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Building leaders for the UN Ocean Science Decade: a guide to supporting early career women researchers within academic marine research institutions

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Diverse and inclusive marine research is paramount to addressing ocean sustainability challenges in the 21st century, as envisioned by the UN Decade of Ocean Science for Sustainable Development. Despite increasing efforts to diversify ocean science, women continue to face barriers at various stages of their career, which inhibits their progression to leadership within academic institutions. In this perspective, we draw on the collective experiences of thirty-four global women leaders, bolstered by a narrative review, to identify practical strategies and actions that will help empower early career women researchers to become the leaders of tomorrow. We propose five strategies: (i) create a more inclusive culture, (ii) ensure early and equitable career development opportunities for women ECRs, (iii) ensure equitable access to funding for women ECRs, (iv) offer mentoring opportunities and, (v) create flexible, family-friendly environments. Transformational, meaningful, and lasting change will only be achieved through commitment and collaborative action across various scales and by multiple stakeholders.

Keywords: diversity, ECR, academia, equality, equity, gender, marine science, perspectives, STEM, inclusion, early career researcher.

Introduction

Diverse and inclusive marine science is now recognized as essential for addressing the complex and accelerating challenges facing marine social-ecological systems (Blythe and Cvitanovic, 2020; Lawless *et al.*, 2021). The United Nations (UN) Decade of Ocean Science for Sustainable Development (2021–2030) identifies gender diversity as integral to achieving its objectives of "the science we need for the ocean we want" and realizing the Sustainable Development Goals. For example, SDG 5.5 specifically aims to ensure that there are equal opportunities for women's leadership at all levels of decision-making in political, economic, and public life (UN, 2015). The importance of gender equality has also been reflected in other global initiatives, including the UN Women's programmes on leadership and participation (UN Women, 2022).

Although there have been advances over the last 60 years (Huang *et al.*, 2020), gender inequality is still pervasive across marine science (IOC-UNESCO, 2017). The marine sciences is a homogenous work environment characterized by many barriers to diversity, equity, inclusion (DEI), and justice (Johri *et al.*, 2021). Leadership positions are still predominantly held by men (Arismendi and Penaluna, 2016; Liverman *et al.*, 2022) and significant disparities exist between men and women in terms of number of publications (Huang *et al.*, 2020). The proportion of women in leadership positions declines along the career trajectory from higher education to research (Black, 2020; Giakoumi *et al.*, 2021). No single factor accounts for the decline in the number of women at each stage of the career ladder. Various and often unseen gendered processes are experienced by women inside and outside of the workplace (National Academies of Sciences, 2020) and inhibit career progression in marine research (Shellock *et al.*, 2022). These can include: unconscious bias, cultural prejudices, stereotyping (Johannesen *et al.*, 2022; Light *et al.*, 2022), and biased expectations, as well as bullying (O'Connell and McKinnon, 2021), and sexual harassment in the office or during conferences, meetings, fieldwork, and research cruises (Women in Ocean Science CIC, 2021). Together, they make it harder for women to move into leadership positions.

A particularly important career stage linked with gender inequality, is that of Early Career Researchers (ECRs), which make up a large portion of the academic workforce. ECRs are graduate students, postdoctoral fellows, and early career faculty (Gibson *et al.*, 2020). The ECR stage is marked by a significant loss of women researchers (Holzinger *et al.*, 2018; Gibson *et al.*, 2020) particularly at the postdoctoral phase, when ECRs are applying for faculty positions or often when they realize that the demands on their time do not allow for a work-life balance (Shaw and Stanton, 2012). Attracting, retaining, developing, and promoting future women leaders is a priority that marine institutions and scientific communities cannot ignore (Mtwisha *et al.*, 2021), especially if they wish to address gender inequality, bring in new perspectives and skills (Sobey *et al.*, 2013; Nicholas *et al.*, 2019; Brasier *et al.*, 2020), increase research quality and diversity (Pannell *et al.*, 2019; Kelly *et al.*, 2021), deliver excellence in teaching and address ocean sustainability challenges (Keynejad *et al.*, 2021).

Yet, support for attracting, retaining, and promoting women ECRs is often lacking. The experiences and wellbeing of women ECRs can provide insights into the wider culture of academia (Mtwisha *et al.*, 2021) and research suggests numerous reasons for concern (Hein *et al.*, 2018; Van Noorden, 2018; Pardo *et al.*, 2020). Women ECRs experience gendered challenges, which place them at a significant disadvantage to male colleagues (Latu *et al.*, 2013; Shen, 2013;

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Kern *et al*., 2015; Kalaitzi *et al*., 2017; Kong *et al*., 2020). For example, ECR status and parenthood often overlap. Women ECRs can face the additional strains of domestic bias (i.e. the unpaid and undervalued work or "invisible labour" that women undertake as mothers, carers, and teachers; Maddrell *et al*., 2019) and may want to be at home more often to spend time with and be there for their children. This is in addition to the challenges experienced by all ECRs (irrespective of gender), including employment uncertainty (i.e. fixed and short term, part time and self-employed working conditions; Sobey *et al*., 2013; Woolston, 2021, ineffective supervisory support (Davies *et al*., 2021), demanding workloads and stress and burnout (Holzinger *et al*., 2018; Andrews *et al*., 2020; Christian *et al*., 2021). Undeniably, many of these challenges have been magnified during the COVID-19 pandemic (Minello, 2020; Dattani, 2021; Fulweiler *et al*., 2021; Gao *et al*., 2021; OECD, 2021). These challenges are often even more substantial for minoritized groups facing intersecting systems of oppression (Maddrell *et al*., 2019), such as ethnicity (Jeffrey, 2021; Maas *et al*., 2021), nationality (Ahmadia *et al*., 2021), sexual identity (Cech and Waidzunas, 2021), disability, and economic class (O'Connell and McKinnon, 2021). Minoritized is a social constructionist approach to understanding that people are actively diminished by others rather than naturally existing as a minority, as the terms "racial minority" and "ethnic minority" imply (Gunaratnam, 2003).

Targeted actions and concerted efforts between academic institutions, funders, industry, decision-makers, the scientific community, and wider society, will be essential to supporting and empowering women ECRs. The COVID-19 pandemic has generated a strong bias against ECRs (Schadeberg *et al*., 2022), especially due to parenthood (Cardel *et al*., 2020a; Staniscuaski *et al*., 2021) and presents a window of opportunity to reflect on academic practices and cultures (Gibson *et al*., 2020; Keynejad *et al*., 2021). To date, the majority of related research and policy initiatives on gender inequality within academia have focused on how to better support women in Science, Technology, Engineering, and Mathematics (STEM; e.g. Australian Academy of Science, 2019; Casad *et al*., 2021; Llorens *et al*., 2021; O'Connell and McKinnon, 2021). However fewer studies have investigated how to support women ECRs more specifically (e.g. Holzinger *et al*., 2018; Cardel *et al*., 2020a), particularly in marine science. In the marine context, previous research has focused on how to enable women scientists (Giakoumi *et al*., 2021; Shellock *et al*., 2022) or ECRs in marine science (Andrews *et al*., 2020; Brasier *et al*., 2020; Pardo *et al*., 2020; Schadeberg *et al*., 2022). But, research has not explored the intersection between gender and the early career stage. Thus, there is a paucity of understanding of what actions and efforts are likely to support women ECRs to become leaders of the future in marine science and what this means within the framework of the UN Decade of Ocean Science for Sustainable Development.

This article provides guidance on implementable practical strategies and actions towards supporting women ECRs to become future leaders of marine research within academic institutions. This work complements and expands on the strategies and actions previously proposed in the STEM literature, whilst also considering the unique nature of marine sciences and the specific challenges facing women ECRs in marine science. To do so, we integrate the collective experiences and perspectives of 34 global women leaders with a narrative review. For the purpose of this study, a "leader" was defined as a researcher who holds some form of leadership role at any level within an academic institution (i.e. leading a research institution, team, project, or program). We acknowledge that leadership roles are multifaceted and vary across regions and cultures (Evans *et al*., 2015); however, such positions often require leaders to assume a greater administrative and managerial load and service duties in addition to their research role.

An in-depth qualitative study was undertaken between January and June 2021. An information-oriented, maximum variation approach was employed (Flyvbjerg, 2006), to ensure the inclusion of a variety of perspectives on the types of strategies that can be employed to support women ECRs. Participants were identified through two types of non-probability sampling methods: (i) purposive sampling and (ii) snowball sampling. Each global women leader had the option of answering the questions via semi-structured interviews ($N = 8$) or by providing a written response ($N = 26$). Global women leaders were asked to identify processes and systems that can aid the development of women ECRs in becoming leaders of marine research. The analysis of raw data were completed following an inductive approach, based on grounded theory analysis. Grounded theory is an iterative approach to the analysis of qualitative data that aims to generate theory out of research data by achieving a close fit between the two (Bryman, 2012). Data analysis was undertaken by the lead author (R.J.S) to maintain independence of interpretation. Though, three practices were undertaken to ensure the validity of the emerging themes and subthemes: (i) the themes were continually verified against the raw data from which they were derived (Marshall *et al*., 2011; Norström *et al*., 2020), (ii) initial coding of transcripts ($n = 5$) was undertaken by three authors (R.J.S., C.C., and M.M.) and the findings were discussed with and refined by the co-ordinating authors, and (iii) the findings were shared with participants to give them the opportunity to clarify, corroborate, or approve the findings (Bryman, 2012).

Broad themes were populated from the perspectives of women leaders and integrated with findings from a narrative review of literature to identify specific actions for supporting women ECRs. Narrative reviews (or "literature reviews") are the most traditional form of evidence synthesis. Unlike systematic reviews, the narrative review helped us to obtain evidence on a broad open-framed question (i.e. what actions can support women ECRs in academia). It also enabled us to synthesise the state of knowledge (Snyder, 2019) and arrive at a critical interpretation of the literature (Bryman, 2012), without the more stringent processes involved with systematic reviews. Literature and best practice were drawn from across marine science, STEM, academia, and industry more broadly (see Supplementary Materials 1 and 2 for further detail).

Strategies and actions for supporting women ECRs in marine research

This study identified five types of practical and straightforward strategies from global women leaders, which can support women ECRs in becoming future leaders of marine research within academic institutions and create a more diverse and equitable leadership. They are: (i) create a more inclusive culture, (ii) ensure early and equitable career development opportunities for women ECRs, (iii) ensure equitable access to funding for women ECRs, (iv) offer mentoring opportunities, and (v) create flexible and family-friendly environ-

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ments (see Table 1 and Figure 1). The strategies braid across and transect the multiple scales at which transformation is required: (i) system, (ii) institution, and (iii) network.

