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Broadening inclusivity at sea

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Ocean sciences in the U.S. remains a field with one of the lowest rates of diversity, having disproportionately low representation from marginalized groups, including Black, Asian, LatinX, Indigenous, and other people of color; LGBTQIA + individuals; disabled persons; women; those with neurological differences; and those from low-income groups. With equity and inclusion in mind, recent efforts have been made to increase the number of ocean science professionals from marginalized groups through multiple entry points, including internships. However, there still exists a large gap between the diversity found in the general population and the diversity within ocean sciences. Perhaps one reason why this field continues to have lower diversity owes to the unique component of many oceanographic careers, which continues to present an especially high barrier for marginalized groups: participating in sea-going research expeditions. Herein, we have synthesized possible ways to prioritize the physical and emotional safety of marginalized ocean science professionals participating in a research expedition, including guidance on preparation, implementation, and providing support post-cruise. These suggestions are intended to be useful for the broader oceanographic research community to consider the safety and well-being of individuals from marginalized groups at sea, since the field of ocean sciences - like all fields - would greatly benefit from increased representation and diversity.

KEYWORDS

marine science, diversity & inclusion, ocean science, field work, oceanography

Importance of research expeditions in oceanographic career development

Careers in the ocean sciences can span a variety of focus areas, from scientific research to national security, the energy sector, supply chains, food availability, and much more. These careers are generally well-paid, and the sector is expected to grow in the US by 7% between 2020-2030 as more and more focus turns to the growing Blue Economy (Bureau of Labor Statistics, 2022). One component of many ocean science careers that differs from most other science disciplines is the necessity of sea-going expeditions - field campaigns that are frequently set on isolated vessels, far from shore. While research expeditions are often described as exciting and rewarding (e.g., LaCapra, 2018; Windom, 2019; Theising, 2021), they can also be a time of unexpected challenges, isolation, and - unfortunately - harassment and/or abuse (Harris, 2022). For those who are about to undertake their first oceanographic expedition, some resources are available to assist with personal preparation (e.g., Glessmer, 2019); however, most of these resources do not specifically address the additional struggles faced by sea-going individuals from marginalized backgrounds aboard research vessels (Ackerman et al., 2023). For the purposes of this manuscript, we are referring to ocean science professionals generally to mean those who are working at sea but who are not necessarily professional mariners nor PhD-level researchers, including hydrographers, marine biologists, marine geologists, physical oceanographers, vehicle and systems engineers, marine technicians, sea-going data scientists, and more. Our authorship represents multiple perspectives though all are currently working in the U.S., so our recommendations are likely most suitable for U.S.-based activities. We focus our guidance on research expeditions, much of which should apply across ocean domains and sectors, but note that some seagoing work (e.g., ocean shipping, offshore energy) may differ significantly.

Many efforts to diversify the ocean science field include sending students and early-career professionals to sea as part of research expeditions (e.g., Ocean Exploration Cooperative Institute (OECI), 2023; American Geophysical Union (AGU), 2023; NSF's STEMSEAS program; Ocean Exploration Trust's ONR-funded internship program). In fact, going to sea is largely considered a critical component of many ocean science careers (e.g., EnvironmentalSciences.org, 2023), with career planning information suggesting field experiences for individuals could start as early as high school (American Geosciences Institute (AGI), 2023). Broadly, undergraduate participation in fieldwork has been shown to lead to greater STEM retention and graduation rates (Beltran et al., 2020), improved understanding of theory, and acquisition of hands-on experience for future career positions (Roberts, 2020). Importantly, in one survey of students participating in a National Science Foundation Research Experience for Undergraduates (REU) program as part of a collaboration between Historically Black Colleges and Universities (HBCUs) and marine laboratories, at-sea research experience of all professional development experiences in the program, was determined to be the most important contributor to personal and professional growth (Gilligan et al., 2007). Positive experiences in the field can lead students to pursue a major or career in a related STEM field (Stokes et al., 2015; Cook et al., 2016), while negative experiences, including experiences related to racial bias, drove students away from further STEM fieldwork and careers (Park et al., 2020). Thus, the efforts to diversify the marine sciences should carefully consider factors of inclusion specifically related to experiences at sea.

