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Early Career Researchers in Ornithology: Attitudes, Career Prospects and Gender Issues

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Abstract – Early Career Researchers (ECRs) represent the next generation of ornithologists. In order to maximise the potential of ECRs to science, it is important to understand their perceptions of the opportunities and constraints that they face. We undertook a pilot study based on a questionnaire survey to gauge attitudes of ECRs in ornithology towards the current research environment, future career prospects, and gender bias. ECRs were defined as having less than five years' post-doctoral experience. The ECRs surveyed included BSc and MSc students, PhD students and post-doctoral researchers. The goal of the majority of ECRs was a career in academia, but there was also interest in working for non-governmental organisations (NGOs). Career prospects were perceived as increasingly negative from BSc/MSc students through to postdocs, likely reflecting a career bottleneck at the post-doctoral level. The influence of Twitter, open access publishing, open access data and journal Impact Factors were generally perceived as positive, although many BSc/MSc students had apparently little awareness of these initiatives. Female, but not male, ECRs perceived their gender to have a negative influence on their job prospects, and also were less likely to agree that a research career was compatible with having a family/partner. Our findings could be used to help ECRs to fulfil their ambitions in terms of establishing a career in ornithology. We suggest that provision of better support, communication and training to ECRs, as well as continuing initiatives to address gender bias, will improve the research environment for the next generation of ornithologists. These goals could be achieved through targeted events at national and international conferences and through enhanced communication on social media platforms.

Keywords: career prospects, gender bias, questionnaire survey, Twitter.

INTRODUCTION

Early Career Researchers (ECRs) represent the 'new wave' of scientists that will shape the next generation of researchers (Nicholas et al. 2017). They are particularly important as most of them will have been born into the digital age and will thus be conditioned to technologies that greatly facilitate the advancement of science to an extent that would have been unimaginable a generation ago. Furthermore, greater awareness of existing diversity issues in science, and also an increasing impetus to address such biases (e.g. gender bias; Shaw et al. 2012, Hinsley et al. 2017), will lead to a far more inclusive and diverse approach to research in the future as ECRs move from junior to senior positions.

Nevertheless, there are many challenges faced by

ECRs. Although there are several existing definitions of an ECR (Nicholas et al. 2017), in general, they can be viewed as being in a transitional state between a dependent and an independent researcher (Laudel & Gläser 2008). In order to fully realise this transition, several barriers have to be overcome in a highly competitive and precarious career environment. ECRs typically do not have permanent employment contracts, and thus their professional lives are unstable, characterized by short-term contracts and thus by frequent moves between institutions (Bennion & Locke 2010). Moreover, ECRs typically find themselves at a "bottleneck" in terms of scientific career, as there are not enough opportunities for ECRs to make the transition to a permanent position (Cyranoski et al. 2011).

The number of ECRs is growing in most countries as their contribution to socioeconomic growth becomes in-

creasing recognized (Cyranoski et al. 2011). In order to maximise the potential of ECRs to science, it is important to understand their perceptions of the opportunities and constraints that they face. In this paper, we present the outcome of a questionnaire survey undertaken by ECRs participating in the Second European Meeting of Young Ornithologists of the European Ornithologists' Union, held in Turin, Italy in October 2018. Our objectives were: (i) to understand the community of European ECR ornithologists; (ii) to survey attitudes of ECRs to the current research environment, including scientific publications and communication; (iii) to determine attitudes towards future career prospects, in particular in relation to the career stage of the ECR (i.e. BSc/MSc student, PhD or early post-doc); and, (iv) to assess the extent to which attitudes to current research and future career prospects varies according to gender.