Figure 1 is inspired by the "braided river" model developed by Batchelor *et al.* (2021), who used the analogy to represent the various pathways into and within STEM careers and how people can flow from multiple points into a STEM career. We adapted this concept and have used the braided river as an analogy for achieving inclusive, responsive, and modern career development in marine science. As shown in Figure 1, each of the three interconnected hills represents the different scales at which change is required (i.e. system, institution, and network). The five rivers flow from the hills and signify each of the strategies that needs to be applied to achieve diverse and inclusive leadership in marine research institutions. Diverse and inclusive leadership is symbolized by the thriving and diverse marine ecosystem that the rivers flow into (i.e. a healthy biodiverse open ocean). We propose multiple possible actions under each of the five strategies. Hence, collectively and over time, implementation of the strategies and actions leads to a solution.

Cultural change in marine research will not be achieved from the goodwill of individuals alone, and certainly should not be the responsibility or burden of women ECRs. Hence, we have avoided individual-level actions (i.e. the responsibility of single individuals), as women and other minoritized groups already tend to bear a disproportionate burden of responsibility for "fixing" problems of inequity (Carson *et al.*, 2019). We acknowledge that various stakeholders will need to work together to implement the strategies and actions identified. The actions can be adopted by various stakeholders in marine science, including: academic institutions, funding organisations, industry, decision-makers, and the scientific community. Transformational, meaningful, and lasting change will only be achieved if there is a commitment and collaborative action across various scales and by multiple stakeholders, but particularly by those in existing leadership positions.

The actions highlighted here do not aim to privilege minoritized groups over others, rather, they aim to provide an equitable platform, which allows everyone to fully participate in and lead marine research. There was discussion among the author group as to whether to advocate for positive discrimination, a position, which has been favoured in much of the literature and by a number of the author team (Manfredi, 2017; Gibson *et al.*, 2020; de Winde *et al.*, 2021; Llorens *et al.*, 2021; Maas *et al.*, 2021; Mori, 2021). Positive discrimination involves the use of "positive measures" or "special measures" to foster greater equality by supporting women and other minoritized groups who face, or have faced, entrenched discrimination, to ensure they have similar access to opportunities as others in the community (Australian Human Rights Commission, 2022). Examples include quotas, women cluster hires and gender-specific positions and scholarships (European Institute for Gender Equality, 2016). However, after discussions, we reached consensus and made the decision to suggest strategies and actions, which provide an equitable platform, allow everyone to fully participate in and lead marine research and omit positive discrimination policies and actions. Instead the suggestions are more analogous with "positive action".

Positive action is lawful and one of the only viable mechanisms to address inequalities when positive discrimination isn't an option (Manfredi, 2017; STEM Women, 2019). Positive action assists, encourages, and trains disadvantaged groups (e.g. women ECRs) to help them overcome disadvantages, without discriminating against other groups. For example, through targets and action plans, which aim to achieve a more balanced workforce (Thomson Reuters Practical Law, 2022). There were two main reasons for aligning the practical actions with a positive action approach. There are differences in global cultural and legal settings. Positive discrimination still remains unlawful in many countries and regions across the world (Ovseiko *et al.*, 2017). Instead, we wanted the strategies and actions to be as widely applicable as possible. There was concern amongst the team about the use of positive discrimination and the potential for negative implications within academia. This has been previously debated in marine science (Vila-Concejo *et al.*, 2018a; Giakoumi *et al.*, 2021; Burdett *et al.*, 2022) and more broadly (Bennett *et al.*, 2005; Noon, 2010; Bourabain and Verhaeghe, 2021). There have been discussions about their consequences for women (Pietri *et al.*, 2019) and such policies have fallen short, as they have lacked attention to minoritized groups and have been described as "window dressing" (Bourabain and Verhaeghe, 2021).

Create a more inclusive culture

The current academic culture and environment within marine research is insufficient for supporting, encouraging, and retaining women ECRs (Mitchneck *et al.*, 2016; Blythe and Cvitanovic, 2020). In prior research, ECRs have described the academic culture within STEM disciplines as stressful, tense, and toxic (Van Noorden, 2018; Woolston, 2021). A system based on demanding performance expectations and masculinised discursive norms of what constitutes academic commitment can disadvantage women ECRs, particularly those with parental and caring responsibilities, chronic health issues and disabilities (Maddrell *et al.*, 2019). Overall, such environments can lead to bullying, harassment, and mental health issues, which can negatively impact the career of women ECRs (Wellcome, 2020; Christian *et al.*, 2021).

Global women leaders advocated that a significant cultural shift is necessary to create a more inclusive academic culture within marine research. For example, participants stated "We *should find ways to change work cultures so that they are more inclusive and diversity friendly at all levels"* (ID10) and "*The change has to start at the top"* (ID27). They perceived that this was essential to the success of the other four strategies and actions for supporting women ECRs. One participant stated *"…it's one of those things where culture is more important than structure"* (ID13). For example, institutions could implement a range of family-friendly policies, but they may still have expectations and targets for staff to publish a specific number of journal articles and outputs per year. This will be harder for women ECRs to achieve if they have domestic duties, such as parenthood and caring responsibilities. Hence, participants advocated for a change in the system. This is supported by a research in Australia, which suggests that a decade of investment in women in STEM is having a limited effect on their representation in the field (i.e. gender split in STEM occupations and length of careers; Australian Government Department of Industry and Science Resources, 2022). Hence, it will be important that investments address the culture within marine science, as it can perpetuate gender equality in these settings (Clavero and Galligan, 2021).

First, Global women leaders highlighted the need for a marine research environment, which challenges traditional

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Table 1. Strategies and actions, which can be applied to support women ECRs in in marine research.

Strategies	Actions
(1) Create a more inclusive culture	• Integrate gender perspective into plans, policies and spending programmes (i.e. "gender mainstreaming") with an intersectional lens (European Institute for Gender Equality, 2022). • Establish DEI committees, working groups, or taskforces. • Implement robust and transparent recruitment processes to target women ECRs (Laland, 2020). • Implement scientific diversity and gender equity training (Mitchneck *et al.*, 2016; Casad *et al.*, 2021). • Deliver formal and mandatory unconscious bias training (Sheltzer and Smith, 2014; Butkus *et al.*, 2018; Holzinger *et al.*, 2018; Black, 2020). • Establish an anti-bullying and harassment culture within marine science (Mahmoudi and Keashly, 2021). • Establish a culture where whistleblowing is encouraged without being reprimanded (Cech and Waidzunas, 2021). • Implement mandatory, safe and confidential mechanisms for reporting and handling of incidences (Johannesen *et al.*, 2022). • Implement compulsory training for all supervisors in how to support, manage, and mentor women ECRs (Universities and Colleges Employers Association *et al.*, 2015; Bell and Koenig, 2017; Wellcome, 2020). • Develop and promote codes of conduct within institutions and research teams (Bell and Koenig, 2017). • Deliver anti-bullying and harassment mandatory training (Bell and Koenig, 2017; Rollock, 2019). • Institutions to promote and implement a culture of work-life balance, self-care, and mindful work ethics within their policies (Evans *et al.*, 2018; Forrester, 2021). • Improve student/teacher ratios (Holzinger *et al.*, 2018). • Reassess and reduce administrative loads of women ECRs (Gibson *et al.*, 2020). • Provide women ECRs with more specific and direct administrative support (GEW *et al.*, 2011; Armstrong and Jovanovic, 2017; Holzinger *et al.*, 2018; Mackay *et al.*, 2020). • Offer relief for women ECRs from specific duties when they return from a career break (Holzinger *et al.*, 2018). • Promote a collaborative environment that encourages transdisciplinary research, active sharing, and co-development (Van Stavel *et al.*, 2021). • Change evaluation metrics shifting from publication counting and bibliometric indices to more holistic metrics (Moher *et al.*, 2018; Davies *et al.*, 2021).
(2) Ensure there are early and equitable career development opportunities for women ECRs	• Offer women ECRs early opportunities to manage and lead research, beyond that of their degree. • Superiors to provide opportunities for women ECRs to expand their external collaborative networks and assist them in taking up opportunities for skill development and leadership (Smith *et al.*, 2017; Jones and Solomon, 2019; de Winde *et al.*, 2021). • Offer training, leadership schemes, and coaching opportunities for women ECRs (Van Oosten *et al.*, 2017; Latimer *et al.*, 2019; Maddrell *et al.*, 2019; Chiarinotti and Weber, 2020; Kong *et al.*, 2020). • Provide more compensated opportunities and resources for women ECRs to facilitate equitable access to publishing (Llorens *et al.*, 2021; Maas *et al.*, 2021; Mori, 2021; Schipper *et al.*, 2021). • Invite more women ECRs to be keynote speakers and provide them with equitable opportunities to present, attend, and lead conferences (Fisher *et al.*, 2021; Llorens *et al.*, 2021).
(3) Ensure there is equitable access to funding for women ECRs	• Develop funding opportunities, which are more tailored to the needs of women ECRs. • Implement funding policies that better address the needs of women ECRs (Bryant *et al.*, 2017; Holzinger *et al.*, 2018; Bourabain and Verhaeghe, 2021; de Winde *et al.*, 2021; Shah *et al.*, 2021). • Use gender-neutral language and stimuli to attract funding applications from women ECRs (Born and Taris, 2010; Gaucher *et al.*, 2011; Lee and Ellemers, 2015). • Establish DEI committees and have trained DEI representatives for each grant panel. • Ensure there is a minimum number of women representatives on grant panels. • Require grant reviewers to undergo training in peer review and biases. • Provide clear guidance for inclusive grant review processes. • Adopt blinded peer review for grant applications (Dewidar *et al.*, 2022). • Make funding data available online (Llorens *et al.*, 2021).
(4) Offer mentoring opportunities to women ECRs.	• Establish an online mentoring platform for women ECRs in marine science (Van Stavel *et al.*, 2021). • Implement well-structured and long term mentoring programmes. • Provide formal training for current and prospective mentors of women ECRs (Van Noorden, 2018; Andrews *et al.*, 2020). • Ensure that mentoring responsibilities are shared fairly across groups to avoid overburdening women and other minoritized groups (Fisher and James, 2022). • Recognize academics who have mentoring responsibilities and include mentoring as a metric of impact (Davies *et al.*, 2021).