Demographics of ocean science professionals

Ocean sciences suffer from a lack of diversity (National Center for Science and Engineering Statistics, 2021). Researchers from minoritized communities - BIPOC (Black, Indigenous, People of Color), as well as other protected classes on the basis of gender, sexual orientation, religion, age, disability, national origin, and other factors such as socioeconomic status - have been historically excluded and continue to be marginalized in these fields (e.g., Valenzuela-Toro and Viglino, 2021; Chen et al., 2022). The history of gender disparity in ocean sciences has been discussed previously, in part due to the fact that women were largely excluded from at-sea research expeditions until the second half of the twentieth century (Day, 1999; Thompson et al., 2011; Duncombe, 2019; Hendry et al., 2020; Legg et al., 2022). This exclusion has in part led to a lack of female representation in marine scientist positions (Kappel, 2014), geoscience faculty positions (Ranganathan et al., 2021), and senior leadership positions in marine science and conservation (Giakoumi et al., 2021). There is also a lack of racial and ethnic diversity in the ocean sciences (Roberts, 2020) at both the student and faculty level (Cook et al., 2016), particularly for women of color (Bernard and Cooperdock, 2018). These researchers often experience persistent systemic and individual bias, microaggressions, and/or exclusion (Marin-Spiotta et al., 2020; Morris, 2021; Marin-Spiotta et al., 2023), in part resulting in a "hostile obstacle course" that decreases retention throughout the ranks and by career stage (Berhe et al., 2022). These are just two examples - sexism and racism - of the many "-isms" that exist in this and many other homogeneous fields.

Efforts to diversify

In recent years, there have been numerous efforts and discussions related to promotion of diversity, equity, inclusion, and justice in STEM, including in the geosciences, oceanography, and other field sciences (e.g., Cooper & Lewis, 2017; Greene et al., 2021; Wilson et al., 2021; Barabino et al., 2023). This includes discussion regarding the general workforce (Johnson et al., 2016), federal workforce (National Science and Technology Council, 2021), academic faculty (Ormand et al., 2021), federal research funding (Chen et al., 2022), conference speaking opportunities (Ford et al., 2018), and student opportunities (Karsten, 2019; Garza, 2021), as well as discussions on promoting safety and

inclusion at institutional and program levels (Kelly and Yarincik, 2021; Ali et al., 2021). While some gains have been made in increasing the number of early career oceanographers from marginalized backgrounds, many efforts to diversify and recruit students in the ocean sciences continue to have problems with retention (Bernard and Cooperdock, 2018; Behl et al., 2021). In part, retention issues are linked to the lack of representation in faculty and leadership positions, positions of authority, which can have ripple effects on recruitment and retention of the future blue economy workforce. Mentorship from those with similar lived experiences and backgrounds (Hernandez et al., 2020; Olcott and Downen, 2020; Behl et al., 2021, Orcutt and Cetinić, 2014, Coles et al., 2011; Lozier, 2015; Aikens et al., 2017) is particularly important for students and early career researchers from minoritized backgrounds in cultivating self-efficacy and building a professional support network.

Obstacles/limitations preventing early career professionals from going on expeditions

A myriad of barriers may prevent ocean science professionals at all career stages from participating in at-sea research expeditions, including; historical exclusionary factors, lack of representation, lack of appropriate accommodations, and potentially hostile work environments, which can all contribute to hesitancy and feeling unsafe at the prospect of going to sea. One barrier that was frequently discussed during the writing of this manuscript is the personal financial costs associated with going to sea (Giles et al., 2020; Roberts, 2020). It was noted that personal protective equipment and specialty clothing is sometimes not supported by funding, leaving especially early career oceanographers with financial hardship. Additionally, some programs that do provide funding for equipment, travel, supplies or materials, or other necessary items, do so through reimbursements, which may take long periods of time to process, creating a situation unfeasible for many students, especially those from economically depressed communities. Another example of this is the potential for high cost medications, which can be excluded by insurance companies if they are requested for longer periods of time, which might be required for longer cruises. Finally, the prospect of being away from home for a longer period can also create financial and logistical hardships, especially for those from lower socioeconomic backgrounds, for paying bills at home, pets, dependent care, and more.

