

WP7, D7.3, D34 Public minutes of gender balance debates in glaciology and microbiology

Project Number:	101072761
Project name:	Center for Glacial Biome Doctoral Network
Project Acronym:	ICEBIO
Call:	HORIZON-MSCA-2021-DN-01
Topic:	HORIZON-MSCA-2021-DN-01-01
Type of Action:	HORIZON-TMA-MSCA-DN
Project Start Date:	1 October 2022
Project Duration:	48 months
Deliverable Title:	Public minutes of gender balance debates in glaciology and microbiology
Deliverable Number:	D7.3, D34
Type:	Document, report
Due date (month):	40
Lead Beneficiary:	AU
Dissemination Level:	PU – Public
Work Package No:	WP7
Lead Authors:	Klara Köhler, Annika Morische
Approved by:	Alexandre M. Anesio



**Funded by
the European Union**



DISCLAIMER

The ICEBIO project is funded by the European Union under the HORIZON-MSCA-2021-DN-01 program, project number 101072761. Views and opinions expressed are, however, those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

WP7, D7.3, D34 Public minutes of gender balance debates in glaciology and microbiology

Fieldwork is an important part of glaciology and (polar and alpine) microbiology. All PhD fellows within the IceBio network have conducted fieldwork, from daytrips in the European alps to several weeks to months spend in polar regions, with stays at research stations, ice camps and on research ships. Collecting our own samples in the field is often essential to pursue our research - yet we face different, often gender-specific challenges. The following report aims to raise awareness of some of them.

Gender and fieldwork

-Addressing challenges in ocean and polar fieldwork-

Report by Klara Köhler & Annika Morische

Introduction

Women face significant challenges in field science, particularly in polar, ocean and coastal research (Vila-Concejo et al., 2018). Fieldwork is essential for gathering data, developing skills, and inspiring emerging scientists. However, many women experience disproportionate barriers, including unsafe working conditions, gender stereotypes, limited opportunities for participation and harassment (Clancy et al., 2014). A lack of female role models, unsafe environments, and discriminatory assumptions about their abilities further hinder women's progress in the field (Vila-Concejo et al., 2018). In ocean-going research, the situation is exacerbated by gender-insensitive ship designs, cultural biases, and the difficulty of balancing family care with long absences at sea (Ojwala et al., 2022). Despite increased awareness, women remain underrepresented in senior roles in STEM, reflecting deeper issues of gender inequality. These challenges reveal the urgent need to rework societal narratives about gender in science and fieldwork (Ojwala et al., 2022; Vila-Concejo et al., 2018). Science must be seen as inclusive, and the outdated view of field science as a male domain needs to be dismantled for true gender equity.

This report uses the term female researchers and women to refer to all persons who identify as women. The section "Period in the field" refers to all menstruating persons. It is important to note that the issues discussed in the following are not exclusive to women but are often a problem for the entire LGBTQIA+ community.

Reworking the Narrative of Gender in Field Science

Stereotypes about women in science and fieldwork emerge from deep-rooted societal norms that view men as more suited for physically demanding or adventurous tasks (Vila-Concejo et al., 2018). These narratives shape perceptions of women's abilities and often lead to gender-biased expectations that women are too "emotional" or "weak" for fieldwork roles (Clancy et al., 2014; Vila-Concejo et al., 2018). Stereotypes pose the risk of reinforcing exclusion and limit opportunities by positioning emotions and physicality as disadvantages, rather than as strengths (McGuire et al., 2020; McKinnon & O'Connell, 2020). Narratives conveyed to and about women significantly shape perceptions of their competencies and professional identities from childhood on (Mulvey & Irvin, 2018). In male-dominated fields such as STEM, these

