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Impacts of COVID-19 on ecology and evolutionary biology faculty in the United States

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Abstract. We surveyed ecologists and evolutionary biologists in American universities to understand how they are coping with the COVID-19 pandemic. Female respondents, assistant professors, and those who care for at least one child or teenager, were significantly more dissatisfied with their work–life balance during this pandemic than others, and further expected these negative impacts to be long lived. Online teaching support, relaxed expectations on publications, the possibility of pausing the tenure clock, and an acknowledgment of “no business as usual” by administrators were thought to be effective policies in mitigating these negative impacts. This survey serves as a manifesto to what our professional community is currently experiencing, and should be used to inform academic policies directed at improving faculty productivity and welfare.

Key words: academia; COVID-19; ecology; evolution; faculty; pandemic; survey.

INTRODUCTION

On 11 March 2020, the World Health Organization characterized the COVID-19 (coronavirus disease caused by the SARS-CoV-2 virus) outbreak a pandemic (World Health Organization 2020a). As of early September 2020, COVID-19 has affected virtually every country and territory, with more than 27.5 million confirmed cases and more than 897,000 mortalities worldwide (World Health Organization 2020b). Highest among all countries, the United States now reports nearly 6.48 million confirmed cases and more than 193,000 mortalities (as of 8 September 2020; data *available online*).⁵ This pandemic has disrupted people’s lives globally in unprecedented ways, and is predicted to have long-lasting societal (Dowd et al. 2020), demographic (McKibbin and Fernando 2020), and economic impacts (Van Bavel et al. 2020) on communities worldwide. Documenting and quantifying the impacts of COVID-19 on diverse

working communities is crucial for adjusting our current and future expectations of how professionals can operate under such circumstances.

As this public health crisis unfolds, we asked how our peers, ecologists and evolutionary biologists, were coping with the COVID-19 pandemic with an online survey (Appendices S1–S2, Data S1). Although our professional ties are often international, our survey focused on faculty associated with doctoral programs in the United States that host programs in ecology and evolutionary biology (The Chronicle of Higher Education 2010), to limit sources of variability in public health regulations across nations and in the academic structure of university programs. We used the National Research Council’s list of 94 ecology and evolutionary biology doctoral programs in the United States to identify our survey population (Appendix S1). We included department heads and chairs in our survey population, but excluded deans, lecturers, instructors, research scientists, cooperative unit scientists/faculty, and emeritus faculty. We administered the survey online through Qualtrics from the 11 May to the 18 June 2020 (Appendix S2).

Our overarching goal was to quantify the nature and extent of the COVID-19 pandemic on teaching, research, mentoring, service, and engagement. Our

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⁵ <https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/cases-in-us.html>

motivation for this survey was two-fold: highlight any inequalities in the impacts of COVID-19 on these activities within our professional community, and provide our peers with data and statistics they can refer to in years to come. Major disparities in gender (Damschen et al. 2005, Martin 2012, McGuire et al. 2012), gender-based family responsibilities (O'Dea et al. 2018), ethnicity (O'Brien et al. 2020), and other dimensions of diversity in the workforce exist in ecology (Jimenez et al. 2019, Maas et al. 2020). These inequalities may be exacerbated by the current pandemic (Maas et al. 2020), and new disparities may emerge from it that could disproportionately impact the careers of parents with young children (mothers in particular; Kahn et al. 2014, Staniscuaski et al. 2020), field ecologists (Inouye et al. 2020), and early-career scientists (Inouye et al. 2020), which have triggered a series of surveys in their own right (Alon et al. 2020, Antecol et al. 2020, Myers et al. 2020).

To capture the breadth of circumstances that our community is experiencing, our survey addressed faculty's work-life balance prior to and during the pandemic; their workplace situation during the pandemic; the impact of the pandemic on their work in the lab and in the field; faculty's engagement in academic activities prior to and during the pandemic; the importance placed on these activities during the pandemic by faculty members and those who evaluate them; and a self-assessment of their physical and mental health; as well as their demographic information.