Additionally, lack of accommodations for researchers with disabilities (Gilley et al., 2015; Bower, 2018; Giles et al., 2020) as well as the historical portrayal of oceanographers as able-bodied (Garza, 2021) can prevent those with disabilities and other health issues from going to sea. Researchers with disabilities also face additional obstacles and barriers during fieldwork at sea, including that many research vessels are not accessible for wheelchairs or other required support (Hall and Healey, 2005). The current lack of representation of ocean science professionals with disabilities is likely directly tied to the lack of accessibility on research vessels in addition to other systemic barriers. Other situations which may preclude researchers from going to sea include those with caretaker responsibilities or religious commitments, who cannot be away for weeks or months at a time. Over the last decade, efforts to incorporate and improve telepresence operations that enable scientists on shore to participate in cruises in-real-time from their home or office have increased participation of those who are not able to sail on the cruise, including if they are pregnant, wheelchair-bound, or unwell (Marlow et al., 2017; Gallaudet et al., 2020; Xia et al., 2022).

Furthermore, sea-going research expeditions can take an emotional toll and present new situations and customs, long hours, isolation from support systems, concentrated time with small groups of people, distance away from medical attention, and the prospect of being far from shore or getting seasick. These situations can create and exacerbate feelings of anxiety (Tucker and Horton, 2018; Lawrence and Dowey, 2021). Sea-going expeditions can also involve travel to new and foreign places depending on the port of call, many of which will have different laws, rules, and customs. For the large number of STEM students and researchers in the US who are not U.S. citizens but wish to go to sea, they may need to go through extra security checks and medical screening. These procedures not only 'other' them in the process and restrict their expedition opportunities, but also subject them to additional stressors. In a survey of LGBTQ+ geoscientists by Olcott and Downen (2020), over half of respondents also indicated that they have felt unsafe in a field work location due to their gender identity or expression. Additionally, isolated, hierarchical groups and power dynamics at sea can embolden harassment, particularly sexual harassment (Clancy et al., 2014) and racial harassment (Dowey et al., 2021).

Current efforts to promote safety and belonging at sea/in the field

Many sea-going expeditions now require participants to watch orientation videos and/or undergo harassment training prior to setting foot on the ship. UNOLS (University-National Oceanographic Laboratory System), an organization that coordinates U.S. research vessels, provides resources for harassment, reporting, and field safety. Congress has passed existing law (PL114-328 Subtitle C), and introduced current bills (e.g. H.R. 2865) requiring the establishment and/or strengthening of sexual harassment and assault prevention and response within NOAA and other maritime groups (e.g. MARAD, US Merchant Marine Academy). Other organizations have been founded as a response to the rampant harassment associated with field work (e.g., The Fieldwork Initiative) and a community-derived approach to preventing sexual harassment at sea has been proposed (Ackerman et al., 2023). However, there is still a need for large scale improvement in programs and systems with regard to safety and inclusion for at-sea researchers, particularly as more programs recruit students and researchers from marginalized backgrounds for programs that include sea going experiences (Amon et al., 2022).