MATERIALS & METHODS

The European Meeting of Young Ornithologists (commonly referred to as the 'Fledglings Meeting') was established in 2016 by the European Ornithologists' Union (EOU) as a biennial event with the goals of increasing communication between early-career ornithologists, gaining further experience in presenting and discussing results in a less intimidating atmosphere (i.e. compared to typical scientific conferences), and providing an opportunity to get advice from more senior researchers. The second meeting in Turin in 2018 was attended by 53 ECRs from 11 European countries, of whom 40 gave a presentation. Abstracts of presentations given at the meeting are available at <http://fledgelings-in-torino.blogspot.com/>. ECRs have been defined in a number of different ways (e.g. Nicholas et al. 2017) and most of these include age amongst the criteria, typically setting a threshold at around 35 years. We felt that career stage, rather than age *per se*, was a more appropriate definition (and indeed at least one person attending the conference would not have met common age-based criteria to qualify as an ECR). We therefore defined an ECR as anyone who had less than five years' post-doctoral experience (i.e. it included BSc and MSc students, PhD students and early-career post-docs).

In order to know better the community of ornithologists represented by attendees, we designed a questionnaire survey which was divided into three sections: (i) basic information on each respondent (3 questions); (ii) present and future careers (12 questions); and, (iii) publications and communications (4 questions). There was also a final question where we asked the respondent to identify

the most important research gap in ornithology. Questionnaires were given out to each delegate at the start of the meeting and were asked to be returned by the end of the final presentation on the last day. Questionnaires were completed anonymously. The questionnaire is shown in Appendix 1.

Analysis

Due to small sample sizes, statistical analysis of responses was not possible in many cases, therefore we mostly present descriptive summaries of responses. For gender, however, there were some cases where statistical analyses were possible by combining different categories into two responses and analysing two-by-two contingency tables. For example, defining a single 'negative' response category by combining all responses that were either 'moderate' or 'poor' for a given category. In cases where expected values were ≥ 5 , significant associations between categories were tested using χ^2 . Where expected values were < 5 , Fisher exact tests were used. All analyses were conducted in R version 3.5.2 (R Development Core Team 2018) using the 'chisq.test' and 'fisher.test' functions to calculate test statistics, adopting a significance level of $p \leq 0.05$.

RESULTS

We received 38 completed questionnaires of which 28 had at least one question unanswered. Respondents were from three different early career stages separated into Bachelor or Master's students ($n = 19$, henceforth "Students"), PhD students ($n = 12$, henceforth "PhDs"), post-doctoral researchers ($n = 6$ "Postdocs") and one unspecified (i.e. no response was given). More than three quarters of the people who took part in the survey stated that they were a birdwatcher ($n = 21$), a ringer ($n = 1$) or both ($n = 12$). Three people answered that they were neither birdwatchers nor ringers, and there was one unspecified. Gender was specified in 30 questionnaires dividing the respondents into 14 men and 16 women.

Research & Communications

Most respondents had already published a paper either as first or as co-author ($n = 29$). Respondents without any publications were mainly Students ($n = 7$). All Postdocs ($n = 6$) and half of the PhDs ($n = 6$) had at least one first author publication, whereas only two Students had published as a first author. Similarly, only five Students had published as a co-author. In contrast, the majority of PhDs and all Postdocs had at least one co-authored publication.

Almost three quarters of all respondents (n = 27) had attended at least one conference between 2016 and 2018. Furthermore, respondents were asked which of their attended conferences they valued most in terms of research or networking. We classified their responses as either ‘national’ or ‘international’ conferences. In cases where national and international conferences were listed, the response was classified as ‘both’. Responses were excluded if it was not possible to identify the conference category. In terms of research and networking, conferences at an international level were identified as the most useful by PhDs (Fig. 1). However, many Students selected national conferences as the most useful in terms of research, whereas in terms of networking, responses were balanced. Postdocs considered national and international conferences as almost equally useful in both categories.