RESULTS

Of the 608 survey respondents, 86.7% identified as white/Caucasian and 54.9% as male. The majority of respondents were 40–49 yr old (29.8%), followed by 60–69 yr old (25%), 50–59 (22.5%), 30–39 (16.8%), and a small fraction of participants were 70 yr or older (4.8%), with 1.1% of respondents preferring not to disclose their age. Among respondents, 39.6% did not provide others with care in their household, 27.5% had to provide care to at least one child between the age of 0 and 5, 20.7% to at least one child or teenager between the age of 6 and 19, and 9.5% to at least one adult age 20 or older (sometimes including seniors age >70), with 2.6% preferring not to disclose this information. Most respondents (53.5%) were full professors, 21.7% were associate professors, and 24.8% were assistant professors, with a large majority (84%) belonging to R1 doctoral universities supporting very high research activity. Mean lab size was 7.6 when including undergraduate students (interquartile range, IQR = 5), and 3.6 (IQR = 3) when only considering graduate students. When the COVID-19 pandemic unfolded in the United States in early 2020, 73.3% of our respondents taught an average of 1.4 courses (IQR = 1). At the time of our survey, 0.83% of our respondents were diagnosed with

COVID-19, yet 7.5% suspected they had it at some point.

We used a five-point scale (Tullis and Albert 2013; from very dissatisfied to very satisfied) to evaluate the overall level of satisfaction in the respondent's personal and professional lives, and balance between the two, prior to and during the pandemic. The ranked distribution of level of satisfaction was significantly different prior to, and during the pandemic, with respect to respondent's professional life ($\chi^2 = 262.22$, $df = 4$, $P < 0.001$), personal life ($\chi^2 = 40.69$, $df = 4$, $P < 0.001$), and work-life balance ($\chi^2 = 127.23$, $df = 4$, $P < 0.001$). Work-life balance was where we found the largest discrepancies; the level of satisfaction was much lower during the pandemic than it was prior to the pandemic. Rank and gender helped explain these differences. For example, assistant professors were significantly more dissatisfied with their work-life balance when compared to associate professors and full professors (32.5%, 26.5%, 10.8% were very dissatisfied, respectively; $P < 0.001$). Significantly more female respondents (i.e., primarily females in our survey, referred to as females moving forward) were very dissatisfied with their work-life balance than were males during the pandemic (12.7% vs. 6.9%, $P < 0.001$). Those who had to care for at least one child under the age of 5, or for at least one child or teenager between ages 6 and 19 were significantly more (very) dissatisfied with their work-life balance than respondents who did not have to care for anyone within their household (16.5% and 9.5%; $P < 0.001$ in both comparisons). The race of our respondents did not explain such differences in work-life balance prior to and during the pandemic ($\chi^2 = 5.6$, $df = 5$, $P = 0.347$). Although racial diversity is notably lacking among the ecology and evolutionary biology professional community (Jimenez et al. 2019), this result is likely not an artefact of small sample size (non-white respondents = 81 vs. white respondents = 527).

Only 1.8% of the respondents indicated that they kept working on campus during the pandemic, while 84% worked from home, and 14.1% had hybrid arrangements. Overall, the distribution of levels of satisfaction was not significantly different across working arrangements when asked about the respondent's professional life ($\chi^2 = 4.226$, $df = 5$, $P = 0.517$), personal life ($\chi^2 = 2.855$, $df = 5$, $P = 0.722$), and work-life balance ($\chi^2 = 8.706$, $df = 5$, $P = 0.121$). Of those who worked on campus or used a hybrid arrangement, the majority (30.9%) felt somewhat satisfied with their work-life balance during the pandemic, followed by 24.7% who felt somewhat dissatisfied. For these same individuals, 23.7% felt academic activities on campus put them at an increased risk of exposure to COVID-19, whereas 63.9% did not feel at an increased risk and 12.4% felt unsure. For those working from home or both from home and on campus (98.1%), their levels of satisfaction with their work-life balance during the pandemic ranged from 21.5% feeling very dissatisfied and 20.5% somewhat