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Table 1. Continued

Strategies	Actions
(5) Create flexible and family-friendly environments	• Ensure there is high quality childcare for all women ECRs (Gibson *et al.*, 2020; Llorens *et al.*, 2021; Reese *et al.*, 2021). • Subsidise or provide family-friendly expenses for on- or off-site childcare. • Ensure there is paid parental and care leave for women ECRs (Llorens *et al.*, 2021; Reese *et al.*, 2021). • Provide funds which can help women ECRs participate in travel that supports childcare (e.g. for fieldwork and conferences; Holzinger *et al.*, 2018; Llorens *et al.*, 2021). • Offer flexible working arrangements for women ECRs, who have parental and caring responsibilities (Maddrell *et al.*, 2019; Staniscuaski *et al.*, 2021). • Improve paternity leave policies and encourage men to take paternity and parental leave (Duvander *et al.*, 2010; Vila-Concejo *et al.*, 2018a; Bourabain and Verhaeghe, 2021; Clavero and Galligan, 2021; Cowper-Coles *et al.*, 2021). • Consider delays to the careers of women ECRs, caused by parenthood and caring responsibilities when evaluating candidates for positions, promotions and awards. • Examine the suitability of policies, which officially extend graduate, postdoctoral, and promotion and tenure (P&T) timelines (Manchester *et al.*, 2013; Mitchneck *et al.*, 2016; Butkus *et al.*, 2018; Malisch *et al.*, 2020; Cardel *et al.*, 2020b; Llorens *et al.*, 2021).

The strategies and actions do not aim to privilege women ECRs over other groups, instead, they aim to provide an equitable platform, which allows everyone to fully participate and lead marine research.

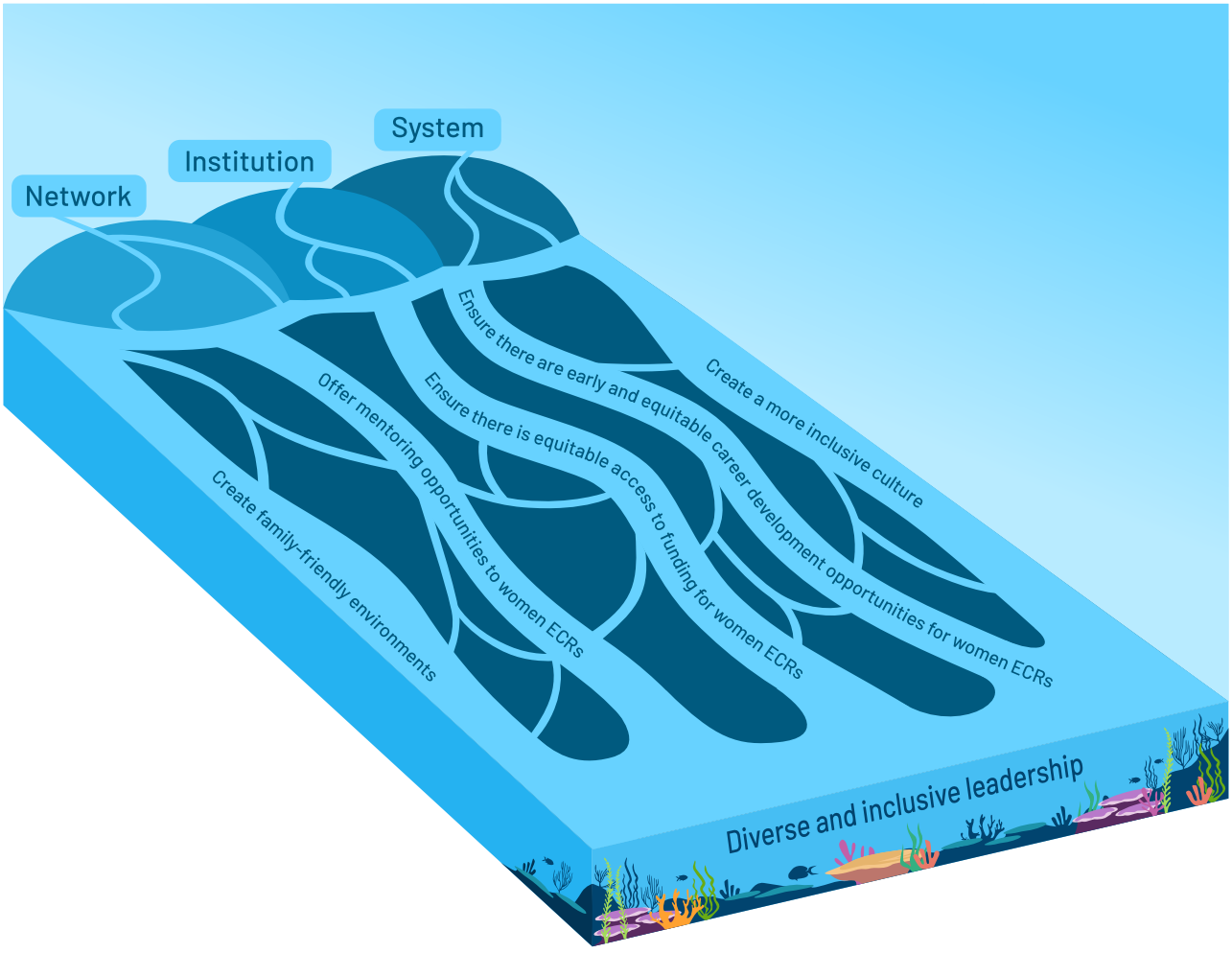

Figure 1. The main strategies that can be adopted by academic institutions, funding organisations, industry, decision-makers and the scientific community to support women ECRs in becoming future leaders of marine research and achieving diverse and inclusive leadership. The strategies are braided across the three main scales at which change is required: (i) system, (ii) institution and (iii) network.

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stereotypes, stands firmly against prejudice and discrimination and actively supports women (including ECRs) and other minoritized groups (Australian Academy of Science, 2019). Bias is a concept that refers to analysis, judgements, or attitudes that do not adhere to the principles of impartiality (e.g. gender bias; Calaza *et al.*, 2021). Gender bias can affect women ECRs and can occur in two forms: (i) prejudice and (ii) discrimination. Prejudice is an attitude reflecting an overall evaluation of a group, and is called sexism when attitudes are based on gender (Fiske, 1998; Dovidio *et al.*, 2010). It can include having negative feelings or pre-conceived ideas about women (i.e. stereotyping). Stereotyping occurs when people assign characteristics to women regardless of actual variation in women's characteristics (Eagly *et al.*, 2000; Murphy *et al.*, 2007; Muñoz Boudet *et al.*, 2013; Reuben *et al.*, 2014; O'Connell and McKinnon, 2021). For example, women experience various stereotypes in marine science, including: (i) being mothers or carers rather than scientists or leaders, (ii) having an inferior performance on quantitative or mathematics-related tasks, and (iii) being weaker and less able to take on physical tasks (e.g. during fieldwork; Shellock *et al.*, 2022). As stated by one participant *"… [disciplines] are either balanced or have more males than females, and [women] think they're not capable in maths and things like that. Why aren't they there? Because probably they were told they couldn't. And maybe even before academia, maybe the girls don't get into the disciplines because maybe the problem is even earlier than that"* (ID29). Discrimination is biased behaviour towards, and treatment of, a group or its members. Prejudice becomes discrimination when opinion is put into action. It includes actions that directly harm or disadvantage another group, but also actions that unfairly favour their own group (Dovidio *et al.*, 2010). For example, women being excluded from career opportunities (e.g. networks, projects, papers, and promotion; De Welde and Laursen, 2011; O'Connell and McKinnon, 2021; Shellock *et al.*, 2022).

Prejudice and discrimination are powerful forces that foster the disparities and inequalities found in academia and in society more generally (Calaza *et al.*, 2021). Hence, academic environments need to better protect women, especially women ECRs, from prejudice and discrimination. We suggest that academic institutions and relevant stakeholders (e.g. funders and publishers) integrate the gender perspective into the preparation, design, implementation, monitoring, and evaluation of plans, policies, and spending programmes. This is termed "gender mainstreaming" (European Institute for Gender Equality, 2022). As part of this, it will be important to highlight the unique issues that women ECRs face (i.e. the overlap of ECR status and parenthood, and the precariousness of their academic positions; Maddrell *et al.*, 2019; Gao *et al.*, 2021) and ensure that this is carefully considered within plans.

Various methods or tools can be used to integrate gender perspectives into institutional policies. These include:

- Gender impact assessments (i.e. the process of comparing and assessing, according to gender relevant criteria, the current situation and trend with the expected development resulting from the introduction of the proposed policy).
- Gender budgeting (i.e. gender based assessment of budgets in- corporating a gender perspective at all levels of the budgetary process and restructuring revenues and expenditures in order to promote gender equality; Arnaut et al., 2019).
- The use of and sharing of gender disaggregated data (i.e. data on individuals that is broken down by gender; Mitchneck et al., 2016; Black, 2020).
- The development of Gender equality plans (GEPS)- i.e. a set of commitments and actions that aim to promote gender equality in an organisation through a process of structural change (European Institute for Gender Equality, 2021).

GEPS, for example, have been implemented in academic institutions in the UK and Australia, through the Athena Swan program and SAGE pathway (Drew, 2022; Rosa and Clavero, 2022; Thomson *et al.*, 2022). Furthermore, they are a compulsory requirement for all EU Horizon2020 funding, which has a direct impact on those applying for funding for marine science research. We do however, acknowledge the pitfalls and limitations of GEPs. For instance, GEPs have been viewed as a potential box ticking exercise and perceived as a woman's work (Clavero and Galligan, 2021).

Other measures for addressing prejudice and discrimination, include but are not limited to:

- The establishment of DEI committees, working groups or taskforces.
- Robust and transparent recruitment processes to target women ECRs (Laland, 2020).
- Scientific diversity and gender equity training (i.e. learning about research on gender bias, how unfair practices affect women at different stages of their career, recognising patterns in the workplace and the hurdles to hiring, retaining, and promoting women; Mitchneck et al., 2016; Casad et al., 2021).
- Formal and mandatory unconscious bias training (i.e. programmes which expose individuals to their biases and aim to eliminate discriminatory behaviour; Sheltzer and Smith, 2014; Butkus et al., 2018; Holzinger et al., 2018; Black, 2020).

One participant reflected that *"[DEI] awareness and training is becoming the norm for appointment and funding panels"* (ID6). However, we do note that organizations need to advance past undertaking simple steps that lead to instantly visible results (e.g. establishing a DEI committee); in part because they are short term, and also because they are efforts often led by ECRs. In the long term, organisations need to make incremental steps and progressions to tackle prejudice and discrimination in the workplace (Ali *et al.*, 2021).