Opportunities for improvements to benefit marginalized oceanographers

The premise of this publication initially arose from a personal conversation between colleagues seeking to provide helpful advice to an early career researcher who was heading out on their first oceanographic expedition. Subsequently, a collection of resources was gathered to share with that researcher to help them prepare for the expedition, including important things to know and pack. Conversations were then held between the coauthors to centralize these resources for onward cruise participants, with a focus on how ocean science professionals can better create a culture of inclusivity while at sea. A decision was then made that we should gather helpful information from as many ocean science professionals as we can, in order to make a list of considerations that can be used widely in support of diversifying the ocean science community. Onward informal discussions were then held with colleagues from a variety of backgrounds in order to centralize their recommendations herein. While attempts were made to gather experiences and information from ocean science professionals from diverse backgrounds with diverse experiences, certainly many unique perspectives may not have been included below, since the whole community of ocean science professionals was not officially surveyed.

Below, we list some considerations for improving safety and inclusion on at-sea expeditions, broken down into time periods of: 1) before the expedition, 2) during the expedition, and 3) after the expedition. This list has been compiled by the authors, many of whom have minoritized identities, from the literature, from speaking with our broad networks, gathering feedback on earlier iterations of the below list of suggestions at the American Geophysical Union Fall Meeting in New Orleans, Louisiana in December 2021, and at the virtual Ocean Sciences Meeting in February, 2022. Our target audience encompasses expedition planners, program managers, principal investigators, vessel operators, funding agencies, and anyone who will be planning expeditions and bringing on researchers from marginalized backgrounds. This resource may also be useful for anyone participating in at-sea research expeditions to consider, particularly for individuals going to sea for the first time, as many may be overwhelmed and may not know what questions to ask nor which measures to consider. Ultimately, the onus should be upon the programs and leaders sending researchers to sea to ensure safety and inclusion for all participants.

This manuscript serves as a useful resource for expedition planners to review and consider, while acknowledging that it may not be feasible to implement all recommendations simultaneously. We also acknowledge that this list is not all encompassing, and we will inevitably miss important topics and suggestions for consideration. Though many of these recommendations can be broken up chronologically throughout the at-sea expedition experience, many changes can be incorporated throughout the expedition process and at all times. Additionally, while this paper highlights specific diversity needs and challenges of scientists going to sea, it is acknowledged that ocean-based careers extend beyond only scientists including artists, culinary experts, firefighters, rope handlers, boat operators, etc. Lastly, we hope that this resource initiates future conversations about ways to further improve safety and inclusion at sea, fully inclusive of all identities.

TABLE 1 Considerations and recommendations prior to the cruise and during cruise planning at both the organizational and expedition level.

Organization, institution, or funder
In order to include minoritized participants, programs can collaborate with Minority Serving Institutions as equal partners (Gilligan et al., 2007; National Science and Technology Council, 2021) to support cohort-based at-sea research experience for students; one example of this is the Tuskegee University Internship program of the Ocean Exploration Cooperative Institute (OECI) by the University of Southern Mississippi.
For application-based positions aboard, make clear from the application process what expenses will be covered, and what funding opportunities are available (Giles et al., 2020).
Provide upfront travel, lodging, per diem, and registration funds for cruise participants, rather than reimbursement, to alleviate financial stress.
Supplement additional costs for those with caretaker responsibilities when at sea (Hendry et al., 2020), such as support for women returning to the field soon after having children (Orcutt and Cetinić, 2014, Vila-Concejo et al., 2018). Some funders have recently provided additional resources for dependent care (e.g., National Geographic Society, 2023; National Science Foundation, 2023; Schmidt Ocean, 2023).
Provide and account for accommodations, to the extent possible, for researchers with disabilities to safely and fully participate in research expeditions. Have open communication about potential barriers and possible accommodations or mitigations the research team can provide (Stokes et al., 2019).
Provide as needed support for the paperwork and travel logistics required for participants to sail, including visa paperwork for foreign national researchers.
Provide a list of resources for participants in an orientation packet, which will be helpful for those sailing for the first time, and act as a refresher for more experienced sea-goers. This can include information on "unwritten rules" of living on a ship, recommended packing list, ship safety, etc.
Conduct targeted outreach through clubs, conferences, organizations, particularly conferences focusing on supporting minoritized groups (e.g.,SACNAS) (Dutt, 2019; National Science and Technology Council, 2021).
Provide training in mental health, unconscious bias, sexual harassment, and bystander behavior for all expedition team members (including the science party and crew) (see, Anadu et al., 2020; Hendry et al., 2020; Hill et al., 2021).
Provide bystander intervention training for all expedition team members (including the science party and crew). As an example, ADVANCEGeo has provided this during its four year tenure (Hill et al., 2021). Acknowledge that although bystander intervention may be helpful in certain situations, intervening may be dangerous or even backfire at other times. Emphasize the goal of a clear and reliable reporting system and a shift in culture in which we no longer need to rely on bystanders to intervene.
Establish a code of conduct and expectations for all parties.
Dispel notions that seemingly minor transgressions or microaggressions are not worth reporting. These experiences add up to create larger effects.
Compile practical resources for cruise planners (expedition leaders, chief scientist, PIs, etc.) on ways to address potential issues (e.g. best practices for responding to harassment or assault allegations; clear guidance for reporting incidents to the appropriate authority) as the first step planners could take proactively if they anticipate complexities in planning their cruise (Appendix A).