dissatisfied, to 24.5% somewhat satisfied and 18.2% very satisfied. The quality of their workspace was a determining factor of their level of satisfaction with their professional lives ($\chi^2 = 27.354$, $df = 4$, $P < 0.001$), personal lives ($\chi^2 = 14.123$, $df = 4$, $P = 0.007$), and work–life balance ($\chi^2 = 17.052$, $df = 4$, $P = 0.0019$). Those who did not have the option of working in a private room (63.8%) were a lot more dissatisfied with their work–life balance ($P = 0.003$) than those who had access to a private room (36.2%).

Within ecology and evolutionary biology academic programs, lab work and fieldwork activities are what “make or break” a research program, and feed into a number of professional activities beyond research, such as teaching, mentoring, and extension. Among respondents who conduct lab work as part of their professional duties, 81.5% indicated that they either strongly agreed or somewhat agreed that lab work activities have been negatively impacted by the COVID-19 pandemic; 78% of respondents who conduct fieldwork shared the same response. There was no statistically significant difference between male and female respondents in the perceived impact of the pandemic on lab work ($\chi^2 = 0.015$, $df = 4$, $P = 1$) and fieldwork ($\chi^2 = 0.015$, $df = 4$, $P = 1$), and similarly, no difference across academic ranks (lab work: $\chi^2 = 0.075$, $df = 8$, $P = 1$; and fieldwork: $\chi^2 = 0.065$, $df = 8$, $P = 1$). Overall, most respondents expected the impacts of the pandemic on lab work and fieldwork activities to be long lived, although the degree of uncertainty in the longevity of these impacts increased with time (Fig. 1).

The majority of respondents reported that their ability to work on research, teaching, mentoring, service, and outreach, engagement and extension had all been negatively affected by the pandemic (Fig. 2). Between males and females, there was no statistically significant difference in the respondents’ ability to conduct research ($\chi^2 = 0.050$, $df = 4$, $P = 0.999$), teach ($\chi^2 = 0.119$, $df = 4$, $P = 0.998$), or mentor lab members ($\chi^2 = 0.013$, $df = 4$, $P = 1$) due to the pandemic. Similarly, no difference was found across academic ranks in their ability to work on research ($\chi^2 = 0.051$, $df = 8$, $P = 1$), teaching ($\chi^2 = 0.073$, $df = 8$, $P = 1$), or mentoring ($\chi^2 = 0.031$, $df = 8$, $P = 1$).

More than 50% of respondents reported spending more time mentoring, providing service, and teaching during the pandemic (Fig. 3). Losing current research opportunities and/or having to pursue new ones, having to transition to online teaching during the pandemic, and caring for dependents were among the three leading reasons that limited a respondent’s engagement in academic activities during the pandemic, while additional meetings were also cited as a moderate limitation (Appendix S3: Table S1).

When asked about the perceived importance of different academic activities for their performance review and/or in tenure and promotion decisions, 93.1% of respondents said research was very important, followed by

