

# What Peer-review Experiences Can Offer To Early Career Scientists And To The Scientific Community

Gwenaëlle Gremion<sup>1,2,✉</sup>, Mathieu Casado<sup>3</sup>, Kelsey Aho<sup>2,4</sup>, Jilda Alicia Caccavo<sup>2,5,6,7</sup>, Nicolas Champollion<sup>2,8</sup>, Emily Choy<sup>2,9</sup>, Sarah L. Connors<sup>10</sup>, Rahul Dey<sup>2,11</sup>, Alfonso Fernández<sup>2,12</sup>, Gerlis Fugmann<sup>2,3</sup>, Juan Höfer<sup>2,13</sup>, Shridhar Jawak<sup>2,14</sup>, Martine Lizotte<sup>2,15</sup>, Sarah Maes<sup>2,16</sup>, Kyle Mayers<sup>2,17</sup>, Katja Mintenbeck<sup>18</sup>, Jhon Fredy Mojica<sup>2,19</sup>, Prashant Pandit<sup>2,20</sup>, Elvira Poloczanska<sup>18</sup>, Paul Rosenbaum<sup>2,21</sup>, Elisa Seyboth<sup>2,22</sup>, Sarah Shakil<sup>2,23</sup>, Maud van Soest<sup>2,24</sup>

<sup>1</sup> Institut des Sciences de la Mer, Université du Québec à Rimouski, Rimouski, G5L3A1, Canada;

<sup>2</sup> Association of Polar Early Career Scientists (APECS), D-14473, Germany;

<sup>3</sup> Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Germany;

<sup>4</sup> International Arctic Research Center, University of Alaska Fairbanks, Fairbanks, Alaska 99775-7340, USA;

<sup>5</sup> Alfred Wegener Institute, Bremerhaven, D-27570, Germany;

<sup>6</sup> Berlin Center for Genomics in Biodiversity Research, D-14195, Germany;

<sup>7</sup> Leibniz Institute for Zoo and Wildlife Research, Berlin, D-10315, Germany;

<sup>8</sup> Université Grenoble Alpes, Institut des Géosciences de l'Environnement, Saint-Martin d'Hères 38400, Grenoble, France;

<sup>9</sup> McGill University, 21111 Lakeshore Road, Ste. Anne de Bellevue, Quebec, Canada H9X 3V9;

<sup>10</sup> Université Paris-Saclay, 91190 Saint Aubin, France;

<sup>11</sup> National Centre for Polar and Ocean Research, Goa, India;

<sup>12</sup> Department of Geography, Universidad de Concepción, Chile;

<sup>13</sup> Escuela de Ciencias del Mar, Pontificia Universidad Católica de Valparaíso, Valparaíso, Chile;

<sup>14</sup> Svalbard Integrated Arctic Earth Observing System (SIOS), Svalbard Forskningspark, P.O. Box 156, N-9171 Longyearbyen, Norway;

<sup>15</sup> Department of Biology, Université Laval, Québec, Québec G1V 0A6;

<sup>16</sup> KU Leuven, 3000 Leuven, Belgium;

<sup>17</sup> NORCE Norwegian Research Centre AS, Nygårdsgaten 112, 5006, Bergen, Norway;

<sup>18</sup> Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Am Handelshafen 12, 27570 Bremerhaven, Germany;

<sup>19</sup> Center for global Sea Level Change (CSLC), New York University Abu Dhabi (NYUAD), Abu Dhabi, UAE;

<sup>20</sup> TERI University, New Delhi, India;

<sup>21</sup> Department of Business Studies, Uppsala University, Uppsala, 75120, Sweden;

<sup>22</sup> Centre for Sustainable Oceans, Faculty of Applied Sciences, Cape Peninsula University of Technology, Cape Town 8000, South Africa;

<sup>23</sup> Department of Biological Sciences, University of Alberta, Edmonton, AB, T6G 2E9, Canada;

<sup>24</sup> Geography and Environment, Loughborough University, Loughborough, LE11 3TU, UK

✉ [gwenaelle.gremion@gmail.com](mailto:gwenaelle.gremion@gmail.com)

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In Memoriam:

This work is dedicated to the memory of our friend and colleague Adrian Dahood-Fritz.