narratives often reinforce gender stereotypes that associate technical aptitude, rationality, and leadership with masculinity, while depicting women as less suitable for cognitively demanding or technical tasks. Such assumptions contribute to subtle yet persistent mechanisms of exclusion, including biased hiring decisions, differential task allocation, and reduced access to advancement opportunities (Cheryan et al., 2017; Mulvey & Irvin, 2018). Female STEM professionals are often stereotyped negatively with assertive behavior more likely to be interpreted as excessive dominance or emotionality (Heilman, 2012; McKinnon & O'Connell, 2020). These and similar stereotypes can create additional obstacles, making women feel vulnerable and discouraged from fully engaging in public communication, which is crucial for career progression (McKinnon & O'Connell, 2020). Therefore, stereotypes pose, especially for women in field research, pose as barriers hindering participation and advancement of female professional by reinforcing outdated views about women's skills in the workplace (Clancy et al., 2014). Fieldwork-based professional environments are particularly prone to reproducing exclusionary practices. In contexts where collaboration, leadership, and resilience are highly valued, gendered perceptions of "weakness" or "unsuitability" can limit access to mentorship and professional networks, thereby reinforcing structural inequality (Vila-Concejo et al., 2018). Changing these narratives is key to dismantling biases and fostering inclusivity.

In turn, Women now receive nearly half of all PhDs in oceanography worldwide, with the proportion of women in some programs ranging from 38% to 65% at the master's level and 40% to 60% at the PhD level (Legg et al., 2023). However, the number of women in higher academic positions significantly decreases (Ranganathan et al., 2021). In 2020, only 22% of full professors in oceanography were women (Legg et al., 2023). These statistics indicate long-standing structural barriers that limit women's career advancement relative to their male counterparts, reinforced by hierarchical structures that reward norms and behaviors traditionally associated with masculinity.

One contributing factor to the exclusion of women and non-binary people from advancement in scientific careers is the persistent framing of STEM as a cold, objective, and emotionless field (Michalena et al. 2020). This notion excludes expressions of gender identities deviating from the "traditional" masculine narrative. In geoscience and other field-based disciplines, researchers are often implicitly discouraged from expressing emotions such as frustration or sadness, reinforcing the notion that "there is no crying in science" (Michalena et al. 2020). When they do express emotions, they are more likely to be perceived as overly sensitive or intense, further marginalizing them (Strauss et al. 2020). The rigid separation between objectivity and emotion reinforces a narrow view of research that disadvantages those who do not conform to dominant norms and undermines the contributions of all genders. This is especially true in field science, where researchers are often confined to narrow spaces, such as research vessels, for extended periods. In such environments, expectations of emotional suppression can be particularly harmful, as they reinforce norms associated with toxic masculinity that discourage emotional expression across all genders. Limits on emotional expression marginalize individuals who do not fit the stoic stereotype of the researcher, thereby reinforcing rigid and damaging norms of emotional resilience and masculinity (Mattheis et al., 2022; Wang et al., 2024). In addition, personal protective equipment (PPE) such as boots, gloves, and clothing is often ordered in men's sizes, which can be ill-fitting and unsafe for women and people deviating from the perceived gender norm. Ill-fitting PPE can limit mobility and dexterity, making it harder for women to perform essential tasks effectively. Equipment designed with male body proportions can also put women at a disadvantage (Kolegraff & Parrotta, 2023; Onyebeke et al., 2016). For example, heavy or oversized gear can increase fatigue, reduce efficiency, or pose physical risks

in demanding environments. These gender-insensitive designs, combined with structural inequalities, likely reinforce the notion that fieldwork is a male domain and perpetuate exclusion. Addressing these issues requires redesigning equipment and adopting inclusive practices that account for diverse body types and genders, fostering a safer and more equitable environment for all scientists (Kolegraff & Parrotta, 2023). Historically, women have made critical contributions to oceanography. Figures like June Pattullo, Mary Sears, and Marie Tharpe advanced the field despite being barred from sea expeditions (Legg et al., 2023; Oreskes, 2000). However, their work was often undervalued compared to their male colleagues because it did not fit the "heroic" explorer narrative that dominates field sciences. The idea of science as an adventure, where fieldwork is glorified as the ultimate form of discovery, has traditionally excluded not only women but also people of colour and individuals with disabilities (Legg et al., 2023; Marín-Spiotta et al., 2020). This exclusionary narrative continues to hinder progress towards gender equity by privileging masculine-coded qualities like physical resilience over intellectual or collaborative contributions (Legg et al., 2023; Marín-Spiotta et al., 2020).