It is also important to create a safe, secure, and positive, environment free from bullying and sexual harassment. One participant stated *"[I] tried to create a safe environment for my students, where they can grow to be more confident than I am, yet not competitive in a negative way"* (ID15). This aligns with previous research (Van Noorden, 2018; Brasier *et al.*, 2020). There needs to be greater awareness, accountability, and action from various stakeholders in marine science, including academic institutions, researchers, support providers, funding agencies, and policy-makers (Mahmoudi and Keashly, 2021). Academic bullying and sexual harassment are serious issues that affect all disciplines and career stages (Mahmoudi and Keashly, 2021) and can occur in offices, online at conferences and meetings, and on fieldworks (e.g. at sea; Amon *et al.*, 2022; Johannesen *et al.*, 2022). Women experience subtle

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workplace discrimination (e.g. belittling, misogynistic unprofessional remarks, and incidences of microaggressions), as well as more blatant forms of bullying in marine research (e.g. arguments with male colleagues; Shellock *et al.*, 2022). In the context of marine science, a recent study found that 78% of women respondents (i.e. 761 out of 975 respondents) had experienced sexual harassment in the workplace or learning environment. Most commonly, women experienced: (i) verbal remarks of a sexual nature, (ii) lustful stares at them or their body, and (iii) unwanted touching or physical contact (Women in Ocean Science CIC, 2021). However, in many cases, women may be unsure as to whether the bullying or harassment incident should or could be reported. The consequences for the harassed, bullied, and assaulted are real (Bell and Koenig, 2017). Incidences of bullying and sexual harassment can lead to hidden labour (i.e. researchers being left out of authorship either intentionally or because of different perceptions as to "what counts" to be listed as an author), deterioration in the wellbeing of women ECRs and the sabotage of women ECR's careers (i.e. women ECRs may struggle to get jobs, secure tenure, win research funding, and receive scientific recognition). Women ECRs lack power, therefore, they often have to find other paths, which can effectively remove competition from the academic environment (Ahmadia *et al.*, 2021; Täuber and Mahmoudi, 2022).

A number of measures may help to prevent bullying and sexual harassment in marine science:

- Co-ordinated and collaborative efforts between stakeholders (e.g. funders, research organizations, businesses, charities, and governments) to establish an anti-bullying and harassment culture with marine science (Mahmoudi and Keashly, 2021).
- Establishing a culture where whistleblowing is encouraged without being reprimanded. The implementation of mandatory, safe and confidential mechanisms for reporting and handling of incidences (Johannesen *et al.*, 2022).
- Offering compulsory training for supervisors in how to support, manage, and mentor women ECRs and require renewal activities each year (Universities and Colleges Employers Association *et al.*, 2015; Bell and Koenig, 2017; Wellcome, 2020).
- Developing and promoting codes of conduct within institutions and research teams (Bell and Koenig, 2017).
- Delivering anti-bullying and harassment mandatory training for academics across institutes and universities, particularly for those who are wishing to take a managerial role (e.g. sexual harassment training and racial justice training; Bell and Koenig, 2017; Rollock, 2019).

We also need a culture and environment that respects and advocates for work-life balance (i.e. a comfortable balance between professional work and personal lifestyle; Amon, 2017; Brue, 2019) and adjusts the academic norm of high workloads. One participant stated "*Work on the workload issue in academia (change the norm)*" (ID12). Research has widely acknowledged that having a work-life balance is a challenge for women, as they have a greater domestic workload and are more likely to be tasked with "academic housework" (e.g. administration, pastoral care, and teaching; Holzinger *et al.*, 2018; Maxwell *et al.*, 2019). Furthermore, women ECRs are also disproportionately affected as they experience gender stereotypes and there are often questions about their credibility (i.e. an expectation of different or diminished interests or abilities, due to their gender; Handley *et al.*, 2015; Armstrong and Jovanovic, 2017; O'Connell and McKinnon, 2021; Shellock *et al.*, 2022). Hence, they are more impacted by administrative overburden and have less time to devote to research and publications, compared to their male counterparts (Yousaf and Schmiede, 2017; Angervall, 2018). This can have flow-on effects for women ECR's careers, as these tasks are not sufficiently valued in promotion and tenure decisions (McKinnon and O'Connell, 2020).

A work-life balance is key for all women to have fulfilling careers (European Institute for Gender Equality, 2016). However, work-life demands may change as women move through the various life and career stages (i.e. from women ECRs to senior leaders). Earlier in their career, women may be of child bearing age and experience moral pressure, interest, and emotional pull to be the main caretaker of infants, babies, and young children. When moving to later life and mid-to-late career stages, challenges, workloads, and expectations may escalate as women become more senior and enter leadership positions. This may happen at a time when women experience a collision of immediate and extended work and domestic demands (e.g. teenagers with complex and high demands and ageing parents). Women ECRs may observe senior colleagues juggling these challenges and this may factor into their future decisions about whether to stay in academia and become a leader in marine science. Therefore, it is important for a work-life balance to be acknowledged and promoted during the ECR stage and this may help to increase the wellbeing and retention of women. A healthier work-life balance can help women to find meaning in their work, have a sense of control over their lives and can reduce incidences of anxiety and depression (Amon, 2017; Evans *et al.*, 2018).

We suggest that academic institutions implement policies that promote a work-life balance for women ECRs (Welch *et al.*, 2011; Brue, 2019; Giakoumi *et al.*, 2021). This will help to facilitate a move to a healthier work and education environment (Evans *et al.*, 2018; Forrester, 2021). Potential actions include:

- Promoting and implementing a culture of work-life balance, self-care and mindful work ethics within their policies, and implement this via faculties and through administration.
- Improving student/teacher ratios.
- Providing women ECRs with more specific and direct administrative support, which aids operational activities, grant development, management, coordination of funding, contracting, and procurement (GEW *et al.*, 2011; Armstrong and Jovanovic, 2017; Holzinger *et al.*, 2018; Mackay *et al.*, 2020).
- Reassessing and reducing the administrative loads of women ECRs.
- Offering relief from specific duties (e.g. teaching, administrative responsibilities and service), teaching sabbaticals, job sharing, part time roles and flexible working.

Institutions could avoid assigning women ECRs to administrative duties until they are on long term contracts or get tenure. These actions may help women ECRs to spend more time on research and fieldwork and enable recovery of women ECRs, following the COVID-19 pandemic (Gibson *et al.*, 2020). This will be particularly important for those who have taken extended leave for parental and/or caring

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responsibilities (Mackay *et al.*, 2020). It is often challenging for women ECRs to manage their academic load when they return from a career break. Offering relief from specific duties (e.g. teaching, administrative responsibilities, and services), teaching sabbaticals, job sharing, part time roles, and flexible working may be particularly helpful in this case.

It is also vital for academic environments to promote collaboration and broader notions of success and impact. Increasingly, academic institutions are operating within the neoliberal paradigm, which is dependent on fee-paying international and domestic students, and labour market flexibility through a casual workforce. This environment emphasises competition and orientates towards activities that yield individual-level benefits (i.e. individualism; Nyboer *et al.*, 2022). In this environment, women ECRs have to be self-motivated, enterprising, highly-productive, competitive, and always-available (Reynolds *et al.*, 2018; Bosanquet *et al.*, 2020). Furthermore, scientists are pushed to publish science, rather than undertake research which is participatory and involves engagement. This can affect efforts to move science into the public realm and tackle critical policy and decision-making needs (Davies *et al.*, 2021). Hence, it will be vital to shift away from this type of environment. One participant highlighted the importance of "*…nurturing a culture that is not a competitive, critique-type environment, which I've seen in some departments …where it just feels like a harsh environment and you're constantly on edge, and you're constantly stressed. I don't think that's good for anyone, particularly I feel like it probably does harm to more females*" (ID5). Hence, it will be important for stakeholders to promote and support a collaborative environment that encourages transdisciplinary research, active sharing, and co-development, rather than unhealthy competitive environments, which rely purely on citations and biased publishing mechanisms (Nyboer *et al.*, 2022). For example, previous researchers have suggested the use of open and transparent online platforms, which can help marine scientists, such as women ECRs, to share their experiences and best practices on specific topics (Van Stavel *et al.*, 2021).

In addition, changing measures of success and what type of impacts are valued, may enable a healthier work-life balance. We should shift from evaluation metrics such as publication counting and bibliometric indices to more holistic metrics. Often academic roles, in particular research, are seen as a "mission" that allows for no or little outside life. If research quality is only measured using quantitative outputs, without any consideration of (i) the quality and impact of research and (ii) above all, the quality of life of academics, then the definition of academic work is potentially too narrow (GEW *et al.*, 2011). As highlighted by Davies *et al.* (2021) "*…traditional metrics are flawed, are biased against already marginalized groups and fail to accurately capture the breadth of individuals' meaningful scientific impacts*" (p1). This change is critical for women ECRs in marine science. Research has shown that women are more motivated than men to engage in research aimed at societal progress, not just scientific progress (Zhang *et al.*, 2021). However, ECRs are often pushed to publish their research at the expense of building relationships and creating impact on the ground (Sellberg *et al.*, 2021). Also, women ECRs often have 1.5 times higher service allocations compared to men, and it is often difficult for them to decline such opportunities (Cardel *et al.*, 2020b). Women ECRs are often in a vulnerable position due to their career stage and because they have to prove their capabilities (Reynolds *et al.*, 2018). Hence, women ECRs are most disproportionately affected if evaluation metrics are too narrow in scope. Therefore, broader metrics are needed to account for societal impact (e.g. delivering benefits to coastal communities), open research protocols (e.g. sharing marine data, protocols, software, code, etc.), and contributions to the scientific enterprise (e.g. co-producing research with marine stakeholders and mentoring). Developing new metrics will be the responsibility of funders, editors, and reviewers and those responsible for recruitment (Sellberg *et al.*, 2021) and will help to advance science through principles of justice, equity, diversity, and inclusion (Moher *et al.*, 2018; Davies *et al.*, 2021). One example is the Research Excellence Framework (REF). Although not without its limitations (Penfield *et al.*, 2014; Pinar and Unlu, 2020), the REF acknowledges, captures, and values the wider impacts of research in the UK (e.g. cultural, economic, health, political, and societal impacts; Research Excellence Framework, 2021).