Twitter, open access publishing, open data, journal impact factor and H-index were rated by the respondents in terms of their influence on scientific research. Overall, Twitter was seen to positively influence research by Students, PhDs and Postdocs. However, a considerable amount of Students, and to a lesser extent, PhDs, did not provide a response (Fig. 2). Open access publishing and open data were considered to have a very positive or positive influence by all three ECR groups (Fig. 3). The influ-

ence of the H-index on scientific research tended to be seen as more negative by PhDs and Postdocs compared to Students. However, several PhDs and Students didn’t provide a response, or they perceived its influence as neutral (Fig. 4). Similarly, the journal impact factor was seen to have no influence on research by several respondents of each ECR level, although Students and PhDs perceived its impact more positively compared to Postdocs (Fig. 4).

Future Career Prospects

This part of the survey addressed questions regarding the future job perspectives of early career researchers e.g. what would be their ideal next job, how do they perceive their job chances and what they think are the biggest barriers to furthering their careers (Fig. 5).

Most Students and PhDs would like to pursue a career in academia as future PhD students or postdocs respectively (Fig. 6). Jobs at NGOs or at external research institutes were attractive to all ECR levels. In terms of assessing chances to get a job at the next stage of their careers, a large number of Students saw their chances as good, whereas the majority of Postdocs perceived their chances as rather poor (Fig. 7). An equal amount of PhDs judged their job chances as good, medium and poor. The low availability of jobs, too much competition and poor

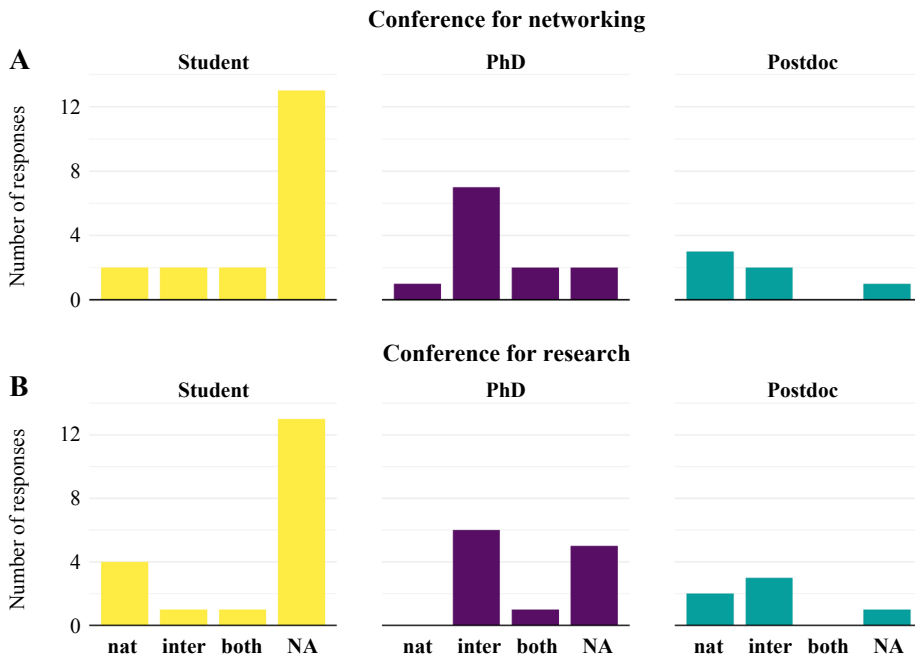


Figure 1. The perceived importance of national and international conferences for (A) networking and (B) research. Respondents are grouped into ECR level: Students, PhDs or Postdocs. Individual conferences were categorised as national (nat), international (inter) or both. NA indicates no response provided for a given questionnaire.

