponding author was not designated. Corresponding authorship was then grouped into six categories: 1) "first" (the first or only author in the author

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string was the corresponding author), 2) "middle" (someone other than the first or last author was the corresponding author), 3) "last" (the last author was corresponding author), 4) "ND" (when corresponding authorship was not designated), 5) "all" (when both – for papers with only two authors – or all of the authors on a paper were corresponding author), and 6) "other" (when some other combination of authors – such as the first and last – were corresponding author).

*Data and code*

Figures were made in R (v3.3.3) using the ggplot, cowplot, and Likert packages. Data and code for the analyses and plots of the poll and the literature survey are available at: https://github.com/duffymeg/DEAuthorshipPoll

## Results

*Demographics of poll respondents*

80% of respondents indicated that ecology was their primary research field (Table 1). Most poll respondents were current students (28%) or received their PhD within the past 1-5 years (31%), but respondents included people in all categories, including those who received their PhD over 20 years ago (Table 2). The vast majority of the poll respondents live in North America (64%) or Europe (26%; Table 3).

*Views on last authorship*

For ecology papers, most respondents viewed the last author as the senior author (that is, the lab head or principle investigator; Figure 1A). However, this view is not unanimous: the three "no"-related answers garnered 14% of the responses. One way of possibly reducing confusion about

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whether the last author is the senior author would be to include a note on one's CV indicating that the last author position is one of emphasis. However, the poll results suggest this is likely to only be partially effective – 29% of respondents said they do not or would not pay attention to these statements (Figure 1B).

Year of degree (as a proxy for career stage) did not strongly influence views on last authorship (Figure 2A); aside from the small group of respondents who do not have PhDs and are not current students, there was very little variation. North American respondents were more likely to say the last author is not the senior author, as compared to Europeans (18% "no" responses vs. 5%, respectively; Figure 2B). Looking at primary research area, the two evolution categories had the highest proportion of positive responses to the question about whether the last author was the senior author, with ecologists being somewhat less likely to give one of the "yes" responses (as compared to evolutionary biologists; Figure 2C). People in Biology and EEB departments were more likely to view the last author as the senior author, compared to those in Natural Resources departments or other types of departments (Figure 2D). Finally, while there was no notable difference based on whether someone did basic vs. applied research (Figure 2E), there was a monotonic decrease in the "yes" responses with increasing frequency of interdisciplinary research: 90% of those who never do interdisplinary research view the last author as the senior author, as compared to only 78% of those who always do interdisciplinary research (Figure 2F).

*Views on corresponding authorship*

There was substantial variation in respondents' views on current and best practices for corresponding authorship (Figure 3). Most respondents (54%) said that the corresponding author

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"uploaded the files, managed the revisions and wrote the response to reviewers, and took responsibility for the paper after publication". The next most common response (19% of respondents) was that the current practice is that the corresponding author is the person who simply uploaded the files – though only 8% viewed this as best practice. Only 7% said that the current practice is that the corresponding author is the senior author.

More senior respondents (those who received their PhDs 11 or more years ago) were less likely to choose the "full responsibility" option (that is, to say the corresponding author "uploaded the files, managed the revisions and wrote the response to reviewers, and took responsibility for the paper after publication"; Figure 4A). Evolutionary biologists were somewhat less likely to choose the "full responsibility" option than ecologists (46% vs. 55%, respectively; Figure 4B). People in EEB departments were more likely to choose the "full responsibility" option than those in Biology departments (60% vs. 50%, respectively; Figure 4C). There were no notable differences in the ways people in Europe vs. North America viewed current corresponding authorship practices (Figure 4D).

*Authorship over time*

The number of authors on *Ecology* papers is increasing over time, with a particularly notable uptick after 1996 (Figure 5A). Between 1956 and 1996, the corresponding author on a paper was not usually indicated and mailing addresses for all authors were given. Of the 129 papers analyzed during that window, only two indicated the author to whom correspondence should be addressed. Interestingly, in one of these cases (Kalisz and Teeri 1986) the first author was indicated, whereas in the other (Murcia and Feinsinger 1996) the second author was indicated.

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Since 2001, the proportion of first authors as corresponding author has increased in *American Naturalist* and *Evolution*, but remained stable in *Ecology*. In 2001 and 2006, it was fairly common for email addresses to be given for no authors, for all authors, for just a middle author, or for multiple authors (e.g., first and third authors). For the 2016 papers analyzed, the corresponding author was almost always the first or last author.