Ensure early and equitable career development opportunities for women ECRs

In many countries, women ECRs receive fewer leadership opportunities than men, even when they have equivalent qualifications, due to gender discrimination (Eagly and Carli, 2007). Therefore, it is important for academic environments to support women ECRs and provide them with early and equitable opportunities for career development.

Preparing women ECRs for leadership can be achieved by giving them early opportunities to manage and lead research, beyond their degrees. As emphasised by one participant, "*Having leadership experience for research projects from early on in the career. Maybe this is where I see the strongest differences between males and females that female scientists can work at our institute for many years without having no project lead. Project lead is required for building CVs and for the career towards professor level, but of course also to prepare and promote women to leader positions (where we have very few females today). Any leadership experience would help when taking the lead in interdisciplinary work*" (ID11). In terms of actions, we suggest that institutions ensure that there are equitable opportunities for women ECRs to manage and lead marine research activities such as workshops, proposals, projects, book chapters, strategically important articles, and policy contributions. This can help women ECRs to develop their research (e.g. as exemplified by the Future Seas Project; Nash *et al.*, 2021) and leadership skills (including planning and management). Previous work has highlighted the value of experiential learning for women ECRs (Brasier *et al.*, 2020) and the need for talent management to develop research leaders (Mtwisha *et al.*, 2021). This can also benefit superiors. As stated by one participant "*Working with ECRs is a privilege and a major source of inspiration. Give them opportunities to lead and make sure they thrive. This will strengthen your team and help you all to succeed*" (ID10). This aligns with previous research, which suggests that women ECRs provide fresh insights and inspiration for research, as well as strengthening the success of the team as a whole (Nielsen *et al.*, 2017).

We suggest that superiors provide opportunities for women ECRs to enlarge their external collaborative networks (e.g. put them forward for external committees and connect them with researchers at marine conferences; Smith *et al.*, 2017; Jones and Solomon, 2019). Research suggests that supervisors'

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collaborative behaviour can affect gender differences in productivity among doctoral students and ECRs. This can aid strategic networking and help to extend women ECR's formal and informal networks. We also recommend that superiors assist women ECRs in taking up opportunities that support skill development and prepare them for leadership: "*I try to offer ECRs in my team what helped me to succeed (everything in my power)*" (ID10). This includes but is not limited to, encouraging and helping them to apply for fellowships, grants and awards, co-authoring papers together, being co-applicants on funding applications and co-ordinating international research visits (de Winde *et al*., 2021). One participant stated "*I indicate them to lead invited papers and chapters, and I make sure that all those that show an interest in studying abroad do so*" (ID15). It is also important to support women ECRs who are coming to the end of their contract and to help them to prepare for and decide on their next steps. For example, we recommend that superiors and mentors meet with women ECRs at least 6 months before the end of their contract to discuss career aims and develop a strategy to seek and obtain new opportunities.

It is also important for publishers to provide career development opportunities for women ECRs, which are compensated and help to provide more equitable access to publishing (Llorens *et al*., 2021; Maas *et al*., 2021; Mori, 2021; Schipper *et al*., 2021). Women are underrepresented in publishing in related fields (e.g. ecology, coral reef science, and fisheries science; Handley *et al*., 2015; Fox *et al*., 2018; Ahmadia *et al*., 2021; Maas *et al*., 2021) and are less likely to be offered leadership and membership of editorial boards (Cho *et al*., 2014). Journal publishers could reverse these trends by offering compensated opportunities for women ECRs to guest edit special issues and to learn more about scientific publishing and journal editing. For example, the ICES Journal of Marine Science has implemented an editorial membership programmes to train ECRs in scientific publishing and journal editing (ICES, 2021). Another option is the use of ECR boards, which are groups composed of ECRs that functions alongside the advisory board and the editors (Wiley, 2021), with representation from women ECRs.

Furthermore, conference committees could provide career development opportunities for women ECRs. Academic conferences are crucial events for women ECRs to disseminate their research, gain exposure and to develop a foster a broad network of peers and collaborators. Previous research suggests that career advancement is often dependent on building good social networks and can involve breaking into the "boys club" or creating a women's club (Eagly and Carli, 2007; Shellock *et al*., 2022). Despite this, conferences represent important cultural events that reflect the barriers faced by women in marine science. Importantly, committees should ensure that women are invited to be keynote speakers at conferences. Prior research suggests that women are discriminated against when it comes to invitations to give keynote presentations (Lupon *et al*., 2021; Carcel *et al*., 2022). Women keynotes can counteract the negative effects of stereotypes (Burdett *et al*., 2022) and can be positive role models, as they provide women ECRs with examples to emulate. It is also essential to provide women ECRs with opportunities to present at and attend conferences (Johri *et al*., 2021). This can be facilitated by assisting with childcare, offering dedicated funding for women ECRs, providing assistance with and funding short-term visas for travel, holding conferences in diverse locations and/or having "multiple-sites" for attendees and adopting hybrid virtual-physical conference formats (Sardelis *et al*., 2017; The Scientist, 2019; Fisher *et al*., 2021; Llorens *et al*., 2021; Niner and Wassermann, 2021; Sarabipour *et al*., 2021; Velin *et al*., 2021). However, we acknowledge that conferences will need to become more accessible and safer places, to benefit women ECRs. This will require changes from within the organizational structure of events, for example, through the implementation of specific guidelines, policies and a conference code of conduct (e.g. equality policies and anti-harassment policies; Black, 2020; Corona-Sobrino *et al*., 2020).

Finally, we suggest that women ECRs are provided with more training, coaching, and networking opportunities. It was perceived that we must do better to train the next generation of women ECRs. Global female leaders highlighted that training and development is a key enabler to better prepare ECRs for future leadership, management, and supervision. This will prepare them for roles within and outside academia (Universities and Colleges Employers Association *et al*., 2015; Holzinger *et al*., 2018). One participant stated "*I would suggest a systematic and effort to mentor, train, and support women throughout their careers with the vision to dismantle existing power differences is required*" (ID34). We suggest that training is provided on topics that are sensitive to the challenges that are disproportionately faced by women, including self-management (e.g. goal setting, time management, work-life balance). This was in addition to encouraging women ECRs to apply for leadership programmes and career coaching schemes: "*I would LOVE to see some kind of leadership program for women….Think about the Pew Fellowship program but specifically for women and not about science but about leadership, mentorship, work life balance*" (ID33). Career development coaching could help women ECRs to establish their professional goals and make a plan to achieve them (Van Oosten *et al*., 2017; Maddrell *et al*., 2019). One example is Homeward Bound, which is a global leadership initiative, against the backdrop of Antarctica, which aims to heighten the influence and impact of women in STEM. The benefits of leadership training and career coaching have been examined previously in the STEM literature (Latimer *et al*., 2019; Chiarinotti and Weber, 2020; Kong *et al*., 2020).

Ensure equitable access to funding for women ECRs

Ensuring equitable access to funding for women ECRs was identified as a key strategy for supporting women ECRs, which aligns with previous research (Sylvia *et al*., 2008; Smith *et al*., 2017; Fox *et al*., 2018; Holzinger *et al*., 2018; Ahmadia *et al*., 2021; Odedina and Stern, 2021). Funding plays a pivotal role in enabling women ECRs to undertake high-quality research and supports a range of inputs and activities, including field and laboratory costs, training, and partnerships (Blythe and Cvitanovic, 2020). Multiple studies have shown that there is a gender bias in funding and that men have significantly higher success rates than women applicants (Shen, 2013; Wijnen *et al*., 2021). For example, previous research found that women needed to be 2.5 times as productive to be judged as equally competent in grant applications (Malisch *et al*., 2020). Women ECRs may be at an even bigger disadvantage. Funding may be particularly scarce and unsuitable for women ECRs working in marine research as it is not sufficiently tailored or flexible enough to support women ECRs at

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specific pressure points in their career (e.g. women re-entering science after extended leave, also women wishing to redirect their career). Further, women ECRs from the Global South are often disadvantaged in terms of capacity, funding, and publishing (Maas *et al.*, 2021; Mtwisha *et al.*, 2021; Shellock *et al.*, 2022). Overall, the stress of insufficient funding and the need to secure funding can impact women ECR's personal wellbeing (Andrews *et al.*, 2020) and can affect their ability to navigate the career pipeline (de Winde *et al.*, 2021). Hence, practical actions that can increase and improve funding will be central to increasing the number of women ECRs becoming leaders in their field.

Participants emphasised that research funders and granting agencies need to be more accountable in recruiting, retaining, and funding women ECR-led projects. This is in line with the STEM and academic literature more broadly (Bryant *et al.*, 2017; Holzinger *et al.*, 2018; Bourabain and Verhaeghe, 2021; de Winde *et al.*, 2021; Shah *et al.*, 2021). Participants perceived that funders could provide more tailored funding to support women ECRs. Many women take maternity leave at the career stage where they have maximised their networks and connections and it can be hard to re-establish and recreate these without funding. One participant stated "*…there should be more scholarships for early-career researchers [and] supporting especially women who have children because then it's much harder to get back into science, if they're a year or several years lost where they couldn't publish"* (ID30). For example, this could be achieved by providing longer term and back-to-back research grants, funding career break extensions and temporary staff to continue projects for women ECRs and by offering start-up funding for women ECRs. The provision of a small fund may help women ECRs to regain lost momentum (i.e. momentum funding) and could be used as a start-up for small projects, to hire a Research Assistant and to attend conferences.

Funding policies should also better address the needs of women who are ECRs, have diverse career paths and have had career breaks. One participant reflected on the funding process in their country: "*…if you apply for funding, you have to submit the papers of the last five years. Well, at least here they say for every child you have you get one year extra where you can submit papers. So they give you this opportunity, which I think is good"* (ID30). Various examples exist around the world, but one example is the use of Research Opportunity and Performance Evidence (ROPE) Statements in Australia. ROPE statements been incorporated in Australian funding schemes, including the Australian Research Council (ARC) and Australia's National Health and Medical Research Council (NHMRC). Researchers submit a ROPE statement, which provides additional context for their grant application. ROPE recognizes that not everyone is on a level playing field when it comes to diversity of career and life experience (e.g. due to caring responsibilities, as well as health issues). Hence, ROPE "...enables evaluation of a researcher's activities, outputs and achievements, in the context of career and life opportunities and experiences, including, where relevant, significant career interruptions" (Australian Research Council, 2022, p2). Funders could also better consider delays to women ECRs (e.g. due to parenthood and caring responsibilities). For example, by extending eligibility windows for women ECRs who have had career breaks and by providing flexible grant deadlines.