Period in the Field

To this day, coping with menstruation remains a topic that is not given much attention in fieldwork. Until the 1970s, female applicants for Antarctic fieldwork were turned down by the British Antarctic Survey (BAS) with the justification that there were simply no "ladies' facilities in Antarctica" (Seag, 2017). Despite the increasing number of female participants in expeditions, the logistics and infrastructure for field work are still male-centered, as we have already described with regard to the problem of unsuitable PPE. Field teams often lack access to private, hygienic toilet facilities, and there is minimal consideration of menstruation management. Already in the preparation phase, expeditioners are not typically briefed on how to handle menstruation during remote fieldwork (Nash et al., 2019; Nash, 2023). This neglect has been termed "subtle sexism," as it normalizes the neglect and exclusion of menstruation from fieldwork logistics. The lack of adequate toilet facilities directly impacts the feasibility of dealing with menstruation and urination. Women are often forced to suppress these needs in the field, a behavior that can lead to urinary tract infections and other health issues (Nash, 2023). The lack of information and ignorance of this issue in remote fieldwork logistics is even more striking as there are research and recommendations on menstruation for people working in other extreme environments, such as military or space missions (Jain and Wotring, 2016; Phillips and Wilson, 2021). In addition to the health risks posed by inadequate facilities, this problem creates conditions of vulnerability. Limited access to private spaces not only affects physical health but also increases exposure to sexual harassment, as discussed in the next section.

Improving fieldwork infrastructure to accommodate basic biological needs, such as menstruation and urination, is essential for reducing health risks and promoting gender equity. Providing adequate toileting facilities, designing schedules that account for personal needs, and briefing all expeditioners on health management are necessary steps to prevent the normalization of neglecting women's and menstruating people's biological needs.

But we can see things changing, and awareness of this issue is growing through blog posts, brochures and conference posters (e.g. Dalrymple & Lane (2024), Pickering & Khosa (2023). BAS has also changed its perspective over the last 50 years and is now one of the pioneers in promoting inclusion and diverse fieldwork, for example by introducing a hygiene manual and a polar hygiene kit (EDI BAS, 2025).

Harassment in the Field

Sexual harassment and gender-based discrimination are pervasive problems in remote fieldwork environments. Studies have consistently shown that a significant proportion of women working in field science experience harassment. The landslide survey by Clancy et al. (2014) revealed 71% of female field scientists reported experiencing harassment (inappropriate comments), and 26% reported assault (physical contact) during fieldwork. Ten years later, the numbers are still relevant for women conducting fieldwork. In a recent survey by Dance et al (2024) on the challenges for women conducting fieldwork, 79% of respondents reported negative experiences during fieldwork and 22% mentioned sexual harassment. While negative fieldwork experience also includes weather and amount of rest time, still sexism and menstruation are two of the five most common reasons named in the survey. Another issue revealed from these studies is the vulnerability and dependency on hierarchy structure of early career researchers (ECR; students, PhDs and postdocs). Clancy et al., (2014) showed that from the 71% harassed women, 84% were ECRs. Further, almost 50% of the women reported persons superior to their position within the fieldwork hierarchy as source of harassment and assaults. Another roughly 20% reported local community members as source. These numbers and the feeling they trigger among ECRs are echoed in these anonymous survey responses: *“No seeming ability to leave or address issues in the field, due to extreme remoteness and power dynamic”* (Dance et al., 2024) and *“The Aurora Australis has been nicknamed the “Love Boat”. . . There is an expectation from some males that shenanigans (sexual relations) will be entered into.”* (Nash et al., 2019).

The second comment reflects another problem in terms of harassment. Certain behavior of (mostly) men towards women is justified by the fact that when women come into extreme environments, where people work isolated for often several weeks and men just lose self-control (Nash et al., 2019). Instead of educating about the numbers from the surveys and raise awareness among male colleagues in particular, women are, for example, advised not to wear leggings on research vessels (Chelsea Harvey, 2020). While the official reason for this is safety, it still shows the sexualization of female expeditioners and their clothes.