**Discussion**

Most ecologists view the last author as a position of emphasis in a paper, though this view is not universal. Most ecologists view the corresponding author as the person taking full responsibility for a paper, but, again, the survey revealed variation in views regarding current and best practices for corresponding authorship. Prior to the late 1990s, it was rare for the corresponding author of a paper to be designated; at present, the first author is usually the corresponding author, with the last author being the corresponding author in a minority of cases. Overall, there is variation in views on corresponding and last authorship in ecology, and the field would benefit from greater consensus on what is signified by corresponding and last authorship.

At the risk of stating the obvious, decisions about who should be last and/or corresponding author are only necessary if there is more than one author. Thus, the trend in ecology towards having more authors on papers (Figure 5), as also seen by others (Johnson 2006, Weltzin et al. 2006, Fox et al. 2016, Logan 2016), means that there are more decisions to be made regarding authorship, including last and corresponding authorship.

Over the past several decades, various systems for attempting to indicate how much different authors contributed to multiauthor papers have been proposed (e.g., Davis and Gregerman 1969, Moulopoulos et al. 1983, Rennie et al. 1997, Weltzin et al. 2006). A common

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suggestion is to use author contribution statements (e.g., Moulopoulos et al. 1983, Rennie et al. 1997, Cozzarelli 2004). While author contribution statements do have the potential to remove ambiguity about whether the last author is a position of emphasis, they have several problems themselves. First, unless the full author contribution statements are put on a CV for every publication, people reviewing job, grant, or award applications are unlikely to see them (especially at earlier stages of screening). Second, and more problematically, people do not necessarily trust author contribution statements (Venkatraman 2010, Fox 2016): in a different poll done on the Dynamic Ecology blog, only 41% of respondents indicated that author contribution statements are always or usually accurate in their experience (Fox 2016).

Thus, attempting to infer the contributions of different authors from the order of authorship is likely to continue. The results of this survey demonstrate that, at present, most ecologists tend to view the last author as the senior author (Figure 1). Therefore, when discussing authorship, ecologists should assume that most people will interpret authorship order assuming a first-last author emphasis (FLAE), viewing the last author as the senior author. As a result, I recommend that discussions regarding authorship should have as their starting point that the senior author will be the last author. However, a problem arises when multiple groups collaborate, making it so that there is not one "senior" author. In some fields, footnotes indicating multiple last authors have started to become more common, but such footnotes are not currently common in ecology. A recent study found that only ~25% of last authors in the journal *Functional Ecology* were women (Fox et al. 2016). It is likely that at least some of this pattern can be attributed to women being more likely to leave science, leading to fewer women as senior authors (Fox et al. 2016). At the same time, the same biases that contribute to women disproportionately leaving science (e.g., Moss-Racusin et al. 2012)) might also influence

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decisions regarding which author is viewed as "senior" (and, therefore, in the emphasized last author position). Given the continued potential for confusion regarding what is conveyed by authorship order – especially in more complicated situations arising from collaborations between multiple groups – and given the high stakes of tenure and promotion decisions, it might be advisable to include a short paragraph in the dossier that describes the authorship system that was used (e.g., a first-last author emphasis system) and noting exceptions (e.g., for a high profile paper based on work done in several different labs).

Of the papers published in 2016 that were examined for this study, 82% had the first author as the corresponding author. Based on the survey results, most people will assume that this person "uploaded the files, managed the revisions and wrote the response to reviewers, and took responsibility for the paper after publication", but 19% will think it simply means that that is the person who uploaded the files. Thus, there is substantial variation in how people view corresponding authorship, including whether it is viewed as something that indicates something larger about responsibility for the work reported in the manuscript. Further work on this topic – especially studies that collect qualitative data on the topic – would be useful for understanding current views on corresponding authorship. One potential focus for such studies is whether corresponding authorship is perceived differently depending on whether the corresponding author is the first or last author, as was found in a survey of medical school department chairs (Bhandari et al. 2014). Based on the combination of poll results and current corresponding authorship practices, a reasonable starting point for discussions of authorship on ecology articles would be to have the lead author be the corresponding author on a paper noting that, in doing so, many readers will assume that means that person is taking full responsibility for the paper.

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Authorship carries with it both credit and responsibility, and the order of authorship can convey information about how much credit and responsibility an author of a multi-authored paper deserves. However, because of variation across fields and over time, what is indicated by last authorship and corresponding authorship is not necessarily clear. My analyses indicate that most ecologists view the last author as the "senior" author on a paper (that is, the head of the lab where the majority of the work was carried out), that the first author tends to be the corresponding author on ecology papers, and that most ecologists interpret corresponding authorship as taking full responsibility for a paper. Thus, in addition to agreeing with earlier calls to discuss authorship early and often (Weltzin et al. 2006), I suggest that those discussions have as their starting point that the last author is the senior author and the first author is the corresponding author.