Funders could also use gender-neutral language and stimuli to attract women ECRs. They could apply inclusive details in funding adverts and applications to encourage and provide stimuli for women ECR applicants. We advise that funders avoid the use of gendered language in instructional and evaluation materials (e.g. as part of grant calls, application information on the website, and evaluation sheets and instructions for grant committee members). For example, they could use gender-neutral language, which avoids referring to one gender (e.g. "he"), and uses more gender inclusive wording (e.g. "he", "she", and "they") and remove masculine wording. Masculine-gendered words include: leader, competitive, dominant, challenging, independent, and adventurous, whereas feminine-gendered words include responsible, organized and thorough (Born and Taris, 2010; Gaucher *et al.*, 2011; Lee and Ellemers, 2015). Masculine wording can affect the motivation of women ECRs to go for funding, their evaluation by others and can sustain gender stereotypes in science. Funding bodies could also use more innovative and fairer processes to award grants, which go some way to increasing equitable access to funding (e.g. lottery schemes). All candidates who meet the criteria are entered into a lottery (i.e. tiebreakers) and grants are randomly allocated. Such schemes are being trialled by a group of funders, including the British Academy, the Volkswagen Foundation in Germany, the Austrian Science Fund, and the Health Research Council of New Zealand (Nature, 2022).

It is also vital that women ECRs are better represented in grant funding processes, to aid equitable access to funding (Butkus *et al.*, 2018). Women are less likely to serve on funding committees, councils, boards, and panels positions and this further propagates biases against minorities (Malisch *et al.*, 2020). Women ECRs are often not in the professional networks of decision-making groups associated with publishing. Hence, their work may be less well known and perceived less favourably in journal publications. Furthermore, there is evidence that reviewers tend to favour researchers of the same gender or country as themselves, which has proven to be a large disadvantage for women and scientists from the Global South (Ni *et al.*, 2021). This can lead to lower success of grant applications, which are often reviewed by the same exclusive professional networks (Johri *et al.*, 2021). Hence, it is important for women ECRs to be involved in grant funding processes. DEI should be considered throughout the grant review process, as it can help to reduce conscious and unconscious bias on women ECRs (de Winde *et al.*, 2021; Llorens *et al.*, 2021; Dewidar *et al.*, 2022). The following actions could be applied by funders:

- Establish DEI committees and trained DEI representatives for each grant panel with compensation for those involved.
- Require grant reviewers to undergo training in peer review and biases.
- Provide clear guidance for inclusive grant review processes.
- Adopt blinded peer review.
- Ensure there is a minimum number of women (ECR) representatives on grant panels.
- Publish funding data (e.g. data on gender balance, success of women ECRs, and amounts awarded).

Offer mentoring opportunities

Mentoring is recognized as a critical element for supporting women ECRs, particularly those facing intersecting systems

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of oppression. There will be increased demand for mentoring over the coming years to substitute for the loss of experiences and skills during the COVID-19 pandemic (Fisher *et al.*, 2021). Mentoring can be formal and informal and exists in various forms including peer-, career development-, and/or personal mentoring (Davies *et al.*, 2021). Mentoring is often implemented by academic institutions, in addition to external organisations (e.g. learned societies and research networks). Many of the global women leaders currently mentor women ECRs through formal and informal routes and highlighted the importance and benefits of mentoring. One participant commented "*…strong support through mentoring during the final stages of my PhD. It got me to where I am now*" (ID22). Another stated that "*Institutionalizing mentoring is important. We need role models, female leaders that act as advisory, share their experiences and are willing to support where necessary. Becoming a leader happens over time, still there are many skills to learn that we usually do not acquire from university but have to get from somewhere else*" (ID7).

This is in line with previous research, which has highlighted the benefits of having a mentor or network of mentors (Bielczyk *et al.*, 2020) in marine science (Johnson *et al.*, 2016; Andrews *et al.*, 2020; Johri *et al.*, 2021; Van Stavel *et al.*, 2021; Burdett *et al.*, 2022) and STEM more broadly (Johnson and Gandhi, 2015; Amon, 2017; Wellcome, 2020). Mentoring can be vital in retaining women ECRs and supporting their career progression (Davies *et al.*, 2021). Mentored academics are more likely to get promoted (e.g. to positions of leadership), have increased commitment to the institution (i.e. reduced attrition), improved self-efficacy in teaching and research, and receive more grant income (Gardiner *et al.*, 2007; Ghosh and Reio, 2013; Brabazon and Schulz, 2020; Cardel *et al.*, 2020b). Mentoring programs need to be properly resourced, evaluated regularly and go beyond a tick box exercise, to avoid undermining the value and benefits that mentoring can bring (Maddrell *et al.*, 2019). A range of actions can be applied to establish and improve mentoring programmes for women ECRs.

An online mentoring platform for women ECRs could be established, to guide career development, funding applications, and the navigation of academic challenges. This is exemplified by one participant who suggested to "*…, promote international mentor-mentee platforms*" (ID18). Online mentoring platforms could be developed by individual academic institutions, external organisations (e.g. learned societies, professional organisations), or through collaborative means. This has been discussed previously in marine science (Van Stavel *et al.*, 2021), STEM (Dewitty *et al.*, 2016; Durbin *et al.*, 2020; Hopp *et al.*, 2020), as well as academia and industry more generally (Barrett *et al.*, 2005; Parmaxi and Vasiliou, 2015; Alves *et al.*, 2018; Holzinger *et al.*, 2018). Mentoring platforms can act as an online community and they match and link women mentors and mentees and may provide a more informal approach to mentoring. They can be delivered through a multitude of different technology platforms, including applications, public websites, social media pages, or via a customer relationship management (CRM; Alves *et al.*, 2018; Durbin *et al.*, 2020). Mentoring platforms can make mentoring more accessible to geographically dispersed and minoritized groups of women, transcend institutions and can be complemented by face-to-face mentoring meetings and networking opportunities with other mentees and mentors (Durbin *et al.*, 2020; Hopp *et al.*, 2020).

Well-structured and long term formal mentoring programmes could be implemented, to aid the development of women ECRs. For example, one participant highlighted the importance of formal mentoring systems: "*Mentoring system, the formal way. This is deliberate and with structure. In my college, we are about to start this" (ID21)*. Formal mentoring programmes can provide women ECRs with opportunities to engage with a career development mentor. Some women ECRs may prefer to have a woman as a mentor, as they may have better insights into the gendered barriers that women ECRs face in achieving advancement. But this may be a challenge, due to the lack of women role models within academia who obtained higher positions in their workplace (Borna *et al.*, 2022). Formal mentoring programmes can help to improve, build on or compliment the work of academic institutions, learned societies, research networks, conferences, and funders. For example, mentoring offered by the Integrated Marine Biosphere Research (IMBeR), the Euromarine network, the Society for Women in Marine Science and the Environmental Leadership Program (e.g. Roger Arliner Young (RAY) Diversity Fellowship Program; Johri *et al.*, 2021).

The duration of formal mentoring programmes varies a lot; however, we are most aware of schemes, which require a 12 month commitment from mentors and mentees (Fisher and James, 2022). After the formal programme, mentors and mentees often have to decide when to re-define their partnership or expectations or to formally end their relationship. However, mentor-mentee relationships can often span a period of several years (Allen and Eby, 2003; Gardiner *et al.*, 2007; Efstathiou *et al.*, 2018). There must be clear delivery objectives for the mentoring program (i.e. for the mentor, mentee, and the institution) and we suggest that formal mentoring programmes have three key components to ensure their effectiveness. First, a facilitated program, which offers career development workshops for mentees and mentors and peer-networking opportunities. Second, one-to-one career development mentoring, where mentees receive ongoing guidance and advice from a mentor who has insights into their goals, strengths, and areas for continued development. Third, a rigorous and long term evaluation of the program to ensure that mentoring programmes are effective (Hansford *et al.*, 2004; de Vries, 2011; Dworkin *et al.*, 2012; De Vries and van den Brink, 2016; Schriever and Grainger, 2019; Vasquez and Pandya, 2020).

It is vital to provide formal training for current and prospective mentors of women ECRs (Van Noorden, 2018; Andrews *et al.*, 2020). Training can help to introduce mentors to key knowledge, skills, and important considerations that mentors need for supporting women ECRs. For example, training could include, but would not be limited to: (i) providing guidance and examples of what good mentorship looks like, (ii) providing training in the professional conduct of mentorships (e.g. making mentors aware of the ethical aspects of mentoring), (iii) raising awareness of the unique challenges women ECRs are faced with in marine science, (iv) discussing antibullying and antiracist mentoring and teaching practices, and (v) giving mentors strategies for handling difficult situations and reporting health and safety concerns (Johnson, 2002; de Vries, 2011; Wellcome, 2020; Davies *et al.*, 2021). It will be important to ensure that mentoring responsibilities are shared fairly across groups, to avoid overburdening women, minoritized groups and those with caring responsibilities (Fisher *et al.*, 2021). In addition, the work of mentors should be

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recognized by academic institutions, as part of plans to expand scientific impact beyond that of citations.

Create flexible and family-friendly environments

Parenthood and caring responsibilities can slow the rate of career advancement of women ECRs and this can be exacerbated by un-career-friendly family structures (Fulweiler *et al.*, 2021; Giakoumi *et al.*, 2021; Shellock *et al.*, 2022). As exemplified by one participant, "*…women have children and there is a part of their life that does not allow them to do the same things that a man could do*" (ID31). The issues facing academic parents and carers have been discussed for decades; however, the COVID-19 pandemic has further exposed the inequalities facing women scientists. Previous studies suggest that the well-known unequal division of domestic labour between men and women, have been made worse by the pandemic and this is particularly the case for women ECRs who are likely to face long-term effects (Staniscuaski *et al.*, 2020; Fulweiler *et al.*, 2021; Gao *et al.*, 2021).

The global women leaders highlighted the need for the creation of flexible and family-friendly environments and perceived this to be vital for bolstering women ECRs. Participants stated "*There was some way to go in creating a family friendly culture*" (ID6) and "*There is nothing in place apart from networks and support, familiar support, and of course a lot of men get the very caring and understanding and all of this, but there is not an official structure to help you, and there should be*" (ID29). Such mechanisms would need to be implemented in marine institutions globally, not just in the Global North. This aligns with existing literature, which suggests that flexible and family-friendly policies can help to recruit, retain and advance women ECRs and make leadership roles more accessible and inclusive (Mitchneck *et al.*, 2016; Care *et al.*, 2021). We discuss a range of potential actions that can be applied alongside efforts to provide equitable funding for women ECRs (with parental and caring responsibilities).