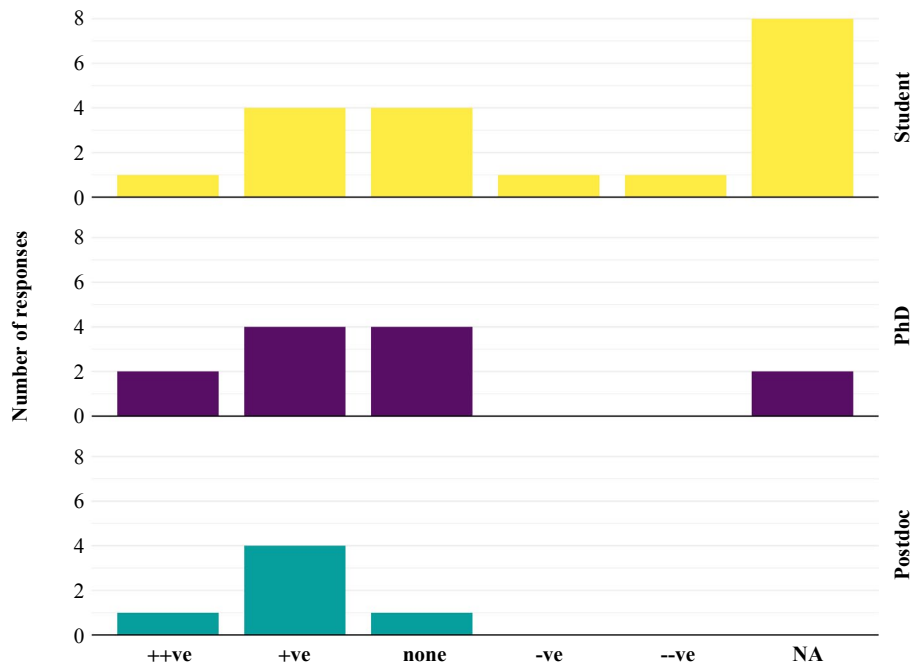


Figure 2. The perceived influence of Twitter on scientific research. Respondents are grouped into ECR level: Students, PhDs or Postdocs. Responses comprised five categories: very positive (++ve), positive (+ve), none, negative (-ve) and very negative (--ve). NA indicates no response provided for a given questionnaire.



Figure 3. The perceived influence of open data (A) and open access publishing (B) on scientific research. Respondents are grouped into ECR level: Students, PhDs or Postdocs. Responses comprised five categories: very positive (++ve), positive (+ve), none, negative (-ve) and very negative (--ve). Note that the category ‘very negative’ was omitted from the figure as there was no response for this option for any ECR level. NA indicates no response provided for a given questionnaire.

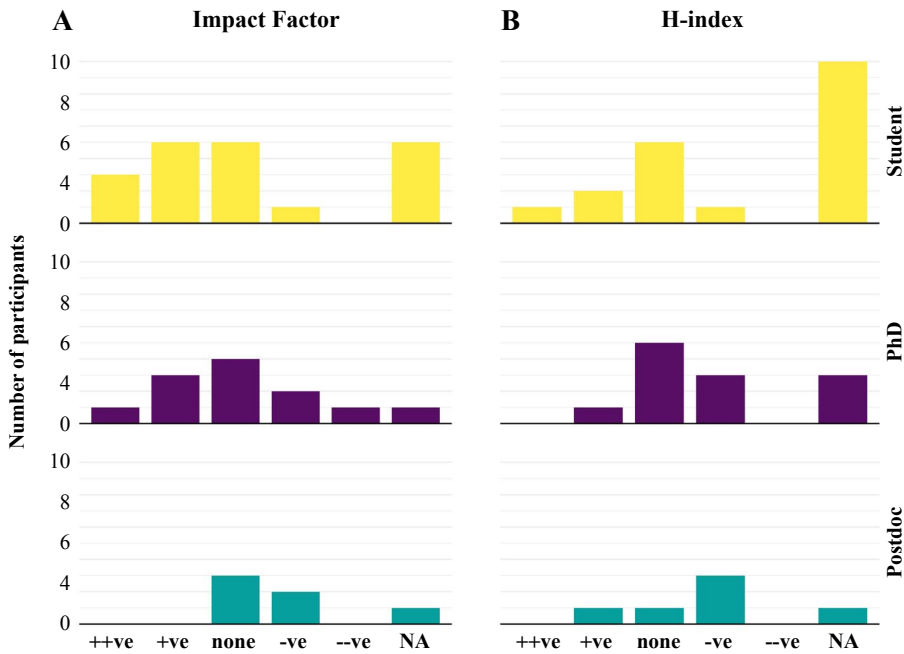


Figure 4. The perceived influence of (A) the Impact Factor and (B) the H-index on scientific research. Respondents are grouped into ECR level: Students, PhDs or Postdocs. Responses comprised five categories: very positive (++ve), positive (+ve), none, negative (-ve) and very negative (--ve). NA indicates no response provided for a given questionnaire.