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**Table 1.** Primary research area of respondents to poll on last and corresponding authorship, sorted in decreasing order of commonness.

| **Primary Research Area** | **%** |
|---|---|
| ecology (primarily field-based) | 50 |
| ecology (primarily computational-based) | 19 |
| evolutionary biology (primarily organismal) | 12 |
| ecology (primarily wet-lab based, including molecular ecology) | 11 |
| evolutionary biology (primarily molecular) | 5 |
| biology other than EEB | 2 |
| outside biology | 2 |

**Table 2.** Number of years since receiving PhD for poll respondents.

| **Years since PhD** | **%** |
|---|---|
| 0 (current students should choose this) | 28 |
| 1-5 | 31 |
| 6-10 | 18 |
| 11-15 | 12 |
| 16-20 | 5 |
| >20 | 5 |
| no PhD and not a current student | 2 |

**Table 3.** Geographic location of poll respondents, sorted alphabetically.

| **Continent** | **%** |
|---|---|
| Africa | 1 |
| Asia | 1 |
| Australia | 6 |
| Europe | 26 |
| North America | 64 |
| South America | 3 |

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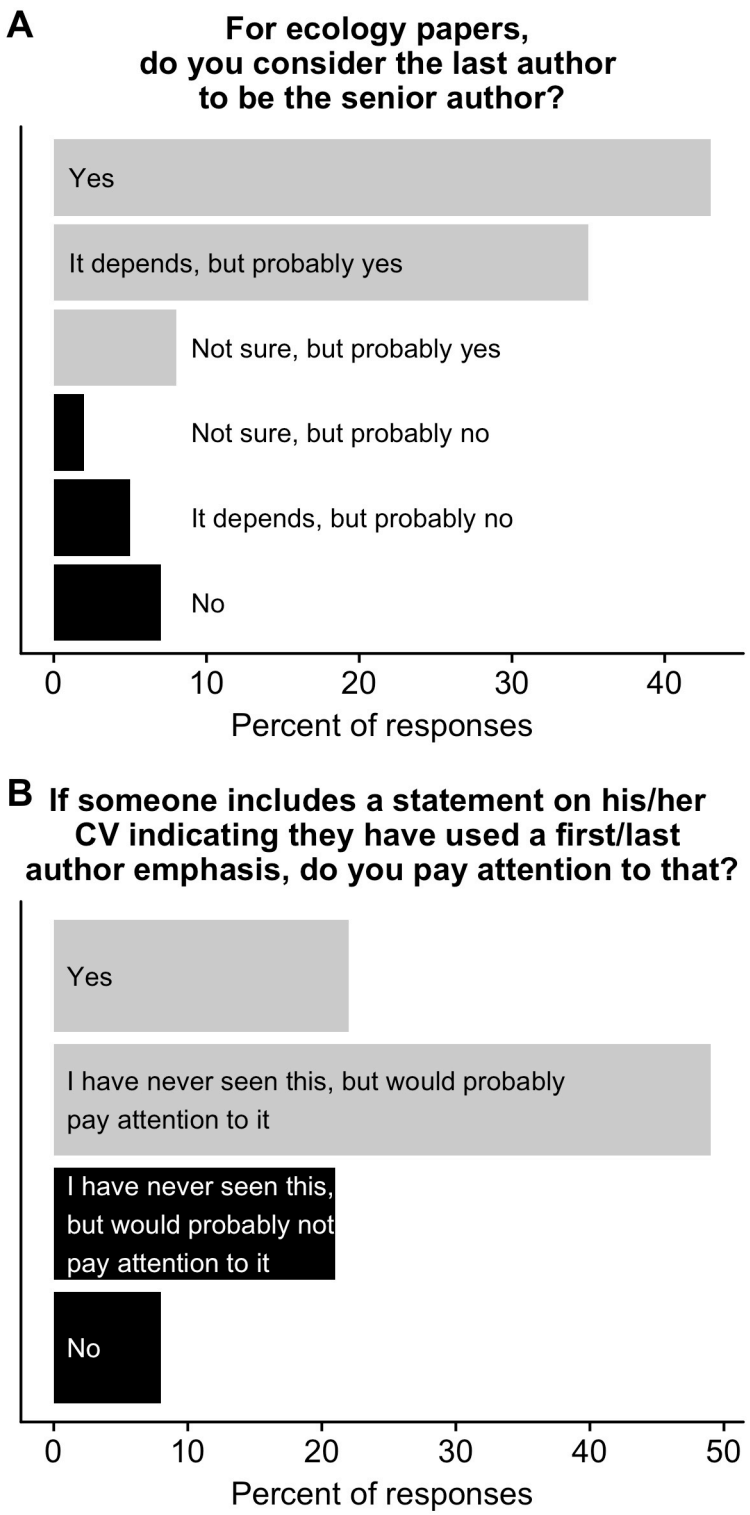


**Figure 1.** Views of poll respondents on A) whether the last author of a paper is the senior author and B) whether they would pay attention to a statement on the CV indicating that the last author position was one of emphasis.