## 1. Motivations

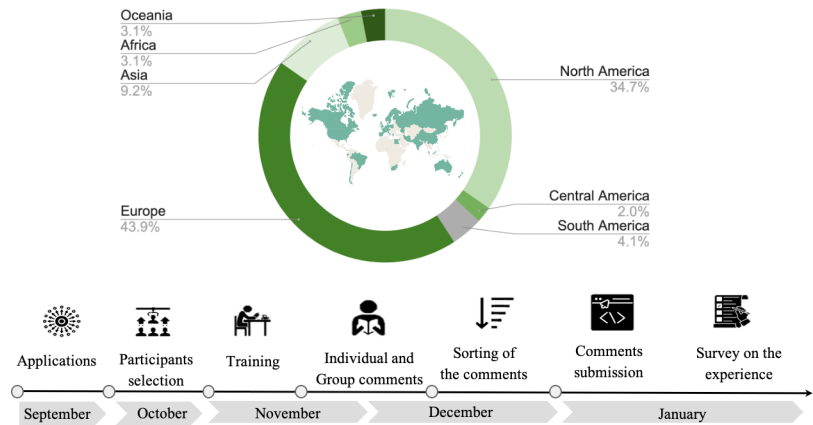
The primary goal of science is the improvement of true and secure knowledge (Bornmann, 2011). Through peer-review, scientific work in many disciplines is assessed through high-quality evaluation ensuring the advancement of scientific knowledge (Bornmann, 2011). The volume of submissions to journals is likely to rise in the years to come due to the phenomenon of “publish or perish” (e.g., Clapham, 2005) and the advent of citation metrics (e.g., Dehon, McCathie and Verardi, 2009; Golden and Schultz, 2012). Therefore, the pressure for peer-reviewing requirements will likely continue to rise. Unfortunately, the availability of qualified referees is often hampered by high workloads of researchers and the necessity for them to produce their own publications, potentially leaving the bulk of reviews to a handful of experts (Rodríguez-Bravo, et al., 2017). In this context, increasing the number of available reviewers would not only be beneficial to the scientific community, but it would also represent an essential step towards the sustainability of the peer-review process (Golden and

Schultz, 2012). Early-Career Scientists (ECSs) could take on a greater share of such reviewing processes. Peer-review opportunities can serve as formative experiences for ECSs that could improve their future submissions (Golden and Schultz, 2012), improve their writing skills, and help them build a reputation (Rodríguez-Bravo, et al., 2017).

## 2. Objectives

The Association of Polar Early Career Scientists (APECS) aimed to demonstrate that the involvement of ECSs in peer-review is not only a crucial catalyst for their careers but also represents a critical contribution to the scientific community in general. APECS, in association with the Intergovernmental Panel on Climate Change (IPCC), used the Second Order Draft (SOD) of the Special Report on the Ocean and Cryosphere (SROCC) as a platform to answer the question: “How motivated and efficient are ECSs in peer-review activities?”. We show that, notwithstanding their academic level, ECSs in this study were competent and motivated in their refereeing activities.

Figure 1: International representation of the selected participants. Countries represented through our participants' institutions appear in green in the World map. A schematic timeline from September to January represents the numerous activities related to the group review.