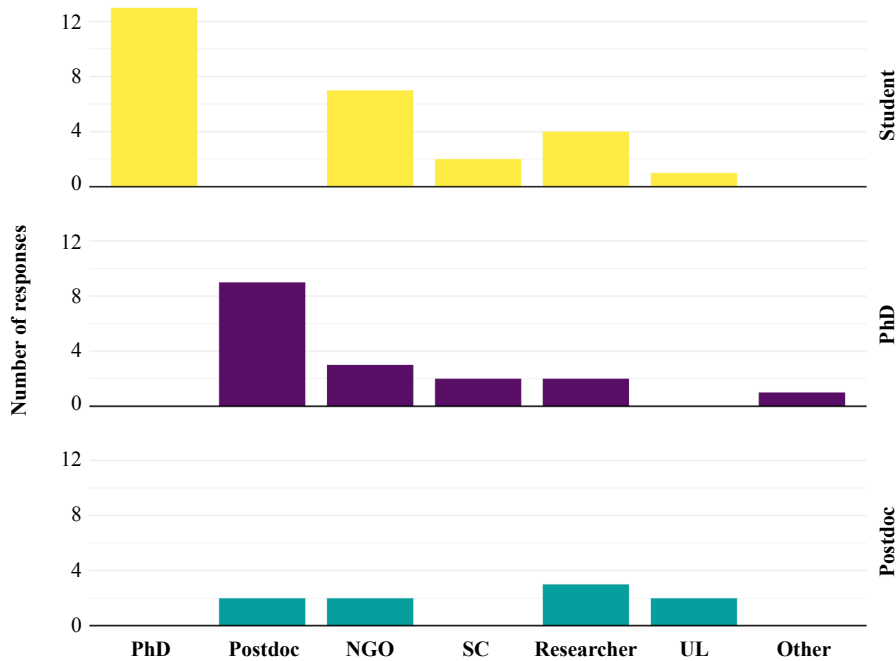


Figure 5. The ideal next jobs of ECRs. Respondents are grouped into ECR level: Students, PhDs or Postdocs. Job categories comprised: PhD, Postdoc, non-governmental organisation (NGO), Scientific consultancy (SC), Researcher, University lecturer (UL) and Other.