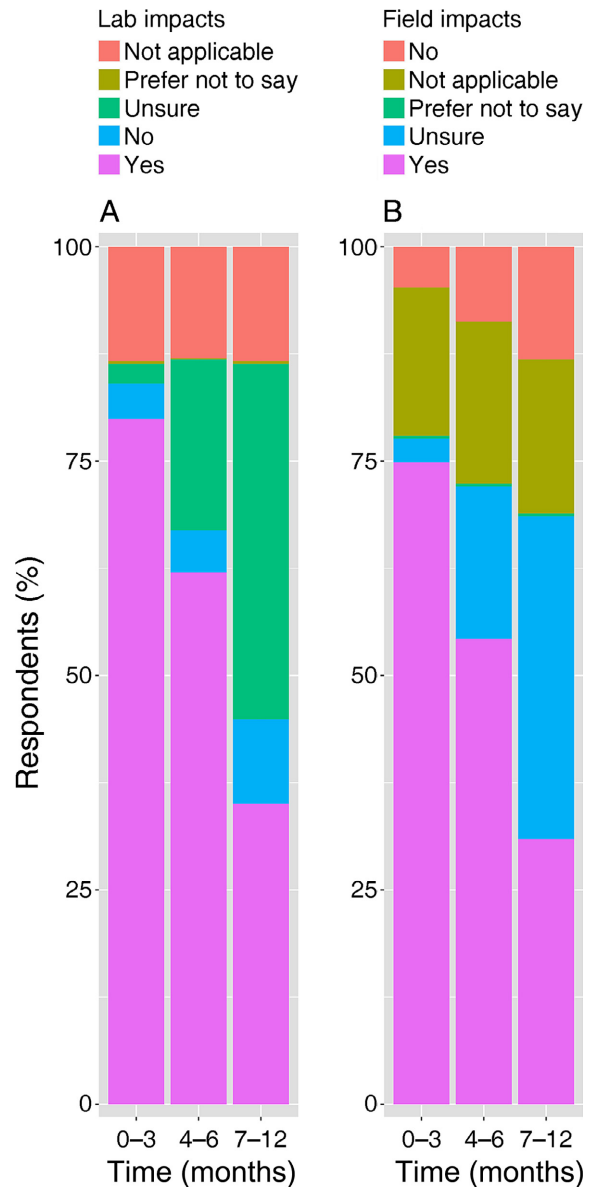


FIG. 1. Predicted lasting negative impacts (0–3, 4–6, 7–12 months) of the COVID-19 pandemic on (A) lab work and (B) fieldwork activities by faculty. Results are presented as percentages of respondents.

40.1% for teaching, and 33.8% for mentoring, while some level of importance was also placed on service, outreach, engagement, and extension, and administrative tasks (Appendix S3: Table S2a). When asked about the level of importance placed on academic activities by those who evaluate them during the COVID-19 pandemic, 51.7% indicated that research was very important, followed by teaching (47.2%), and mentoring (30.1%). Respondents perceived the level of importance placed on service, outreach, engagement, and extension, and administrative tasks by their evaluators to be much lower (Appendix S3: Table S2b).

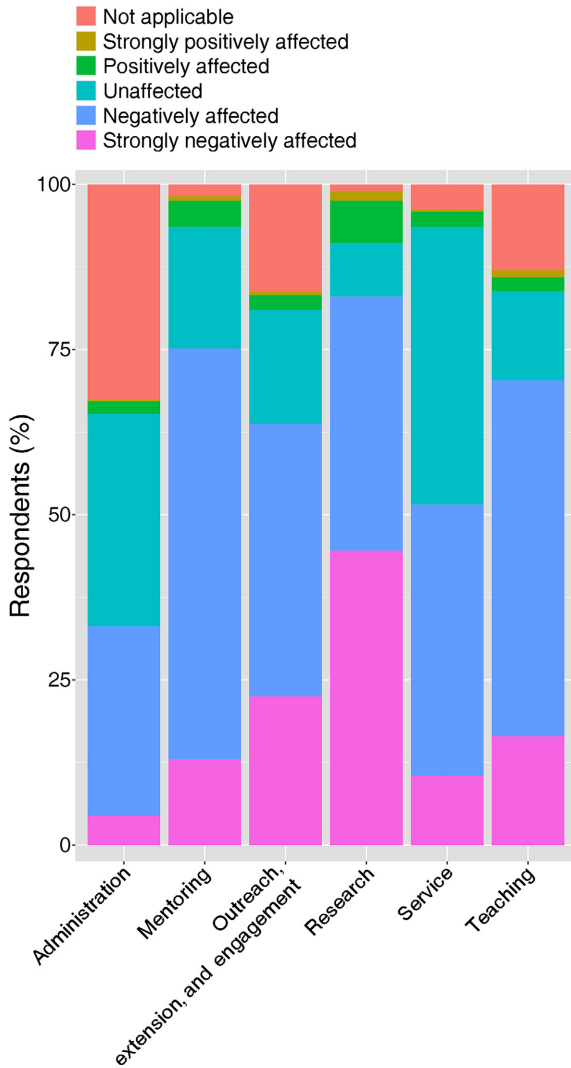


FIG. 2. Perceived impacts of the COVID-19 pandemic on academic activities by faculty. Results are presented as percentages of respondents across a five-point scale.