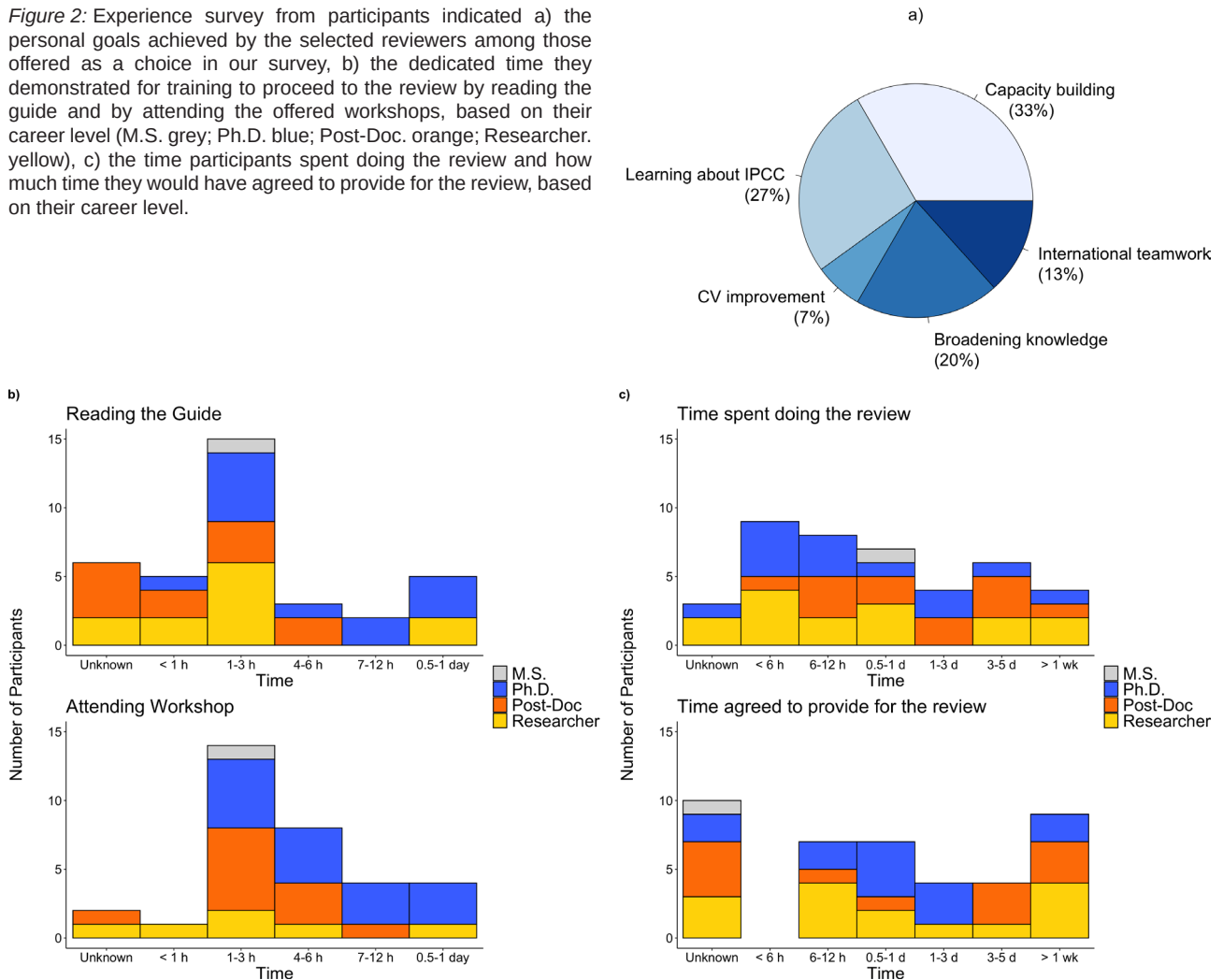
### 3. Methods

Based on the previous group review of the First Order Draft (FOD) of the Special Report described in Casado, et al. (2020), a team of 19 council members of APECS chaired the group review of the SOD-SROCC. Chairing activities involved (a) the review of the 201 applications received, (b) the selection of 99 participants, (c) the assignment of chapter sections to the participants, (d) the reviewing and sorting of submitted comments (e.g. finding duplicates and categorizing the comments) and (e) the synthesis of comments into a global review submitted by APECS to the IPCC (Fig. 1). The reviewed comments were sorted into three categories: major, minor, and unfit for submission. 'Major' comments related to scientific content corrections, suggestions for new references, and incoherencies (i.e. substantial). 'Minor' comments encompassed rephrasing and modifications to references. 'Unfit for submission' comments included typos and editorial corrections, duplicates, as well as inappropriate comments defined as unfit for submission; these were not forwarded to the IPCC. Overall, as the evaluation of the comments was conducted by the chairs themselves, and not by an independent panel of experts, we cannot provide an objective evaluation of the quality of comments, and thus limit ourselves to classifying them as the major, minor or unfit. As a result, when we describe the performances in the review process of the participants from different career levels, we only evaluate their efficiency, which we define as the ability to produce a large number of preferentially major comments in a below-average amount of time. Through this opportunity, APECS aimed to offer ECSs the possibility to review chapters and sections of the Special Report that best related to their interests and expertise. ECSs are defined in this project as students (i.e., B.Sc., M.S., or Ph.D.), or early career professionals (ECPs, i.e. Post-Doc researchers, researchers in faculty-level positions for less than 5 years or non-faculty members). The