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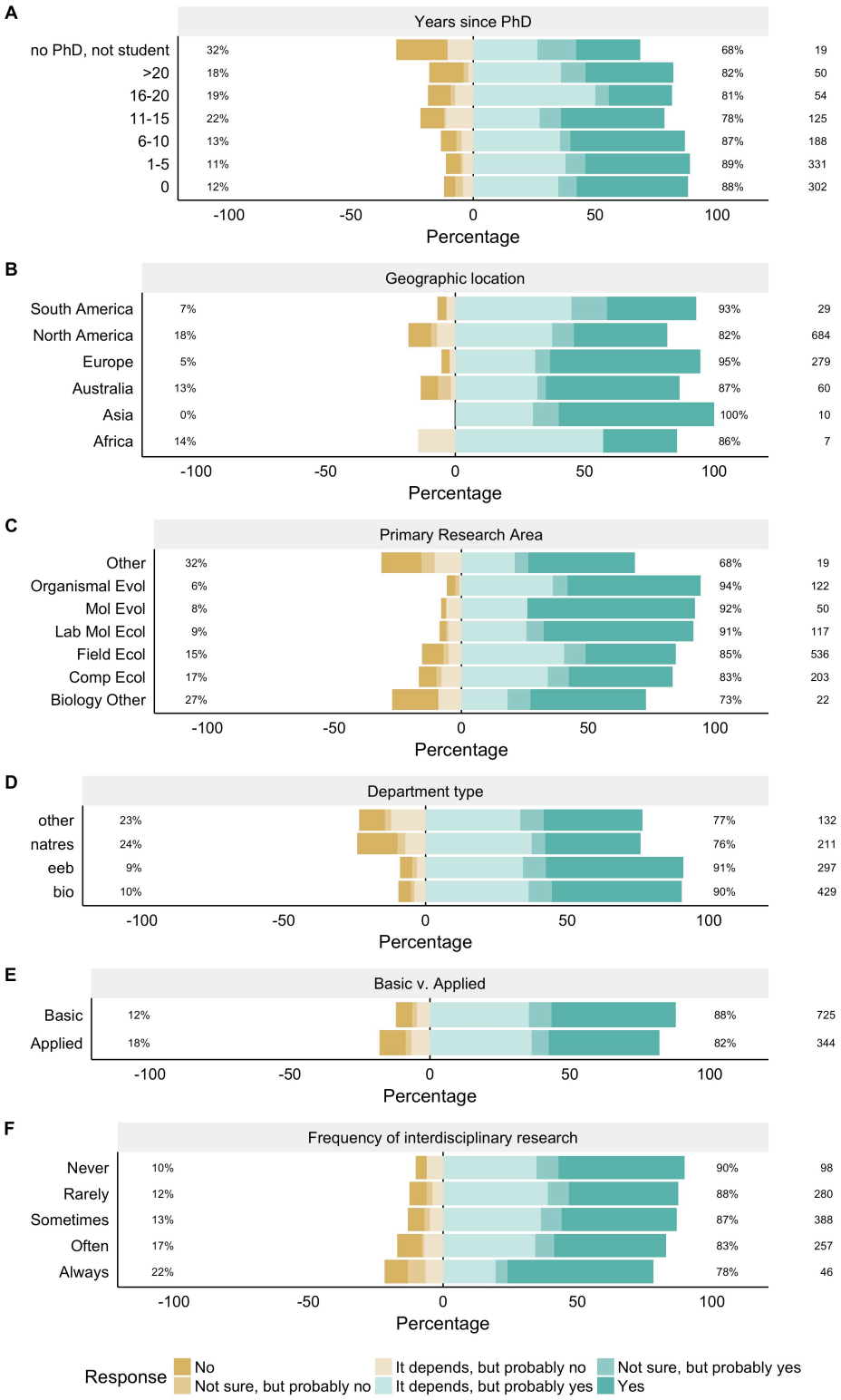


**Figure 2.** Variation in views on last authorship by career stage, geographic location, research area, and department type. The bars shaded in greens are positive responses to the question "For ecology papers, do you consider the last author to be the senior author", whereas gold responses are negative responses (as described in the figure legend). The percentage on the right gives the

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total percentage of positive responses, while the percentage on the left gives the total percentage of negative responses for a group. The number on the right hand side shows the number of respondents in a given category (e.g., 29 respondents indicated that they live in South America).