Academic institutions could help by providing access to high quality childcare for all women ECRs with parental responsibilities. Participants suggested that academic institutions could establish or expand high-quality on-campus childcare and ensure it is flexible and available to all women ECRs, regardless of their career stage and contract. They could also subsidise or provide family-friendly expenses for on or off-site childcare. For example, "*… a scheme that would work very well would be a gender-neutral scheme that would allow me to use an allowance to pay for quality and reliable childcare, or family-related expenses, and would provide me freedom to better focus on professional development and benefit from the post in a more full and relaxed way*" (ID19). This aligns with the STEM literature (e.g. Gibson *et al.*, 2020; Llorens *et al.*, 2021; Reese *et al.*, 2021). It is also vital to provide childcare to enable women ECRs to attend conferences, meetings or undertake fieldwork. Due to their domestic burden, women ECRs are often unable to participate in travel. As stated by one participant, "*Travelling can be challenging as a mom, so considerations around how we can participate in travel in a way that supports childcare options*" (ID1). For example, it may be beneficial to provide grants for childcare during travel to conferences or fieldwork (Holzinger *et al.*, 2018; Llorens *et al.*, 2021). Also, there are examples of marine science conferences and meetings, which have organised and/or funded childcare on site for those wanting to attend (e.g. the International Marine Conservation Congress and the Australian Marine Sciences Association).

Efforts could be made to reduce the difficulty for those returning to work after maternity leave. Flexible working arrangements or practices could help women ECRs to achieve work-life balance and would highly benefit those who have parental and caring responsibilities. This is where administrative activities and teaching schedules are carried out by colleagues with more flexibility, being able to work from home and where possible, not holding meetings and work events during times that conflict with domestic duties (e.g. to accommodate the school run; Maddrell *et al.*, 2019; Staniscuaski *et al.*, 2021). For example, one participant discussed having flexible working arrangements for those returning from maternity leave: "*… offer more opportunities to work from home, because babies are also sleeping a lot, it's not that you can't work, but you cannot go to a job and stay there the whole day, especially if you want to breast-feed, which you should because it's very healthy. So I think that's really important, to be more flexible for women with kids, to give them more opportunities to work from home*" (ID29). In addition, institutions could allow for phased or part-time return to work after maternity leave and provide new and improved spaces for lactation (i.e. family rooms) within all buildings on campus (Butkus *et al.*, 2018; Greider *et al.*, 2019).

Institutions could also ensure that there is paid parental and care leave for women ECRs, particularly graduate students and postdoctoral researchers (Llorens *et al.*, 2021; Reese *et al.*, 2021). Improving paid-leave policies for parents can improve the health outcomes of both children, mothers, and family members and increases the likelihood that women return to work (Dustmann and Schönberg, 2012; Cardel *et al.*, 2020b). Improving paternity leave policies and encouraging men to take paternity and parental leave can also contribute to childcare and relieve domestic burden from women. This can help to enable a more gender-equal division of care (e.g. maternity/paternity leave sharing and career breaks for men and women; Duvander *et al.*, 2010; Vila-Concejo *et al.*, 2018a; Bourabain and Verhaeghe, 2021; Clavero and Galligan, 2021; Cowper-Coles *et al.*, 2021).

Institutions could also consider delays to the careers of women ECRs, caused by parenthood and caring responsibilities when evaluating candidates for positions, promotions, and awards. For example, this could involve providing official extensions for graduate, postdoctoral, and promotion and tenure (P&T) timelines for women ECRs, on the basis of child birth, parenthood and caring responsibilities. One example is the use of tenure clock extensions (or Stop the Tenure Clock; STC), which allow tenure-track faculty members to delay their tenure review, typically in increments of one year. This has been offered to both men and women in academic institutions (i.e. as a gender-neutral policy). However, there is still debate about the relative costs and benefits of such policies within the literature. On one hand, extensions may help provide a supportive environment that allows for promotion and advancement and may provide stress relief for women ECRs (e.g. first-year faculty; Mitchneck *et al.*, 2016; Butkus *et al.*, 2018; Llorens *et al.*, 2021). However, other have argued that extensions are not a panacea and can cause issues for women ECRs. They may result in the following consequences for women ECRs: (i) women ECRs being out of sync with funding mechanisms (e.g. those that require the primary investigator to be

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tenured), (ii) women ECRs being unconsciously penalised for productivity loss and (iii) decreases in women ECR's long-term earning potential when compared with men who have had tenure extensions (e.g. for parental leave; Manchester *et al.*, 2013; Malisch *et al.*, 2020; Cardel *et al.*, 2020b). It will be important for institutions to weigh up the costs and benefits of such policies.

Considerations for applying the strategies and actions in practice

Here, we discuss three points that that should be considered before strategies and actions are applied by stakeholders wishing to support women ECRs in marine research.

Intersectionality should be a crossing-cutting principle across all plans

The concept of diversity is commonly filled by gender, which can leave ethnic, racial and other minoritized groups feeling excluded. Therefore, it is important for intersectionality to be a crossing-cutting principle in all plans for supporting women ECRs, as it can widen the view of gender and power (European Institute for Gender Equality, 2016; Bourabain and Verhaeghe, 2021). Intersectionality was first introduced by Kimberle´ Crenshaw in 1989 (Crenshaw, 1989). It is defined as a *"...theoretical framework for understanding how multiple social identities such as race, gender, sexual orientation, socio-economic status, and disability intersect at the micro level of individual experience to reflect interlocking systems of privilege and oppression (i.e. racism, sexism, heterosexism, classism) at the macro social structural level"* (Bowleg, 2012, p1267). The challenges faced can be more substantial for minoritized groups, who have multiple disadvantaged statuses (Maddrell *et al.*, 2019; Ahmadia *et al.*, 2021; Cech and Waidzunas, 2021; Jeffrey, 2021; Maas *et al.*, 2021; O'Connell and McKinnon, 2021; Park *et al.*, 2022).

Women from minoritized groups have observed and experienced discrimination (e.g. macroaggressions and tokenism) within marine science (Shellock *et al.*, 2022) and STEM more generally (Bala Chaudhary and Berhe, 2020), which has led to them being isolated and excluded from career progression. For example, women of colour, have been most affected by the COVID-19 pandemic, in terms of academic productivity (Staniscuaski *et al.*, 2021) and have experienced the most harassment in STEM fields (Clancy *et al.*, 2017). This has been referred to previously as "gendered racism" or "intersectional discrimination." This exemplifies the multiplicative effect of characteristics such as race on gender for minority women and demonstrates that women cannot be considered a homogenous group (Bourabain, 2021). Addressing inequalities that intersect with gender can provide efficient leverage for change and also inspire comprehensive strategies and actions. However, this will require more analytical resources and data, and a broader range of expertise, than tackling gender separately from other inequality issues (European Institute for Gender Equality, 2016). A number of the actions for supporting women ECRs would also be of benefit to minoritized groups. However, it will be vital to tailor these actions and for them to be complimented by or integrated with specific plans to protect and support minoritized groups (e.g. anti-racism plans, LGBT + plans and disability action plans; Bala Chaudhary and Berhe, 2020; Ali *et al.*, 2021; Cech and Waidzunas, 2021).

Strategies and actions should be adapted for the context in question

In highlighting these strategies and actions, we do not wish to deny the complexity of the gender-gap, the scale of gender discrimination in society and the cultural practice of different geographical and disciplinary contexts. Nor do we imply that they should serve as prescriptions of a set of actions applicable in all contexts. The type of action applied will depend on the culture and legal system in each country, as well as the socio-political dynamics within each organisation (Mitchneck *et al.*, 2016). Rather, we aim to outline the range of potential options and call attention to the need to tackle the challenges experienced by women ECRs. We suggest that organisations undertake preparatory work before developing new and existing policies and structures, implementing targets and establishing monitoring and evaluation processes. Preparation should involve: (i) assessments of the degree to which COVID-19 has and will continue to impact the productivity of women ECRs (e.g. particularly ethnic minorities and those with parental and caring responsibilities; Malisch *et al.*, 2020), (ii) organisational analyses, (iii) a review of already existing gender equality policies, which provide opportunities for women ECRs, and (iv) the use of participatory processes to identify specific areas for improvement and accountability (AlShebli *et al.*, 2020; Ahmadia *et al.*, 2021; Bourabain and Verhaeghe, 2021; Clavero and Galligan, 2021; Llorens *et al.*, 2021; Maas *et al.*, 2021).

Good leadership is central to the success of the strategies

Good leadership is vital for designing and implementing the strategies and actions, and ultimately achieving inclusive, responsive, and modern career development in marine science. We would like to state that as a group of (wo)men in leading positions we are aware of or can be involved in cases where we or our colleagues create or maintain the barriers we discuss in our paper. Therefore we call on introspection and suggest critical reflexivity as part of creating a more inclusive academic culture.

Good leadership will be required within the various stakeholder groups who have a part to play in the academic research environment (i.e. academic institutions, funding organisations, industry, decision-makers, and the scientific community) and multiple levels within these organisations (European Institute for Gender Equality, 2016). As exemplified by Holzinger *et al.*, (2018), "[this commitment should] not only to be shared amongst top-level executive management, but also amongst other organisational stakeholders, in particular middle or line managers, who are more involved in the daily routines and operational procedures of organisations. Securing organisational commitment can be supported through cooperating with external stake-holders, for instance regional or national policy makers or non-governmental organisations" (p215). Training and performance measures, as well as resources, should be tailored so that all organisations and leaders are empowered to implement change that supports women ECRs. Leaders will need to: (i) be a visible part of the change process, (ii) understand the socio-political

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dynamics of research, the system and their organisation, (iii) work with a diversity of stakeholders and leaders at all levels within the organisation who are accountable for implementing change, and (iv) establish an accountability system to monitor and evaluate the effectiveness of their efforts (Mitchneck *et al.*, 2016).