Most respondents thought that the dismissal of spring 2020 teaching evaluations or forgoing annual faculty evaluations would not be effective policies in mitigating the negative impacts of the COVID-19 pandemic on their academic activities (Appendix S3: Table S3). Online teaching support, and relaxed expectations on publications, service, and outreach, engagement, and extension were thought to be effective policies, and so was an acknowledgement of “no business as usual” by administrators. A widely used policy that allows for a pause in the tenure and promotion clock (Htun 2020) was thought to be moderately or very effective by 62.4% of respondents to whom this policy applies (Appendix S3: Table S3). Specifically, at the assistant professor rank, 68.2% of respondents thought this policy would be slightly, moderately, or very effective in mitigating the

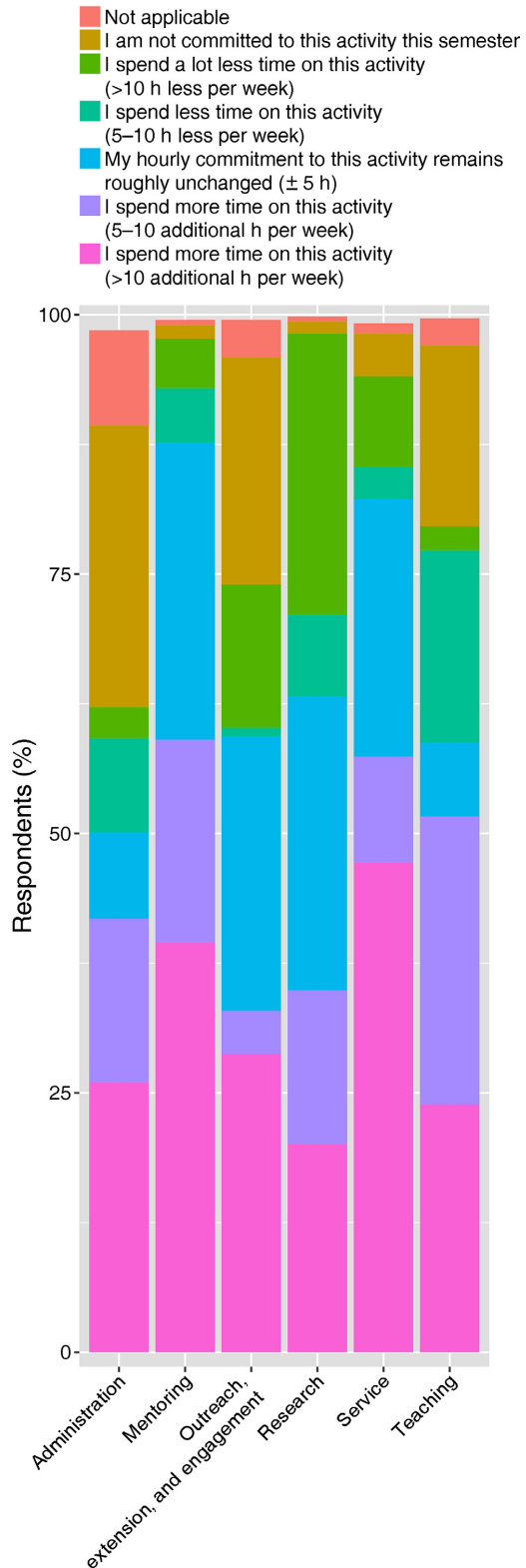


FIG. 3. Shifts in time allocation to different academic activities by faculty in response to the COVID-19 pandemic. Results are presented as percentages of respondents across a five-point scale.

negative impacts of the pandemic on their academic activities (Appendix S3: Table S3). Perception of this policy did not differ by gender ($\chi^2 = 3.026$, $df = 5$, $P = 0.696$).