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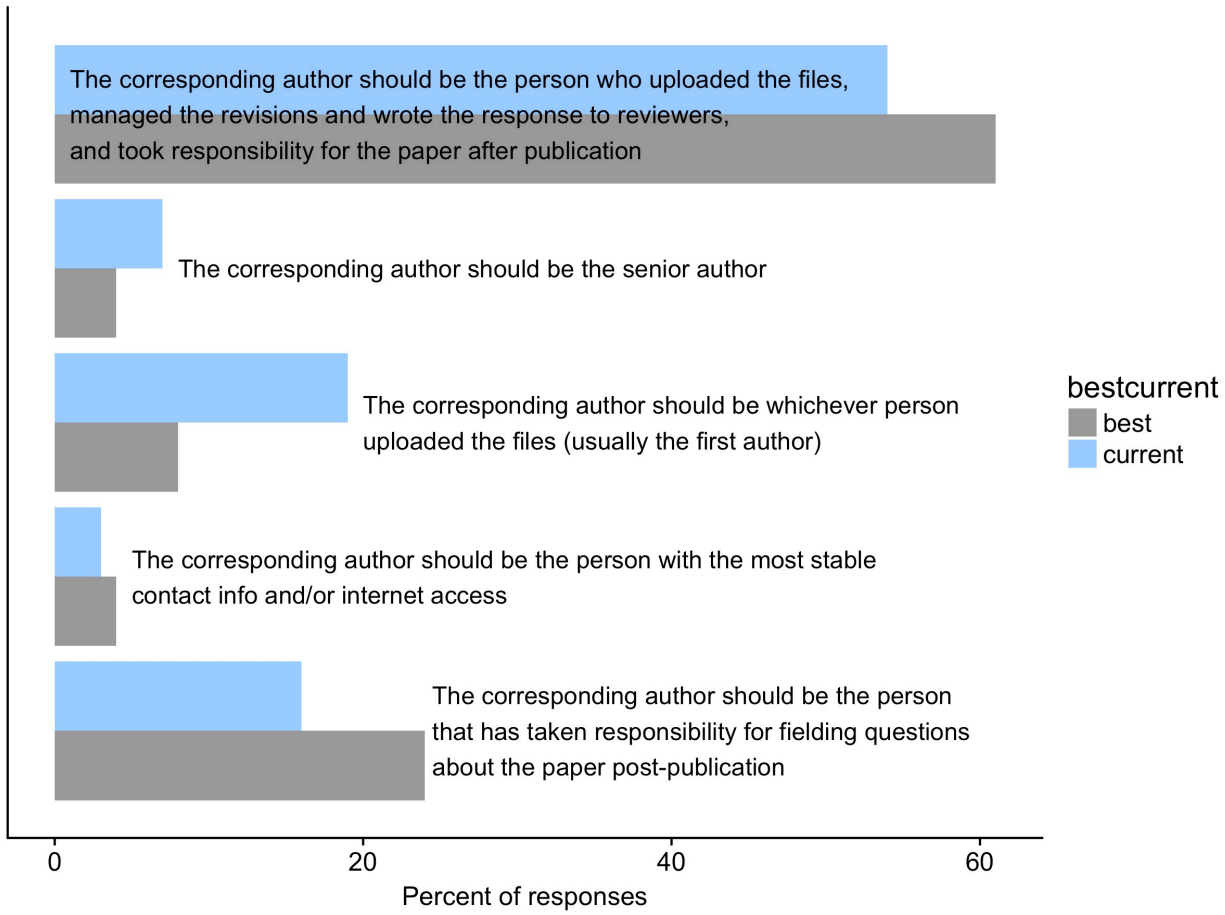