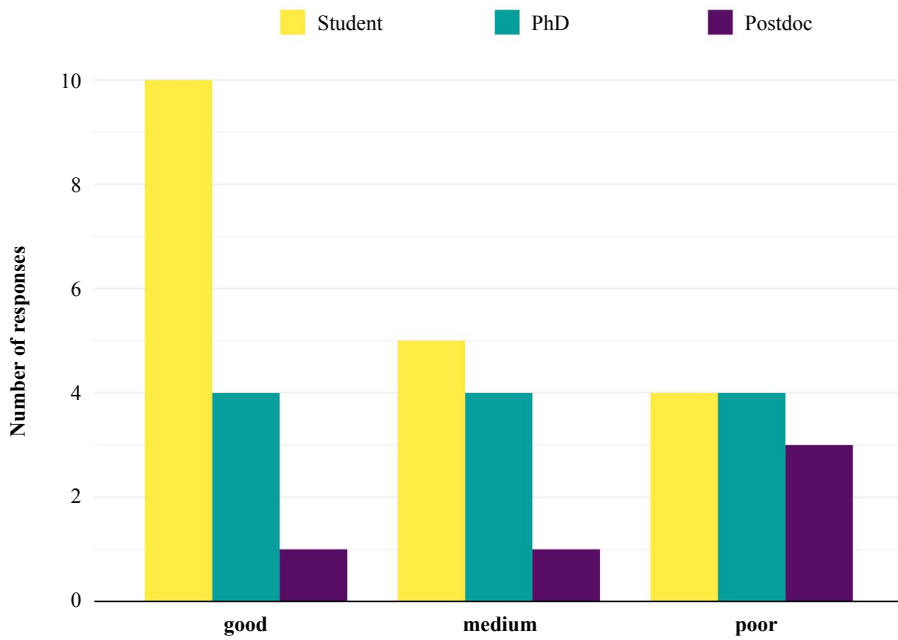


Figure 6. Perceived future job prospects of ECRs. Respondents are grouped into ECR level: Students, PhDs or Postdocs.

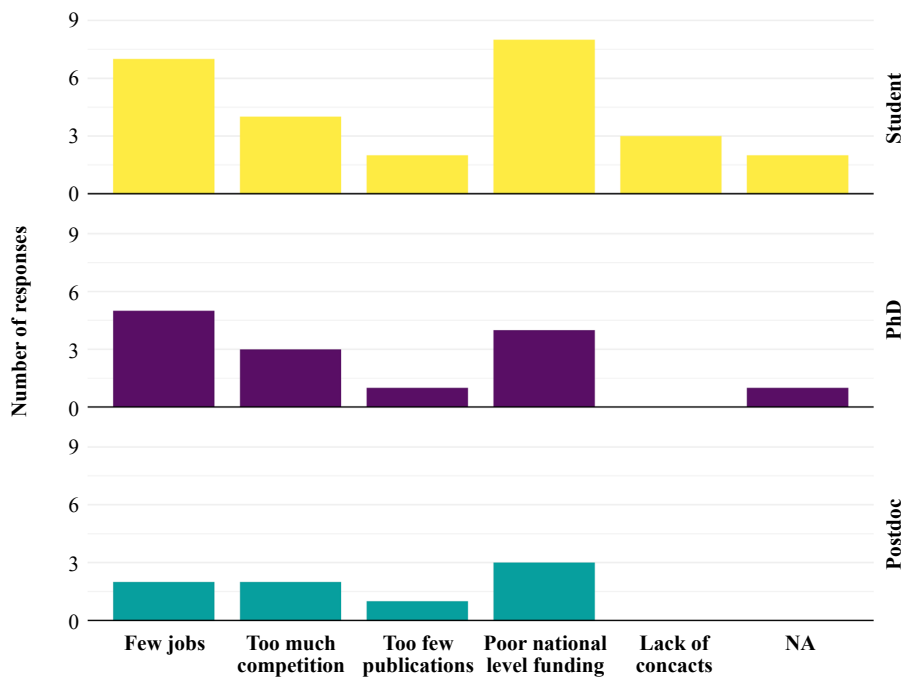


Figure 7. Perceived barriers to obtaining the ECRs' ideal job. Respondents are grouped into ECR level: Students, PhDs or Postdocs.

national-level funding were seen as the biggest barriers in pursuing a career in ornithology by all levels of ECRs. The lack of personal contacts was identified as an additional barrier by Students.

Most ECRs (~78%) expressed a preference to work in Europe for their ideal next job. During their career/university, ~40% of the respondents had already changed country. ECRs changed country due to various reasons, but most because of a job opportunity abroad, or they wanted to get to know other research groups, projects and cultures.

Reponses in relation to Gender

There was no overall difference between males and females in their perceived future job prospects when combining ‘moderate’ and ‘poor’ responses into one category (Fisher exact test, $p = 0.70$). Most of the female respondents thought that their gender influences their career prospects, whereas the majority of male respondents assumed that career prospects were gender-neutral (Fig. 8). Those male and female respondents who assumed that there is an influence of gender on their career were also asked if they thought that this influence is positive or negative. Most females indicated that they thought it is a negative influence, while male respondents perceived it as positive, a difference that approached significance (Fisher’s exact test, $p = 0.052$).