Still, 93% of participants in the survey by Dance et al. (2024) stated that they want to continue participating in polar research despite these challenges. This number again underscore the resilience of researchers, especially women, who are aware of the problems but do not allow this to dampen them. However, the statistic from these surveys also emphasizes, as already shown in the section about narratives, that institutional change is necessary.

Strategies for Improvement

Addressing gender inequities in polar fieldwork requires a multifaceted approach that includes improving institutional policies, increasing female representation in leadership roles, and providing training on harassment and respectful behavior. Dance et al (2024) already suggest important elements to achieve a safe and good field experience for all. One of the most critical steps is ensuring that harassment is treated as seriously as research misconduct or safety violations. Institutional reporting mechanisms must be accessible, transparent, and fast, designed to avoid re-traumatizing victims while holding perpetrators accountable (Dance et al., 2024).

Further, there is a clear need for fieldwork-specific extensions of institutional equity, diversity, and inclusion (EDI) policies (Rowan et al., 2022). Such policies would provide a consistent

baseline for gender inclusiveness across research institutions and field stations. They should include provisions for private facilities, gender-sensitive training, and pre-deployment briefings on managing menstruation and personal health. The EDI project group of the Association of Polar Early Career Scientists (APECS) already provides, among others, resources on safety, gender and LGBTQIA+ (APECS, Diversity-Equity-Inclusion).

Training programs are another essential strategy. All team members should receive comprehensive training on issues such as harassment, bullying, and violence, with a focus on ethical and respectful field conduct. APECS provides template for a Field Code of Conduct (APECS, Field Code of Conduct) for fieldwork teams and a Fieldwork Planning Handbook, published by the INTERACT research group, APECS and the University Centre in Svalbard (INTERACT, Fieldwork Planning Handbook), provides further guidance on how to consider the needs of all parties involved in the planning and execution of expeditions. The University of Leeds offers printable guides and video summaries for educating on 'Pointers for Research that is Inclusive, Diverse & Equitable for LGBTQ+ fieldworkers' (PRIDE Guidelines, <https://inclusivefieldwork.leeds.ac.uk/pride/>) and the University of Colorado Boulder build an online field safety training including aspects like a Code of Conduct and bystander intervention (ADVANCEing FieldSafety, <https://fieldsafe.colorado.edu/>).

Conclusion

To truly achieve gender equity in STEM and research areas that require field work, we must rethink not only the structures that perpetuate gender disparities but also the narratives that shape our understanding of what it means to be a scientist. Field work must be freed from the male-centered gaze. Emotions and personal expression should not be viewed as weaknesses but as essential aspects of human experience that can enrich scientific work. By reworking the gender binary and challenging the idea that science is inherently cold and emotionless, we open the door to more inclusive and diverse participation. In conclusion, the stories we tell ourselves about gender, science, and emotion need to be re-examined. Gender equity is not only about increasing the number of women in scientific fields but also about reshaping the cultural narratives that define what makes a "good" scientist. Achieving true equity means dismantling the stereotypes and structures that marginalize not just women but all non-conforming identities in science.

Note from the authors

Both authors have personal experience with ocean and polar fieldwork. All figures and data presented here are based on the cited studies. Unfortunately, we can only confirm the situation presented. Our aim is to raise awareness and advocate for a better fieldwork situation. Our hope is that already our generation of female researchers will experience an equal and safe polar and ocean fieldwork so that the focus can return to our research and the incredible places we are privileged to visit.