**Figure 3.** Views of poll respondents on current (light blue) and best (gray) practices for corresponding authorship.

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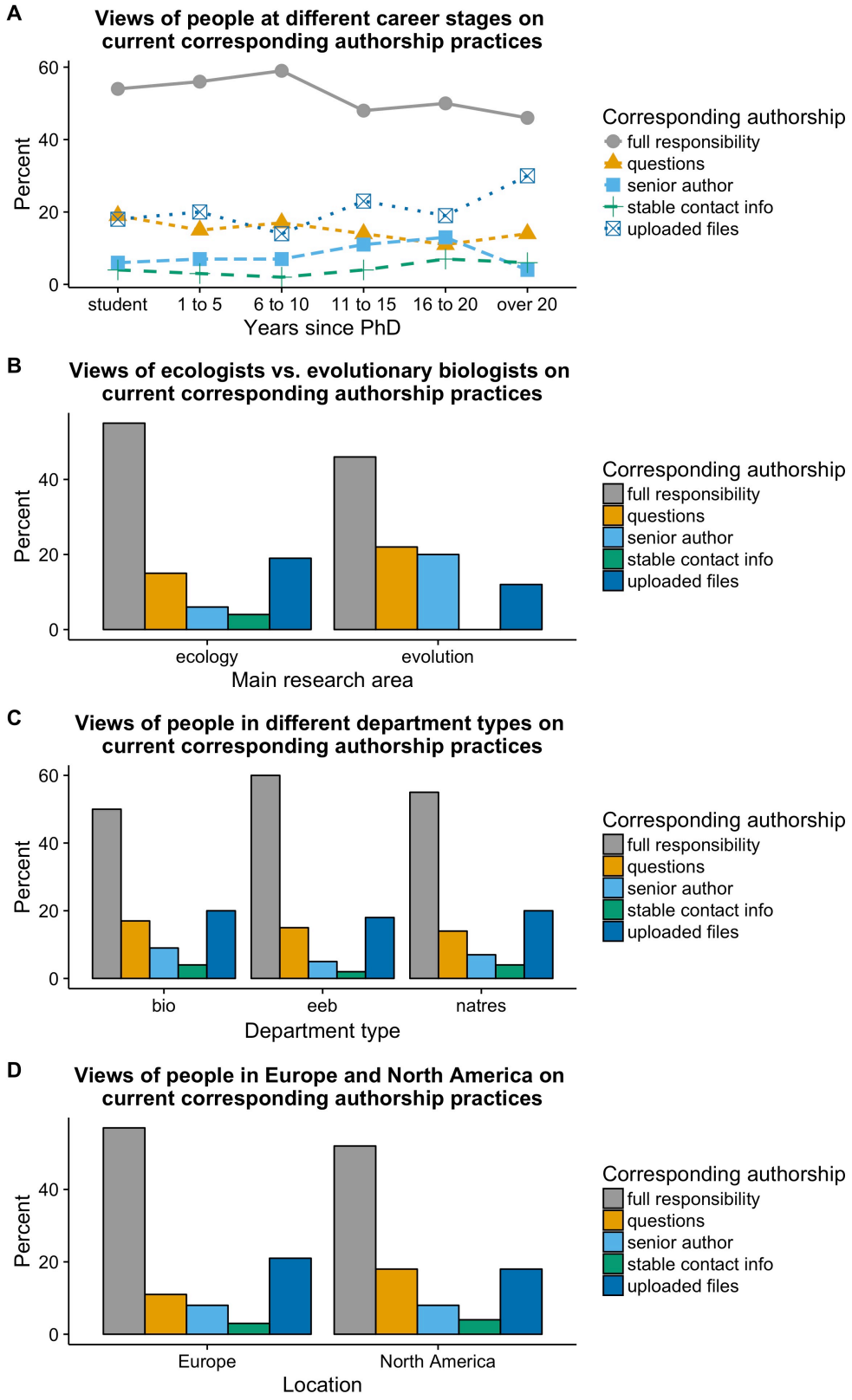


**Figure 4.** Influence of career stage, research area, department type, and geographic location on views on current corresponding authorship practices.