The compatibility of having a partner or family with a job in research was most often seen as either neutral or

compatible for the majority of male respondents. Female responses were very mixed, with three respondents thinking that compatibility is possible, four being neutral and eight thinking that having a job/family is incompatible with job in research. However, there was no significant difference in response according to gender when combining positive or neutral responses versus negative responses ($n = 28, \chi^2_1 = 2.65, p = 0.10$). Respondents identified unstable living conditions (i.e. short-term contracts), long working hours, low salaries and the incompatibility of job location between both partners as potential barriers to having both a family and a job in research.

DISCUSSION

In this study, we have attempted to understand better the community of early-career ornithologists in terms of who they are, their level of experience, their attitudes to the current research environment and their aspirations for the future. Our sample was made up of undergraduates, Master’s or PhD students with approximately equal proportions of females and males. Most of them were bird-watchers and/or ringers, suggesting that, despite concerns to the contrary (e.g. Panuccio 2018) most ECRs participated in field-based activities and had an interest in ornithology beyond their research. Given the small sample sizes (inevitable given the nature of the meeting upon which the

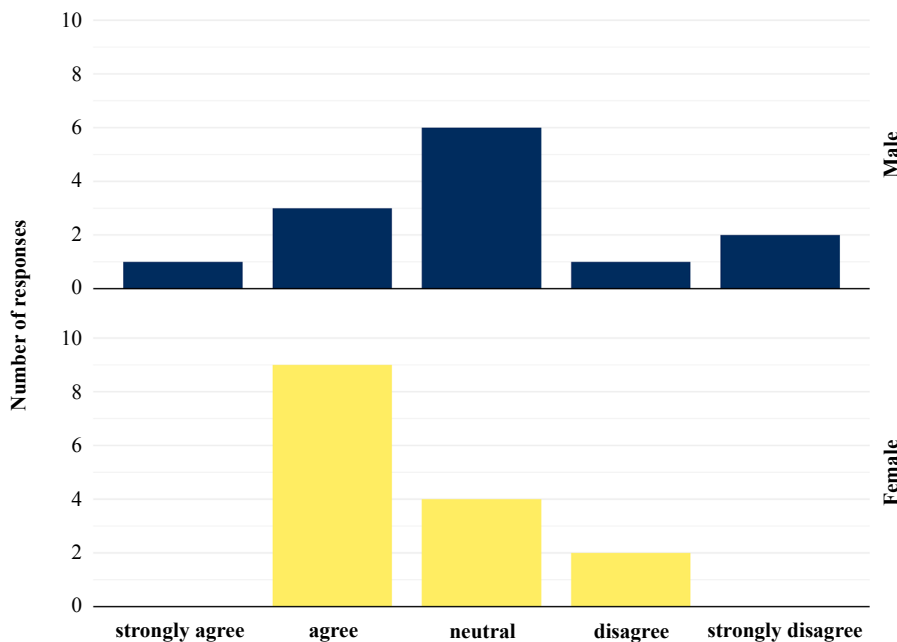


Figure 8. Perceived influence of the respondents’ gender on their future career prospects. Respondents are grouped into male and female.

questionnaire was based), we consider our work as a pilot study. Nevertheless, the responses revealed some interesting trends.

Our sample of ECRs was already relatively experienced in terms of publications and conference attendance – 80% had published a paper (either as first author or co-author) and 89% had already participated in at least one conference. However, not surprisingly those that hadn't published were almost all Students. It is increasingly important that candidates have already published in order to obtain a PhD position, and Master's thesis supervisors should be encouraged to help ambitious students to publish as much as possible. The ECRs were also generally positively disposed to relatively recent developments in terms of publishing (open access and open data) and communication (Twitter). There was also some tendency for positive responses regarding the influence of Impact Factors on scientific research, although this was not the case for the H-index, which was generally perceived as having a neutral or negative influence. However, amongst Students there were many that didn't respond to the above categories. We suggest that this is reflective of a lack of knowledge amongst those respondents who were at the outset of their potential ornithological careers. It would be advantageous for these ECRs to learn more about bibliometrics, and the rapid ongoing changes in scientific publishing. Furthermore, it was somewhat surprising that 42% of Students did not provide a response to the influence of Twitter, even though it is probably now a key means of communication in science (Finch et al. 2017) by which PhD positions and job opportunities and publications are publicized in ornithology. Future initiatives for ECRs, such as our 'Fledglings Meeting', should consider targeted workshops to raise awareness of bibliometrics, the process of scientific publishing and the use of social media to enhance ECR career prospects.