(Continued)

TABLE 1 Continued

Organization, institution, or funder
Fund and promote bursaries for minoritized group members to go to sea, particularly in leadership positions (e.g. Hendry et al., 2020).
Expedition coordinators, planners, or leaders
Avoid placing a single, minoritized individual within a larger, homogenous group. This can be accomplished by implementing cohort based at-sea research expedition experiences when recruiting students and early career researchers, and include cohort-building opportunities. Examples of cohort-based experiences include the OceanX Young Explorers Program, NOAA Ocean Exploration's Explorer-In-Training Program, Ocean Exploration Trust's Science & Engineering Internship Program and Science Communication Fellowship program, and the STEM Student Experiences Aboard Ships (Cooper and Lewis, 2017) program.
Assign multiple mentors, peer mentors, and points of contact for new participants to discuss questions and concerns. Peer mentorship can increase retention (Coles et al., 2011; Jin et al., 2019), create a supportive community and network (Behl et al., 2021; Stofer et al., 2021), and enhance researchers' science identity.
Be transparent about expedition logistics and mitigation planning with all participants (Lawrence and Dowey, 2021). Mitigation planning might mean hosting team meals and happy hours only at publicly inclusive restaurants, or clearly communicating why a certain action is being taken to increase safety and inclusivity. Acknowledge that expedition logistics are always subject to change, and communicate itineraries and updates in a timely manner.
Train staff to identify potential dangers to minoritized groups as part of risk assessments (Anadu et al., 2020; Olcott and Downen, 2020; Lawrence and Dowey, 2021). Expedition planners need to be aware of potential safety issues associated with traveling to certain locations, in certain ports of call, and during travel. This can be particularly dangerous for certain racial and ethnic groups and LGBTQ+ scientists.
Create a dress code focused on safety that is non-sexist and gender-inclusive
Conduct an orientation meeting before the expedition to discuss what to expect and answer any additional questions.
Make introductions for all expedition participants prior to departure, and share travel itineraries and contact details in case any participants need support during travel.
Assign a travel buddy, if possible, and coordinate travel to and from airport, lodging, and port. Consider that members of minoritized groups may not feel safe or comfortable traveling alone to and from certain port locations.
Include preferred name and space for pronouns in the participant list.
If cabin rooms are being shared, inquire what gender berthing participants require, and never suggest to a participant that they should compromise their berthing requirements for the sake of the mission. Provide single occupancy berthing if possible to accommodate.
Clearly describe and promote reporting protocols for concerns about the work environment and how cases and conflicts will be handled, including multiple points of contact for reporting. Enforce accountability and consequences.
Consider breaking up expeditions into shorter segments (when possible), or allow switching of personnel, to accommodate those with caretaker responsibilities and other factors which may preclude one from being away for long periods of time (Orcutt and Cetinić, 2014; Vila-Concejo et al., 2018; Hendry et al., 2020).
Accommodate religious calendars and specific hours of prayer when scheduling expeditions (Lawrence and Dowey, 2021) and provide appropriate space for religious activities.
Provide meals suitable for religion- or heath-based specialty diets.