References

- APECS (Field Code of Conduct). Association of Polar Early Career Scientists - Field Code of Conduct. Available at: <https://www.apecs.is/diversity-equity-inclusion/field-code-of-conduct.html> (Accessed 25.01.26)
- APECS (Diversity-Equity-Inclusion). Diversity-Equity-Inclusion. Available at: <https://www.apecs.is/career-resources/diversity-equity-inclusion.html> (Accessed 25.01.26)
- Chelsea Harvey (2020). No "hot pants": Sexist rules for women on Arctic expedition. Available at: <https://subscriber.politicopro.com/article/eenews/1063713099> (Accessed 25.01.26)
- Cheryan, S., Ziegler, S. A., Montoya, A. K., & Jiang, L. (2017). Why are some STEM fields more gender balanced than others? *Psychol Bull*, 143(1), 1-35. <https://doi.org/10.1037/bul0000052>
- Clancy, K. B., Nelson, R. G., Rutherford, J. N., & Hinde, K. (2014). Survey of academic field experiences (SAFE): trainees report harassment and assault. *PLoS One*, 9(7), e102172. <https://doi.org/10.1371/journal.pone.0102172>
- Dalrymple, S., Lane, T., (09.01.2024), *Breaking the menstruation taboo to make fieldwork more inclusive*, <https://www.nature.com/articles/d41586-024-00044-5#:~:text=To%20these%20we%20add%20a,work%20in%20challenging%20field%20conditions> (Accessed 25.01.26)
- Dance, M., Duncan, R. J., Gevers, M., Honan, E. M., Runge, E., Schalamon, F. R., et al. (2024). Coming in from the cold: Addressing the challenges experienced by women conducting remote polar fieldwork. *PLOS Clim* 3, e0000393. doi: 10.1371/journal.pclm.0000393
- EDI BAS (19.09. 2025), *Breaking barriers in the ice*, <https://www.bas.ac.uk/media-post/breaking-barriers-in-the-ice-bas-creates-more-inclusive-antarctic-operations/> (Accessed 25.01.26)
- Heilman, M. E. (2012). Gender stereotypes and workplace bias. *Research in Organizational Behavior*, 32, 113-135. <https://doi.org/https://doi.org/10.1016/j.riob.2012.11.003>
- INTERACT (Fieldwork Planning Handbook). INTERACT Fieldwork Planning Handbook. INTERACT. Available at: <https://eu-interact.org/publication/interact-fieldwork-planning-handbook/> (Accessed 25.01.26)
- Jain, V., and Wotring, V. E. (2016). Medically induced amenorrhea in female astronauts. *NPJ Microgravity* 2. doi: 10.1038/npjmgrav.2016.8
- Kolegraff, S., & Parrotta, K. (2023). Safety First Means Safety Fits: A Mixed Methods Analysis of Gender and Personal Protective Equipment Feminist Hackathon (Vol. 16). <https://doi.org/10.36367/ntqr.16.2023.e790>
- Legg, S., Wang, C., Kappel, E., & Thompson, L. (2023). Gender Equity in Oceanography. *Annual review of marine science*, 15(Volume 15, 2023), 15-39. <https://doi.org/https://doi.org/10.1146/annurev-marine-032322-100357>
- Marín-Spiotta, E., Barnes, R. T., Berhe, A. A., Hastings, M. G., Mattheis, A., Schneider, B., & Williams, B. M. (2020). Hostile climates are barriers to diversifying the geosciences. *Advances in Geosciences*, 53, 117-127.
- Mattheis, A., Marín-Spiotta, E., Nandihalli, S., Schneider, B., & Barnes, R. T. (2022). "Maybe this is just not the place for me:" Gender harassment and discrimination in the geosciences. *PLoS One*, 17(5), e0268562. <https://doi.org/10.1371/journal.pone.0268562>
- McGuire, L., Mulvey, K. L., Goff, E., Irvin, M. J., Winterbottom, M., Fields, G. E., Hartstone-Rose, A., & Rutland, A. (2020). STEM gender stereotypes from early childhood through adolescence at informal science centers. *J Appl Dev Psychol*, 67, 101109. <https://doi.org/10.1016/j.appdev.2020.101109>