An open-ended option allowed for additional insight into potentially effective policies that were either already in place during the pandemic or could be developed from the perspective of our respondents. Twenty-six such policy ideas were offered, among which the most frequently mentioned idea (seven times; 27%) was providing gap or emergency funding to support graduate students and other research project personnel to complete impacted projects. We also offered an open-ended comment box for respondents who wanted to share additional insights. One-third of the respondents ($n = 206$) offered various comments, ranging in length from single sentences to long essays. Themes emerged from these qualitative data suggest that many of our respondents were struggling with childcare-related challenges ($n = 35$), and worried about uncertainties and long-term impacts on research due to a variety of reasons (e.g., halt of international projects, loss of multiple field seasons, loss of data collection opportunities; $n = 26$).

The following quotes express these concerns: “I am expected to provide full-time assistant professor activities at the same time as full-time child care and full-time schooling. Every time I hear a colleague talk about getting another paper or grant submitted because they have so much time during the stay-at-home, I feel frustrated, because my reality is that I can only take care of mentoring my students and very little else from home given my family responsibilities.” “In fields like mine, the productivity hit to research output will not necessarily be felt in 2020, but will cascade into 2021 and 2022. [...] I haven’t seen any recognition in any policies that the effects of this might span several years.”

A number of respondents also commented on the positive impact of the pandemic on their academic activities (e.g., more writing time, one-on-one mentoring of graduate students, effective teaching; $n = 17$): “I am a man with no children and very supportive spouse, we have been more productive than ever in submitting peer-reviewed papers, I expect a bump in the number [...]” However, most of these respondents acknowledge that such positive impacts may be short-lived, as lab members run out of data to analyze and write about, and are unable to collect new data due to restrictions on lab work and/or fieldwork activities: “[...] All of the things I used to hope to get done during 1–2 week academic breaks are finally seeing the light of day. However, there is absolutely no generation of new data. . . I am working much more on research activities (>10 h/week more) and I expect to see a spike in 2020–2021 research publications, but a huge gap in 2022 publications as I won’t have data from this year to carry forward.” The very large majority of comments received were deeply insightful, with the exception of a handful, such as this one: “Suck it up, cupcake. We are all in the same boat, so

what’s the big deal?” Although we are all in this together, we are clearly not all equally impacted by the COVID-19 pandemic.

Survey respondents were asked to provide a physical and mental health self-assessment. An overwhelmingly large proportion of respondents acknowledge that the pandemic had made them more stressed and anxious about their own health and well-being, that of those who live with them, as well as family and friends they do not live with (Appendix S3: Table S4). The respondent’s state of stress and anxiety was not statistically different by gender ($\chi^2 = 7.248 \times 10^{-33}$, $df = 4$, $P = 1$ regarding their own health; $\chi^2 = 2.821 \times 10^{-32}$, $df = 4$, $P = 1$ for those living with them), and was similar when comparing those who had to care for dependents vs. those who did not ($\chi^2 = 0.006$, $df = 4$, $P = 1$ regarding their own health; $\chi^2 = 0.025$, $df = 4$, $P = 0.999$ for those living with them).

DISCUSSION

Our results indicate that the COVID-19 pandemic has been perceived to have substantial negative impacts on all academic activities. We highlight that academic rank, gender, care-giving roles, and working arrangements all played a significant role in explaining work–life balance satisfaction. Specifically, assistant professors, females, care-givers of children and teenagers, and those who did not have access to a private workspace were significantly more dissatisfied with their work–life balance during the COVID-19 pandemic when compared to their counterparts.