TABLE 2 Recommendations for inclusivity during an overnight expedition at sea.

Recommendations during an overnight expedition at sea
Be clear about daily schedules and be upfront about potential changes to the schedule. Schedule regular breaks (Greene et al., 2020; Lawrence and Dowey, 2021), including prayer breaks (Giles et al., 2020).
Emphasize that there are codes of conduct and expectations for behavior, and clearly post reporting protocols, and remind participants of reporting protocols with multiple points of contact for reporting.
Enforce accountability and consequences, with no acceptance of intolerance and microaggressions.
Continually evaluate working conditions and regularly meet during the expedition to discuss potential issues or concerns (Kelly and Yarincik, 2021).
Provide adequate personal protective equipment for all persons, regardless of size, ability, or gender.
Encourage frequent restroom and mental health breaks and establish gender neutral restrooms (Greene et al., 2020).
Make menstruation products available, provide clear directions and identify locations for their disposal.
Accommodate and account for dietary restrictions of participants, including religious restrictions and fasting periods (Giles et al., 2020).
Ensure that participants can communicate externally at all times with support systems on shore. Consider expanding internet and communication capabilities for participant communication with family or children at home.
Consider using or expanding ship-based telepresence capabilities to allow for full remote participation in the expedition, particularly for those with care responsibilities, those who are pregnant, and those with disabilities.
Avoid potential biases when assigning or distributing tasks.
Refrain from making comments on other participants' appearance, attractiveness, or your intentions to pursue them sexually/romantically.
While socializing is an integral part of the at-sea experience, discourage overt flirting or sexual activity during the trip. Sexual behavior, even between a pair of consenting cruise participants, can make others (such as roommates) uncomfortable.
Always use correct pronouns.
Actively dispel the pervasive at-sea culture that participants or observers should be willing to accept minor discrimination, sexism, harassment, etc. for the sake of a successful mission.
Be cognizant of the alcohol culture in the geosciences (e.g., Guertin, 2019), particularly during and after fieldwork (Miller, 2018), which can be a barrier to inclusivity to those who do not drink (Fernando and Antell, 2020; Dowey et al., 2021), and can lead to reduced inhibitions that could be dangerous for all participants, especially including members of minoritized groups (Forrester, 2021).
Specific expectations should be put in place for participants to consent to being filmed beyond simply a blanket consent that lasts the duration of a cruise. While at sea operations can occur at all hours of the day, media collection or interactions (videography, photography, etc), should be planned in advance, whenever possible. Certain marginalized groups may be sensitive to being filmed and potentially publicly shown in conditions when they feel they won't be represented in a way they are comfortable with.
Ensure that minoritized groups do not become overly highlighted or 'tokenized' in promotional efforts through careful/deliberate messaging via cruise related media efforts.

Based on the information that we have gathered and experienced, we propose a lengthy list of considerations and recommendations for institutions and individuals to strongly consider actioning in order to ensure the emotional and physical safety of participants both prior to an expedition (Table 1) and during an expedition (Table 2). However, we additionally recommend that a range of actions would also be strongly beneficial to the entire community following an expedition, including;

- Request feedback from all participants relevant to personal safety and comfort, and use this feedback to address needs prior to the next expedition.
- Continue mentor relationships and peer-mentor circles after the expedition.
- Provide support forward – guidance for early career participants on how to add at-sea experience to their resume/CV, LinkedIn, and job interviews.
- Ensure resulting abstracts and publications include an inclusive authorship that appropriately reflects contributions to the research.
- Provide funds to register for, travel to, and participate in major conferences.
- Allow team members to control what information is publicly shared. For example, many cruises feature participant websites including photos and descriptions which remain online indefinitely after the cruise. If a participant chooses to transition gender, presentation, change pronouns, names, etc., an outdated website could create an uncomfortable reference to a past presentation that an individual may be uncomfortable having online and searchable, and they could be hesitant to undertake the process of trying to get it removed or changed. Making these sorts of pages easy for participants to update, having a set expiration, or having a longer term "opt-in" could alleviate this concern.