The majority of ECRs wanted to pursue a career in academia within Europe. Nevertheless, almost half (48%) also specified an interest in non-academic positions. Much research into attitudes of ECRs focusses exclusively on academia. In ornithology at least (and more broadly in ecology and conservation), there are many other options to stay in active research outside of the higher education sector. Furthermore, many skills learned in ornithological research are highly transferable to other disciplines, including data analysis and presentation, oral and written communication, and project management. We suggest that future research into ECRs attitudes and aspirations encompasses the whole range of potential careers.

In terms of perceptions of future career prospects, there seemed to be a trend of growing pessimism from early to

late-stage ECRs. Job prospects were rated as 'good' by 53% of Students, but only 20% of Postdocs. Conversely, 21% of Students and 60% of Postdocs rated their future job prospects as 'poor'. Whilst we must acknowledge the small sample size for Postdocs, we nevertheless suggest that this trend reveals a growing awareness of the lack of opportunities for career-enhancement in ornithology, a career "bottleneck" that is well known in science (Cyranski et al. 2011).

There were some clear differences in responses according to the gender of the respondent. There was evidence of a greater appreciation of gender bias in females – women were more likely to see their gender as having a negative influence on their career prospects. Disregarding neutral responses, there was also a small majority of males (3 out of 4) who felt that they had an advantage due to their gender. Similarly, female respondents in general did not agree that having a research career was compatible with having a family or partner, whereas males were generally neutral or in agreement. These responses reflect the overall and now well-known gender biases that exist in science (e.g. Feldon et al. 2017). It seems clear that among our sample of early-career ornithologists, there is still a degree of pessimism, suggesting that initiatives to address gender biases have not yet reached their goals, or at least are not perceived as having done so. We should therefore strive as an ornithological community to further address these issues by adopting guidelines to minimise gender bias (e.g. Cacace 2009).

Our survey was fairly *ad-hoc* and designed to provide a "snap-shot" of European ECRs in ornithology. There are several caveats on our results. First, sample sizes were fairly small, in particular when breaking-down the responses into different categories, thus restricting inferences that can be drawn, especially in terms of statistical analysis. Second, we cannot know to what extent our sample was representative of ornithological ECRs in general. There could be a number of ways in which our sample was biased. For example, an international meeting will obviously incur financial costs, thus individuals with restricted access to funds (an important demographic to survey) may not have attended. It would be interesting to survey a sample of non-attending ECRs to determine if their responses are consistent with those of the meeting's participants. Third, we are conscious that perfectly unbiased questionnaires are hard to design, and that our form may have included some 'leading questions' (*sensu* Gomm 2004, White et al. 2005). We suggest that our pilot study be used as a basis to design a further questionnaire that follows standard protocols and is targeted at a much larger and more representative sample of early-career ornithologists.

Despite the caveats on the interpretation of our results, we feel that our pilot survey has revealed some important trends that could be used to help ECRs to fulfil their ambitions in terms of establishing a career in ornithology, and to encourage senior researchers to better address their concerns, thus ultimately improving research for the next generation of ornithologists. We suggest that the situation could be improved through provision of better support, communication and training to ECRs, as well as continuing initiatives to address gender bias. These could be achieved through targeted events at national and international conferences (including meetings specifically for ECRs) and through enhanced communication on social media platforms.

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