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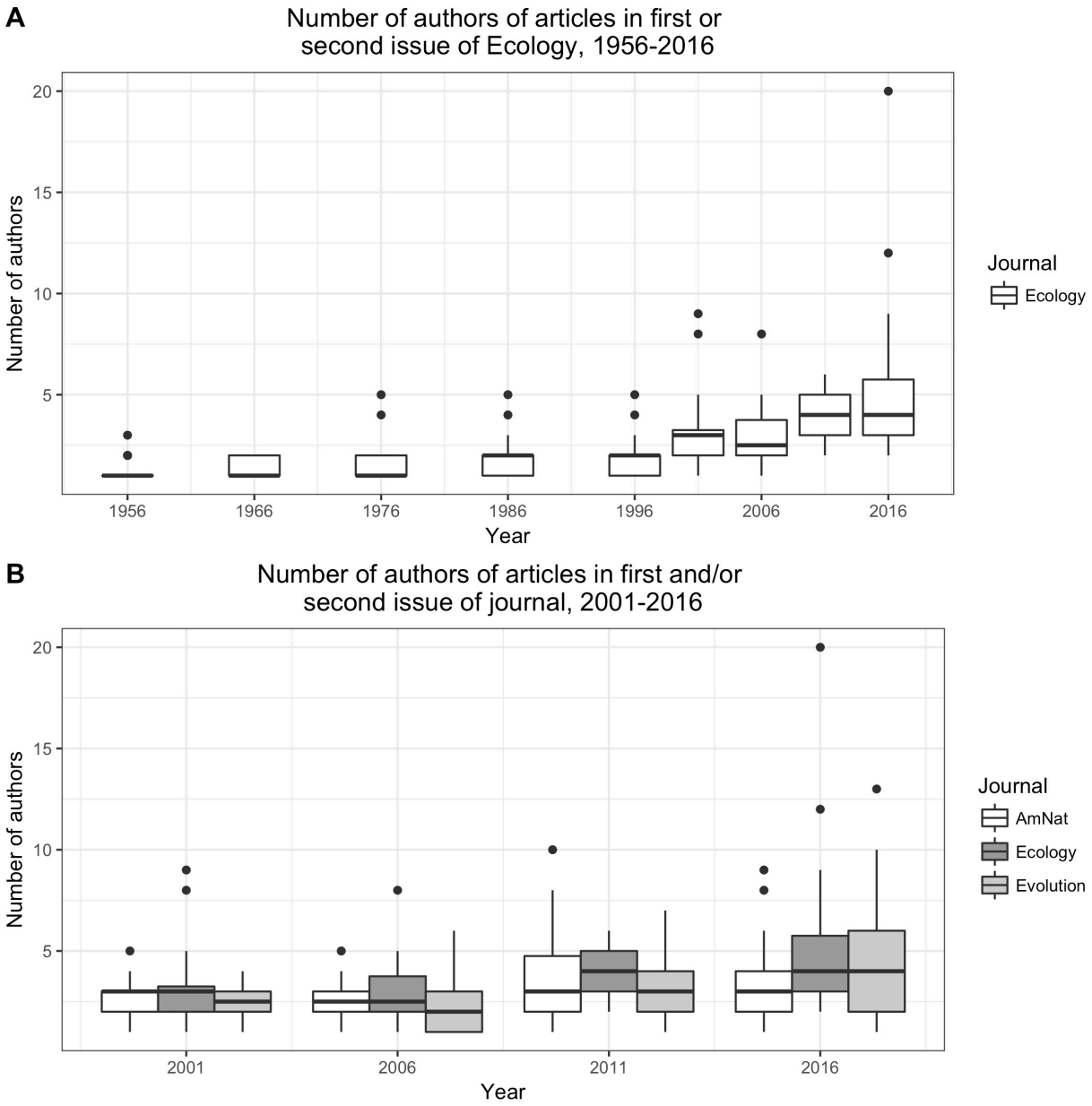


**Figure 5.** Number of authors on papers in *American Naturalist, Ecology*, and *Evolution* over time. See methods for more information on which journal issues were analyzed. A) Data for *Ecology* for 1956-2016. B) Data for *American Naturalist*, *Ecology*, and *Evolution* for 2001-2016.