Our quantitative assessment supports claims that early-career assistant professors, not just Ph.D. students and post-doctoral fellows (Paula 2020), are more negatively impacted by the pandemic than those with tenure (Maas et al. 2020). Our results further suggest that female scientists, especially those with young children and teenagers at home, were less likely to maintain productive careers during the pandemic (Kramer 2020), as they have to assume care-giving roles on top of professional duties (Maas et al. 2020, Myers et al. 2020). The majority of assistant professors, men included, indicated that a pause in the tenure and promotion clock would be effective in mitigating the negative impacts of the pandemic on their academic activities, while one-fifth of assistant professors did not agree (19.2%). One-size-fits-all policies can inadvertently increase preexisting inequalities (Antecol et al. 2020, Myers et al. 2020), and could substantially reduce female tenure rates with respect to male tenure rates (Antecol et al. 2020). Thus, providing flexible tenure policies (e.g., selecting top productive years for tenure decisions, allowing for qualitative assessments, providing statements detailing COVID-19 impacts on academic activities) could help alleviate such negative impacts (Htun 2020).

We identified another discrepancy between what faculty thought were most important academic activities

for their performance review and promotion decisions, namely research, and what they perceived to be important to those who evaluate them (i.e., research, teaching, and mentoring). This supports previous research (Robert and Carlsen 2017) and suggests ecologists and evolutionary biologists in R1 institutions perceive research as most important, although they believe their supervisors value it as much as teaching and mentoring, highlighting a potential mismatch between role statements and expectations. This finding should be considered when drafting future performance reviews and promotion policies during the COVID-19 pandemic and thereafter. Specific to the field of ecology and evolutionary biology, most faculty expected the negative impacts of the pandemic on lab work and fieldwork activities to be long lived, with impacts on productivity driven by the lack of ability to collect or generate new data via fieldwork and/or lab work. This is currently impacting graduate students, postdoctoral fellows, and faculty's own professional future, yet has barely been recognized (Inouye et al. 2020, Paula 2020).

An acknowledgement by university administrators of the negative impacts of COVID-19 on females, especially pre-tenured faculty, who also serve as parents or guardians of minors, could reduce the anxiety that this group is experiencing in maintaining their work-life balance. University administrators face the challenging task of coordinating and balancing policies that boost student enrollment (e.g., in-person teaching; Smalley 2020), with policies that support the well-being and productivity of their students and employees. Communication between administrators and faculty exists, but decisions related to COVID-19 seem to result in unilateral, top-down policies. For example, some universities are requiring freshman courses to be taught in person by faculty who may not feel safe doing so, yet have to, unless they can provide medical proof that they belong to a COVID-19 "at-risk" category. Faculty should be a larger part of university decision-making processes. For example, universities could conduct internal surveys among their faculty, and build diverse task forces that represent those demographics we identified as being disproportionately affected by the COVID-19 pandemic, as well as other dimensions of diversity, to be better informed of faculty circumstances and needs during these unprecedented times.

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serve as a manifesto to what our community is currently experiencing.