main selection criteria were: motivation, experience, and relevance of the application. A numerus clausus was set up by the chairs based on their availability to efficiently supervise the participants' workload. Then, the final selection was made to allow an equitable distribution of participants by country of residence, and amongst students and ECPs. The selected participants included 36 students and 56 ECPs. The participants were affiliated with non-governmental and governmental organizations from 26 countries (Fig. 1).

A guide explaining the objectives, timeline, and organizational information was created by the project leaders from APECS in association with members of the IPCC Technical Support Unit and representatives from the two Working Groups (WGs) providing scientific leadership to the Special Report (WGI: The Physical Science Basis and WGII: Impacts, Adaptation, and Vulnerability). The guide is included in the supplementary material. In addition, two training webinars were organized to allow discussion between participants and report authors as an introduction to the IPCC goals and mission, the use of the IPCC uncertainty language, as well as an overview of what entailed a constructive review and useful comments. These webinars and the related documentation are included in the supplementary materials as well. Methods for the individual review were, for the most part, similar to those described by Casado, et al. (2020). However, due to prior knowledge of the contents of the Special Report after the FOD, chairs of the SOD were able to allocate specific chapter subsections to participants as a function of their interests and expertise. Moreover, participants were invited, without obligation, to read the entire chapter and provide a synoptic critique. After the submission of the 1083 comments, participants were surveyed on their experience of the review process.

Figure 2: Experience survey from participants indicated a) the personal goals achieved by the selected reviewers among those offered as a choice in our survey, b) the dedicated time they demonstrated for training to proceed to the review by reading the guide and by attending the offered workshops, based on their career level (M.S. grey; Ph.D. blue; Post-Doc. orange; Researcher. yellow), c) the time participants spent doing the review and how much time they would have agreed to provide for the review, based on their career level.