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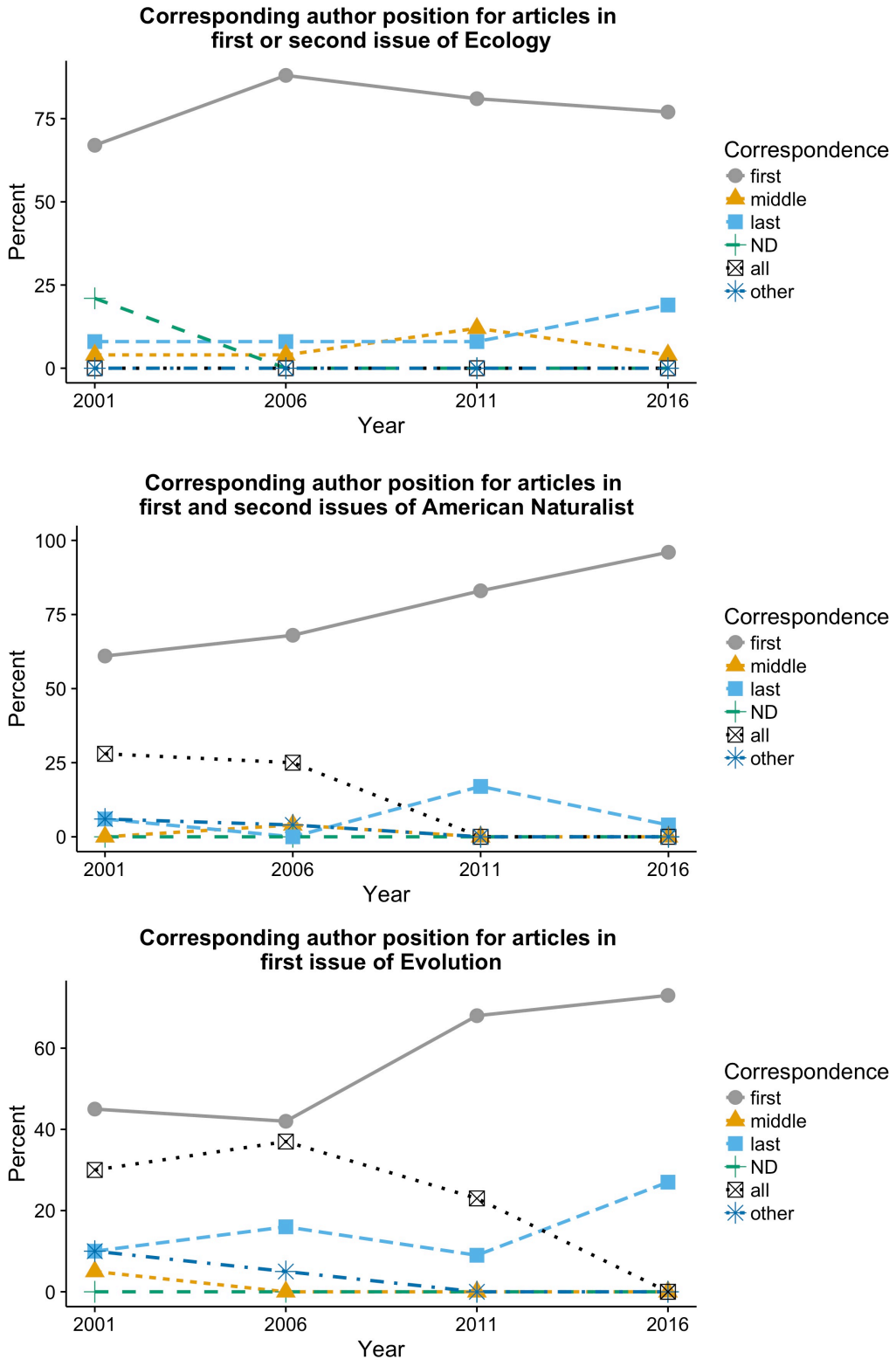


**Figure 6.** Corresponding author position for articles in the first and/or second issue of the journals *American Naturalist*, *Ecology*, and *Evolution*.

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## Supplementary Material

### Survey

The complete survey is given here.

1. For ecology papers, do you consider the last author to be the senior author?
   - Yes
   - No
   - Not sure, but probably yes
   - Not sure, but probably no
   - It depends, but probably yes
   - It depends, but probably no

2. Which of the following statements most closely matches the current norms in ecology in terms of who is corresponding author?
   - The corresponding author is usually the person who uploaded the files (usually the first author)
   - The corresponding author is usually the senior author
   - The corresponding author is the person with the most stable contact info and/or internet access
   - The corresponding author uploaded the files, managed the revisions and wrote the response to reviewers, and took responsibility for the paper after publication
   - The corresponding author is the person that has taken responsibility for fielding questions about the paper post-publication

3. Which of the following statements would be the best practice in terms of who is corresponding author?
   - The corresponding author should be whichever person uploaded the files (usually the first author)
   - The corresponding author should be the senior author
   - The corresponding author should be the person with the most stable contact info and/or internet access
   - The corresponding author should be the person that has taken responsibility for fielding questions about the paper post-publication
   - The corresponding author should be the person who uploaded the files, managed the revisions and wrote the response to reviewers, and took responsibility for the paper after publication

4. If someone includes a statement on his/her CV indicating they have used a first/last author emphasis, do you pay attention to that?
   - Yes
   - No
   - I have never seen this, but would probably pay attention to it
   - I have never seen this, but would probably not pay attention to it

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5. What is your primary research area?
- Ecology (primarily field-based)
- Ecology (primarily wet-lab based, including molecular ecology)
- Ecology (primarily computational-based)
- Evolutionary biology (primarily molecular)
- Evolutionary biology (primarily organismal)
- Biology other than EEB
- Outside biology

6. Is your research primarily basic or applied?
- Basic
- Applied

7. How frequently do you conduct interdisciplinary research (i.e., publish research with co-authors outside of your discipline)?
- Never
- Rarely
- Sometimes
- Often
- Always

8. How many years post-PhD are you?
- 0
- 1-5
- 6-10
- 11-15
- 16-20
- >20
- I do not have a PhD and am not a current student

9. Where do you live?
- Africa
- Asia
- Australia
- Europe
- North America
- South America

10. Which best describes your current department?
- An EEB department (or similar)
- A biology department
- A natural resources department (or similar)
- other