- McKinnon, M., & O'Connell, C. (2020). Perceptions of stereotypes applied to women who publicly communicate their STEM work. *Humanities and Social Sciences Communications*, 7(1), 160. <https://doi.org/10.1057/s41599-020-00654-0>
- Mulvey, K. L., & Irvin, M. J. (2018). Judgments and reasoning about exclusion from counter-stereotypic STEM career choices in early childhood. *Early Childhood Research Quarterly*, 44, 220-230. <https://doi.org/https://doi.org/10.1016/j.ecresq.2018.03.016>
- Nash, M. (2023). Breaking the silence around blood: managing menstruation during remote Antarctic fieldwork. *Gender, Place & Culture* 30, 1083–1103. doi:10.1080/0966369X.2022.2066635
- Nash, M., Nielsen, H. E. F., Shaw, J., King, M., Lea, M.-A., and Bax, N. (2019). “Antarctica just has this hero factor...”: Gendered barriers to Australian Antarctic research and remote fieldwork. *PLoS ONE* 14, e0209983. doi: 10.1371/journal.pone.0209983
- Ojwala, R., Mariamalia, O., Rodriguez, C., Neat, F., Kitada, M., Buckingham, S., Schofield, C., Long, R., Jarnsäter, J., & Sun, Z. (2022). The Sea Change Needed for Gender Equality in Ocean-Going Research. *Marine Technology Society Journal*, 56. <https://doi.org/10.4031/MTSJ.56.3.6>
- Onyebeke, L. C., Papazaharias, D. M., Freund, A., Dropkin, J., McCann, M., Sanchez, S. H., Hashim, D., Meyer, J. D., Lucchini, R. G., & Zuckerman, N. C. (2016). Access to properly fitting personal protective equipment for female construction workers. *Am J Ind Med*, 59(11), 1032-1040. <https://doi.org/10.1002/ajim.22624>
- Oreskes, N. (2000). "Laissez-tomber": Military Patronage and Women's Work in Mid-20th-Century Oceanography. *Historical Studies in the Physical and Biological Sciences*, 30(2), 373-392. <https://doi.org/10.2307/27757836>
- Phillips, A. K., and Wilson, C. (2021). Menstrual Practices in Operational Military Women. *Military Medicine* 186, 767–774. doi: 10.1093/milmed/usaa345
- Pickering, R., Khosa, R., (12.05.2023), *The geological period that no one talks about: menstruation in the field*, <https://blogs.egu.eu/geolog/2023/05/12/the-geological-period-that-no-one-talks-about-menstruation-in-the-field/> (Accessed 25.01.26)
- Ranganathan, M., Lalk, E., Freese, L. M., Freilich, M. A., Wilcots, J., Duffy, M. L., & Shivamoggi, R. (2021). Trends in the Representation of Women Among US Geoscience Faculty From 1999 to 2020: The Long Road Toward Gender Parity. *AGU Advances*, 2(3), e2021AV000436. <https://doi.org/https://doi.org/10.1029/2021AV000436>
- Rowan, A. V., Olund, E., Pickerill, J., and Souch, C. (2022). Incorporating Equality, Diversity and Inclusion (EDI) into field-based teaching and research fieldwork. *Copernicus Meetings*. doi: 10.5194/egusphere-egu22-8749
- Seag, M. (2017). Women need not apply: gendered institutional change in Antarctica and Outer Space. *The Polar Journal* 7, 319–335. doi: 10.1080/2154896X.2017.1373915
- Vila-Concejo, A., Gallop, S. L., Hamylton, S. M., Esteves, L. S., Bryan, K. R., Delgado-Fernandez, I., Guisado-Pintado, E., Joshi, S., da Silva, G. M., Ruiz de Alegria-Arzaburu, A., Power, H. E., Senechal, N., & Splinter, K. (2018). Steps to improve gender diversity in coastal geoscience and engineering. *Palgrave Communications*, 4(1), 103. <https://doi.org/10.1057/s41599-018-0154-0>
- Wang, L., Adams, C., Fundis, A., Hsiao, J., Machado, C., Malik, M., Quadara, R., Rodriguez, C., Soule, A., Suhre, K., Wu, L., & Elmore, A. (2024). Broadening inclusivity at sea. *Frontiers in Marine Science*, 11. <https://doi.org/10.3389/fmars.2024.1387204>