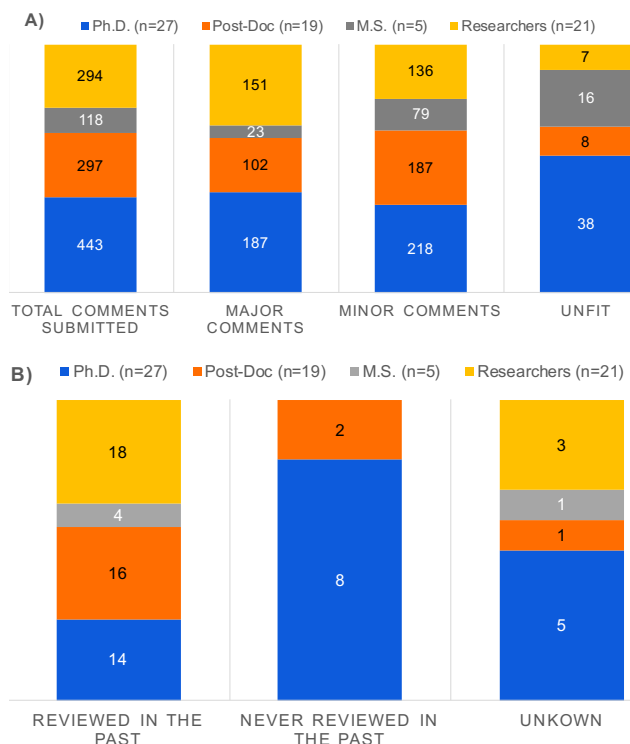
## 4. Results

Among the 118 reviewers (i.e. participants and chairs), 41 completed the survey representing a 35% rate of participation. The survey demonstrated that the main goals driving the involvement of ECSs in the review were related to capacity building (35%), the opportunity to expand their literature knowledge (22%), the opportunity for international collaboration (20%), and the desire to gain a better understanding of the structure and role of the IPCC (14%) (Fig. 2a). Distribution charts presented in Figure 2b show that most ECSs dedicated between 1 to 3 h towards preparation on the training guide and webinars before the beginning of the review process. The difference in the amount of time dedicated to preparation by students and early career professionals was not significant neither for the time spent reviewing the guide (chi-squared = 3.101, p-value = 0.3763) nor for the time spent watching the workshops (chi-squared = 6.9272, p-value = 0.07426) (see methods in Casado et al, 2020). ECSs were willing to dedicate more time than they actually needed to proceed with the review (Fig. 2c). Again, no significant difference was found between students and professionals regarding the

required time to complete the review (chi-squared = 1.7314, p-value = 0.63). Overall, Ph.D. students provided more comments than their more senior peers (16.4 comments per participant on average for the Ph.D. students, versus 15.6 and 14.0 for Post-Docs and Researchers, respectively), and more minor comments as compared to major ones (218 vs. 187, for the Ph.D. students, which is larger than the Researchers, but smaller than the Post-Docs). Overall, there are no significant differences between the relative number of major comments (chi-squared = 1.3421, p-value = 0.2467), minor comments (chi-squared = 0.7393, p-value = 0.3899) and unfit comments (chi-squared = 1.1427, p-value = 0.2851) between the different career levels (Fig. 3a). Previous review experience of our participants indicates that the majority of individuals in each category had already taken part in review activities prior to this opportunity (Fig. 3b.).

## 5. Conclusions and perspectives

Following on previous work described by Casado, et al. (2020), results from this study support the idea that ECSs are dedicated and efficient in reviewing activities regardless of their academic level. The



**Figure 3:** a) Distribution of submitted comments as a function of the participants' position and the quality of submitted comments for each participants' position based on the classification (major comments, minor comments and unfit for submission) of Casado, et al. (2020); b) the review experience of participants depending on their position.

varied review experience of the participants (by career level category), combined with the fact, that the same training was provided to all participants, helps to reduce biases in our results. The quality of comments received from our group was acknowledged by SROCCs authors (Derksen C. and Harper S., Pers. Comm.). As of yet, however, ECS inclusion in the reviewing arena remains marginal and often “ghosted” under the name of their immediate supervisors (MacDowell, 2018). With a mean 2.6 % annual growth in the volume of peer-reviewed articles since 2013 (Publons, 2018), the pressure for scholarly review procedures is intensifying. As it stands, the scientific publishing system and the expansion of a trusted corpus of research literature heavily relies on the scrutiny and critical examination by a limited number of benevolent gatekeepers (Spier, 2002), with 10 % of reviewers being responsible for 50% of all peer-review records (Publons, 2018). There is thus a strategic imperative to transform the peer-review landscape. The shift required to ensure the sustainability of the peer-review process requires the exploration of new approaches and a willingness to tap into a larger and more diversified array of expertise. Findings from the current study advocate for the increased involvement and recognition of ECSs in refereeing activities as submissions and publication outputs continue to rise. Ensuring the quality and integrity of ECS reviews