LITERATURE CITED

- Alon, T. M., M. Doepke, J. Olmstead-Rumsey, and M. Tertilt. 2020. The impact of COVID-19 on gender equality (No. w26947). National Bureau of Economic Research.
- Antecol, H., K. Bedard, and J. Stearns. 2020. Equal but inequitable: Who benefits from gender-neutral tenure clock stopping policies? *American Economic Review* 108:2420–2441.
- Damschen, E. I., K. M. Rosenfeld, M. Wyer, D. Murphy-Medley, T. R. Wentworth, and N. M. Haddad. 2005. Visibility matters: increasing knowledge of women's contributions to ecology. *Frontiers in Ecology and the Environment* 3:212–219.
- Dowd, J. B., L. Andriano, D. M. Brazel, V. Rotondi, P. Block, X. Ding, Y. Liu, and M. C. Mills. 2020. Demographic science aids in understanding the spread and fatality rates of COVID-19. *Proceedings of the National Academy of Sciences USA* 117:9696–9698.
- Htun, M. 2020. Tenure and promotion after the pandemic. *Science* 368:1075.
- Inouye, D. W., N. Underwood, B. D. Inouye, and R. E. Irwin. 2020. Support early-career field researchers. *Science* 368:724.
- Jimenez, M. F., T. M. Laverty, S. P. Bombaci, K. Wilkins, D. E. Bennett, and L. Pejchar. 2019. Underrepresented faculty play a disproportionate role in advancing diversity and inclusion. *Nature Ecology and Evolution* 3:1030–1033.
- Kahn, J. R., J. Garcia-Mangano, and S. M. Bianchi. 2014. The motherhood penalty at midlife: Long-term effects of children on women's careers. *Journal of Marriage and Family* 76:56–72.
- Kramer, J. 2020. The virus moved female faculty to the brink. Will universities help? *The New York Times*, October 6.
- Maas, B., Grogan, K. E., Chirango, Y., Harris, N., Liévano-Latorre, L. F., McGuire, K. L., Moore, A. C., Ocampo-Ariza, C., Palta, M. M., Perfecto, I., Primack, R. B. 2020. Academic leaders must support inclusive scientific communities during COVID-19. *Nature Ecology & Evolution* 4:997–998.
- Martin, L. J. 2012. Where are the women in ecology? *Frontiers in Ecology and the Environment* 10:177–178.
- McGuire, K. L., R. B. Primack, and E. C. Losos. 2012. Dramatic improvements and persistent challenges for women ecologists. *BioScience* 62:189–196.
- McKibbin, W. J., and R. Fernando. 2020. The global macroeconomic impacts of COVID-19: Seven scenarios. Centre for Applied Macroeconomic Analysis Working Paper Series, Volume 19. Crawford School of Public Policy, Australian National University, Canberra, Australia.
- Myers, K. R., W. Y. Tham, Y. Yin, N. Cohodes, J. G. Thursby, M. C. Thursby, P. Schiffer, J. T. Walsh, K. R. Lakhani, and D. Wang. 2020. Unequal effects of the COVID-19 pandemic on scientists. *Nature Human Behavior* 4:880–883.
- O'Brien, L. T., H. L. Bart, and D. M. Garcia. 2020. Why are there so few ethnic minorities in ecology and evolutionary biology? Challenges to inclusion and the role of sense of belonging. *Social Psychology of Education*:1–29.
- O'Dea, R. E., M. Lagisz, M. D. Jennions, and S. Nakagawa. 2018. Gender differences in individual variation in academic grades fail to fit expected patterns for STEM. *Nature Communications* 9:1–8.
- Paula, J. R. 2020. Lockdowns due to COVID-19 threaten PhD students' and early-career researchers' careers. *Nature Ecology and Evolution* 4:999.

- Robert, J., and W. S. Carlsen. 2017. Teaching and research at a large university: Case studies of science professors. *Journal of Research in Science Teaching* 54:937–960.
- Smalley, A. 2020. Higher education responses to coronavirus (COVID-19). In National Conference of State Legislatures. <https://www.ncsl.org/research/education/higher-education-responses-to-coronavirus-covid-19.aspx>
- Staniscuaski, F., et al. 2020. Impact of COVID-19 on academic mothers. *Science* 368:724.
- The Chronicle of Higher Education. 2010. Doctoral programs by the numbers. <https://www.chronicle.com/article/NRC-Rankings-Overview-Ecology/124723>
- Tullis, T., and B. Albert. 2013. Self-reported metrics. Pages 121–161 *in* Measuring the user experience: collecting, analyzing, and presenting usability metrics. Second edition. Elsevier, Waltham, Massachusetts, USA.
- Van Bavel, J. J., Baicker, K., Boggio, P. S., Capraro, V., Cichocka, A., Cikara, M., Crockett, M. J., Crum, A. J., Douglas, K. M., Druckman, J. N., and Drury, J. 2020. Using social and behavioural science to support COVID-19 pandemic response. *Nature Human Behaviour*:1–12.
- World Health Organization. 2020a. Director-General's opening remarks at the media briefing on COVID-19 – 11. <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>
- World Health Organization. 2020b. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>

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