Summary

Much of the research regarding demographics in the ocean sciences, particularly at the faculty level, are broken down by gender and are not further disaggregated by racial or ethnic identity. Even so, these data follow the gender binary, and many surveys do not include information on LGBTQ+ scientists (Olcott and Downen, 2020). More research is needed to understand the demographics of ocean science professionals at all levels, sectors, and needs. Programs need to acknowledge that much more work is needed to address issues of racism, sexism, ableism, safety, and belonging in the field (Dutt, 2019; García-Gonzales et al., 2019; Marin-Spiotta et al., 2020), and work towards diversity, equity, inclusion and justice, not just to "check a box". Furthermore, research programs and researchers need to confront and address the phenomenon of "parachute science" (Stefanoudis et al., 2021), and work in partnership with and with full inclusion and participation of members of Indigenous communities when conducting geographically or culturally relevant research (Ali et al., 2021). At all times, geoscience professionals, researchers, and students should raise the visibility of past and present ocean researchers from a variety of backgrounds and perspectives (Núñez et al., 2019; Olcott and Downen, 2020). Additionally, conversations regarding both visible and invisible disabilities should be initiated and sustained to bring the topic of accessibility in at-sea research expeditions to the forefront. This representation is needed for students and early career researchers to see themselves in this field. Throughout all this, there will need to be buy-in at all levels - from leadership, to chief scientists, to expedition coordinators, funding agencies, and those in positions of authority.

These recommendations, which are certainly not all encompassing, serve as a catalyst for onward conversations, and that further recommendations can be employed continually to ensure that oceanographers from minoritized groups are not pushed out of oceanography careers due to negative experiences at sea. Every person and every situation is unique. Only once our community fully embraces the breadth of cultures and experiences of all potential oceanographers can our field really be inclusive and exceptional. Additionally, while this manuscript relates to ship-based missions, many of the recommendations above could also apply for long-term, shore-based scientific missions including; travel to remote locations, shared living quarters, and back-to-back day-long cruises, all of which can yield harmful work environments, especially for people from minoritized groups (e.g., Langin, 2022; Woolston, 2022).

Data availability statement

The original contributions presented in the study are included in the article/supplementary material. Further inquiries can be directed to the corresponding author.

Author contributions

LuW: Conceptualization, Data curation, Investigation, Methodology, Writing – original draft, Writing – review & editing. CA: Writing – review & editing. AF: Writing – review & editing. JH: Writing – review & editing. CM: Writing – review & editing. MM: Writing – review & editing. RQ: Writing – review & editing. CR: Writing – review & editing. AS: Writing – review & editing. KS: Writing – review & editing. LiW: Writing – review & editing. ACE: Conceptualization, Resources, Supervision, Writing – original draft, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Appendix 1- Helpful resources

- https://scripps.ucsd.edu/ships/preventing-harassment-and-discrimination
- UNOLS Shipboard Civility Training: https://www.unols.org/shipboard-civility
- RAINN National Sexual Assault Hotline and Chat: https://www.rainn.org/ Free, Confidential, Available 24/7, via Phone or Chat
- NOAA SASH Prevention and Response Guidance
- Sailing Guide for NOAA Ship *Okeanos Explorer* seagong participants. This includes information on shipboard culture, safety, expectations, key things to know about life at sea, and a suggested packing list.
- How to find inclusive "Open to All" businesses and restuarants via Yelp: https://blog.yelp.com/news/yelp-makes-it-easier-than-ever-to-support-inclusive-businesses-with-new-open-to-all-search-filter/