can be explored through a number of ways: (1) participation in group reviews, as is shown in this study and in Casado et al. (2020); (2) exploiting resources such as the Review Quality Instrument that establishes a baseline metric to assess the caliber of a review (van Rooyen, et al., 1999); (3) avoiding ghostwriting practices and instead encouraging senior researchers and editors to recognize co-authored reviews by ECSs (this is the focus of projects such as #ECRPeer-Review driven by Future of Research (FoR, Publons, 2018)). The benefits of these approaches are twofold. First and simply put, they alleviate a great deal of the pressure imposed on the global scientific community. Second, these approaches promote capacity-building in ECS by allowing them to keep up-to-date with the latest research trends in their field, to develop their reputation and further their career progression, to improve their own writing skills, and to build relationships with editors and journals. In the current context of rapid climate change and the continued need to develop a meaningful dialogue between knowledge holders, stakeholders, and policymakers (Cortner, 2000), the engagement of well-prepared and proficient ECSs represents an astute investment. The opportunity provided here by the IPCC and APECS is a step forward in the right direction, facilitating the sustainability of the critical reviews of the scientific basis of human-induced climate change risks and the enhancement of sound recommendations for mitigation strategies (Geden, 2015).

## 6. Supplementary material

Supplementary material to this article can be found online at <https://doi.org/10.2312/yes19.15>.

## 7. References

- Bornmann, L., 2011. Scientific peer review. *Annual Review of Information Science and Technology* 45, 197–245. <https://doi.org/10.1002/aris.2011.1440450112>.
- Casado, M., Gremion, G., Rosenbaum, P., Caccavo, J. A., Aho, K., Champollion, N., Connors, S. L., Dahood, A., Fernandez, A., Lizotte, M., Mintenbeck, K., Poloczanska, E., and Fugmann, G., 2020. The benefits to climate science of including early-career scientists as reviewers. *Geoscience Communication* 3, 89–97. <https://doi.org/10.5194/gc-3-89-2020>.
- Clapham, P., 2005. Publish or perish. *BioScience* 55, 390–391. [https://doi.org/10.1641/0006-3568\(2005\)055\[0390:POP\]2.0.CO;2](https://doi.org/10.1641/0006-3568(2005)055[0390:POP]2.0.CO;2).
- Cortner, H. J., 2000. Making science relevant to environmental policy. *Environmental Science & Policy* 3, 21–30. [https://doi.org/10.1016/S1462-9011\(99\)00042-8](https://doi.org/10.1016/S1462-9011(99)00042-8).
- Dehon, C., McCathie, A., & Verardi, V., 2009. Uncovering excellence in academic rankings: A closer look at the Shanghai ranking. *Scientometrics* 83, 515–524. <https://doi.org/10.1007/s11192-009-0076-0>.
- Geden, O., 2015. Climate advisers must maintain integrity. *Nature* 521, 27–28. <https://doi.org/10.1038/521027a>.
- Golden, M., & Schultz, D. M., 2012. Quantifying the volunteer effort of scientific peer-reviewing. *Bulletin of the American Meteorological Society* 93, 337–345.

<https://doi.org/10.1175/BAMS-D-11-00129.1>.

MacDowell, G., 2018. Recognizing the role of Early Career Researchers in Peer Review. [blog] 13 December 2019. Available at: <https://publons.com/blog/recognizing-the-role-of-early-career-researchers-in-peer-review/>

Publons, 2018. Global State of Peer Review, Web of Science Group. <https://doi.org/10.14322/publons.GSPR2018>.

Rodríguez-Bravo, B., Nicholas, D., Herman, E., Boukacem-Zeghmouri, C., Watkinson, A., Xu, J., ... & Świgoń, M., 2017. Peer review: The experience and views of early career research-

ers. *Learned Publishing* 30, 269–277. <https://doi.org/10.1002/leap.1111>.

Spier, R., 2002. The history of the peer-review process. *Trends in Biotechnology* 20, 357–358. [https://doi.org/10.1016/s0167-7799\(02\)01985-6](https://doi.org/10.1016/s0167-7799(02)01985-6).

Van Rooyen, S., Black, N., Godlee, F., 1999. Development of the review quality instrument (RQI) for assessing peer reviews of manuscripts. *Journal of Clinical Epidemiology* 52, 625–629. [https://doi.org/10.1016/s0895-4356\(99\)00047-5](https://doi.org/10.1016/s0895-4356(99)00047-5).