Conclusions

Women ECRs are well-placed to shape the future of academic marine research and innovate and champion new approaches to addressing critical research needs. However, women ECRs experience a host of challenges, which place them at a significant disadvantage in comparison to male colleagues and inhibits their progression to leadership within academic institutions. Here we have outlined five strategies that can support and empower early career women researchers to become the leaders of tomorrow, building on the collective experiences and perspectives of 34 global women leaders and a narrative review. These actions aim to support the goal of more diverse and inclusive leadership in academic marine research institutions. We anticipate that these strategies and actions may be adopted by diverse marine science stakeholders, including academic institutions, funding organisations, industry, decision-makers, as well as the broader scientific community. However, transformational, meaningful, and lasting change will only be achieved if there is commitment and collaborative action by diverse stakeholders across scales. The perspectives presented in this paper are not intended to provide an accurate representation of the global picture. Challenges faced by women ECRs vary according to geographical, cultural, and legal contexts, which in turn affect the type and extent to which actions can be applied. This paper provides a useful starting point for identifying and developing practical actions that could be implemented to empower women ECRs and ensure equitable access to leadership positions within academic marine research institutions.

Although our findings are derived from global women leaders in marine research and focus on marine systems, many of our ideas are transferable to other contexts. As highlighted previously, case studies can provide in-depth understandings of complex and complicated issues (Starman, 2013); however, they cannot be directly extrapolated to each and every context. Hence, the applicability of the strategies and actions to other disciplines may be more limited (Cvitanovic *et al.*, 2021). The results of this paper should be seen as an opportunity to better understand the challenges facing women ECRs in other disciplines, and not seen as a definitive list of strategies and actions that can be applied in every situation.

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Supplementary data

Supplementary material is available at the *ICESJMS* online version of the manuscript.

Conflict of interest

The authors declare no conflicts of interest.

Author contributions

Conceptualization, R.J.S, C.C., M.C.M., M.M., J.B., R.K., and Iv.P.; methodology, R.J.S, C.C., M.C.M., M.M., J.B., R.K., and Iv.P.; investigation, R.J.S, C.C., M.C.M., M.M., J.B., R.K., and Iv.P.; formal analysis: R.J.S, C.C., M.C.M., and M.M.; validation, R.J.S, C.C., M.C.M., M.M., IvP., J.B., R.K., P.T., K.M.M., S.M., and NS; writing—original draft: R.J.S. Writing- review and editing, all authors.

Data availability statement

The data underlying this article cannot be shared publicly due to privacy of individuals that participated in the study. The data will be shared on reasonable request to the corresponding author.

References

Ahmadia, G. N., Cheng, S. H., Andradi-brown, D. A., Baez, S. K., Barnes, M. D., Bennett, N. J., Campbell, S. J. *et al.* 2021. Limited progress in improving gender and geographic representation in coral reef science. Frontiers in Marine Science, 8: 1–15.

Ali, H. N., Shef, S. L., Bauer, J. E., Caballero-gill, R. P., Gasparini, N. M., Libarkin, J., Gonzales, K. K. *et al.* 2021. An actionable anti-racism plan for geoscience organizations. Nature Communications, 12: 3794.

Allen, T. D., and Eby, L. T. 2003. Relationship effectiveness for mentors: factors associated with learning and quality. Journal of Management, 29: 469–486.

AlShebli, B., Makovi, K., and Rahwan, T. 2020. The association between early career informal mentorship in academic collaborations and junior author performance. Nature Communications, 11: 1–8.

Alves, A., Hendrie, M., Modelski, H., and Schwartz, Z. 2018. Helping Vital Voices Costa Rica Impact More Women : Designing an Online Mentoring Platform. Worcester Polytechnic Institute, Worchester, USA

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Amon, D. J., Filander, Z., Harris, L., and Harden-Davies, H. 2022. Safe working environments are key to improving inclusion in open-ocean, deep-ocean, and high-seas science. Marine Policy, 137: 104947.

Amon, M. J. 2017. Looking through the glass ceiling: a qualitative study of STEM women's career narratives. Frontiers in Psychology, 8: 1–10.

Andrews, E. J., Harper, S., Cashion, T., Palacios-Abrantes, J., Blythe, J., Daly, J., Eger, S. *et al.* 2020. Supporting early career researchers: insights from interdisciplinary marine scientists. ICES Journal of Marine Science, 77: 476–485.

Angervall, P. 2018. The academic career: a study of subjectivity, gender and movement among women university lecturers. Gender and Education, 30: 105–118.

ARC. 2022. Research Opportunity and Performance Evidence (ROPE) Statement. https://www.arc.gov.au/about-arc/program-policies/research-opportunity-and-performance-evidence-rope-statement (last accessed 29 September 2022).

Arismendi, I., and Penaluna, B. E. 2016. Examining diversity inequities in fisheries science: a call to action. Bioscience, 66: 584–591.

Armstrong, M. A., and Jovanovic, J. 2017. The intersectional matrix: rethinking institutional change for URM women in STEM. Journal of Diversity in Higher Education, 10: 216–231.

Arnaut, C., Barbieri, D., Broglio, D., Dauvellier, M., Dennehy, J., Duda, A., Elomäki, A. *et al.* 2019. Gender budgeting European Institute for Gender Equality. Vilnius, Lithuania.

Australian Academy of Science. 2019. Women in STEM Decadal Plan . Australian Academy of Science Canberra, Australia

Australian Government Department of Industry and Science Resources. 2022. STEM Equity Monitor: STEM-qualified occupations. Canberra, Australia. https://www.industry.gov.au/publications/stem-equity-monitor/workforce-data/stem-qualified-occupations (last accessed 29 September 2022).

Australian Human Rights Commission. 2022. Positive Discrimination. Sydney, Australia. https://humanrights.gov.au/quick-guide/12078#:~:text=Employers,%27 or %27special measures%27 (last accessed 1 July 2022).

Bala Chaudhary, V., and Berhe, A. A. 2020. Ten simple rules for building an antiracist lab. PLoS Computational Biology, 16: 1–9.

Barrett, M., Dolnicar, S., Kaidonis, M., MOERMAN, L., Randle, M. J., and Wood, C. 2005. Launching research: experiences with and achievements of a research mentoring platform for academic women. Wollongong, Australia.

Batchelor, R. L., Ali, H., Gardner-Vandy, K. G., Gold, A. U., MacKinnon, J. A., and Asher, P. M. 2021. Reimagining STEM workforce development as a braided river. https://eos.org/opinions/reimagining-stem-workforce-development-as-a-braided-river (last accessed 13 December 2022).

Bell, R. E., and Koenig, L. S. 2017. Harassment in science is real. Science, 358: 1223.

Bennett, M., Roberts, S., and Davis, H. 2005. The way forward—positive discrimination or positive action? International Journal of Discrimination and the Law, 6: 223–249.

Bielczyk, N. Z., Ando, A., Badhwar, A. P., Caldinelli, C., Gao, M., Haugg, A., Hernandez, L. M. *et al.* 2020. Effective self-management for early career researchers in the natural and life sciences. Neuron, 106: 212–217.

Black, C. A. 2020. Gender equity in ocean science: amplifying voices, increasing impact. https://publications.gc.ca/collections/collection_2021/mpo-dfo/Fs23-631-2020-eng.pdf (last accessed 29 November 2022).

Blythe, J., and Cvitanovic, C. 2020. Five organizational features that enable successful interdisciplinary marine research. Frontiers in Marine Science, 7 981

Born, M. P., and Taris, T. W. 2010. The impact of the wording of employment advertisements on students ' inclination to apply for a job the impact of the wording of employment advertisements on students' inclination to apply for a job. The Journal of Social Psychology, 150: 485–502.

Borna, E., Afrasiabi, H., Sadati, Kalateh, and Gifford, W. 2022. Women's perspectives on career successes and barriers: a qualitative meta-synthesis. Social Science Information, 61: 318–344.

Bosanquet, A., Mantai, L., and Fredericks, V. 2020. Deferred time in the neoliberal university: experiences of doctoral candidates and early career academics. Teaching in Higher Education, 25: 736–749.

Boudet, Muñoz, M., A., Petesch, P., Turk, C., and Thumala, A. 2013. On Norms and Agency: Conversations about Gender Equality with Women and Men in 20 Countries. Directions in Development. Washington.

Bourabain, D. 2021. Everyday sexism and racism in the ivory tower: the experiences of early career researchers on the intersection of gender and ethnicity in the academic workplace. Gender, Work and Organization, 28: 248–267.

Bourabain, D., and Verhaeghe, P. P. 2021. Shiny on the outside, rotten on the inside? Perceptions of female early career researchers on diversity policies in higher education institutions. Higher Education Policy,35: 0–26.

Bowleg, L. 2012. The problem with the phrase women and minorities: intersectionality-an important theoretical framework for public health. American Journal of Public Health, 102: 1267–1273.

Brabazon, T., and Schulz, S. 2020. Braving the bull: women, mentoring and leadership in higher education. Gender and Education, 32: 873–890.

Brasier, M. J., McCormack, S., Bax, N., Caccavo, J. A., Cavan, E., Ericson, J. A., Figuerola, B. *et al.* 2020. Overcoming the obstacles faced by early career researchers in marine science: lessons from the marine ecosystem assessment for the southern ocean. Frontiers in Marine Science, 7: 1–9.

Brue, K. 2019. Work-Life balance for women in STEM leadership. Journal of Leadership Education, 18: 32–45.

Bryant, L. D., Burkinshaw, P., House, A. O., West, R. M., and Ward, V. 2017. Good practice or positive action? Using Q methodology to identify competing views on improving gender equality in academic medicine.

Bryman, A. 2012. Social Research Methods. Oxford University Press, Oxford.

Burdett, H. L., Kelling, I., and Carrigan, M. 2022. #TimesUp: tackling gender inequities in marine and fisheries science. Journal of Fish Biology, 100: 4–9.

Butkus, R., Serchen, J., Moyer, D. V., Bornstein, S. S., and Hingle, S. T. 2018. Achieving gender equity in physician compensation and career advancement: a position paper of the american college of physicians. Annals of Internal Medicine, 168: 721–723.

Calaza, K. C., Daflon, V. T., David, I. P. A., Castro, H. C., Vargas, M. D., Martins, L. B., and Stariolo, J. B. 2021. Facing racism and sexism in science by fighting against social implicit bias: a latina and black woman's perspective. Frontiers in Psychology, 12: 1–9.

Carcel, C., Woodward, M., Anderson, C. S., Delcourt, C., Bernhardt, J., and Gall, S. 2022. Gender equity in leadership and conferences of the stroke society of australasia. Cerebrovascular Diseases, 51: 125–130.

Cardel, M. I., Dean, N., and Montoya-Williams, D. 2020a. Preventing a secondary epidemic of lost early career scientists effects of covid-19 pandemic on women with children. Annals of the American Thoracic Society, 17: 1366–1370.

Cardel, M. I., Dhurandhar, E., Yarar-Fisher, C., Foster, M., Hidalgo, B., McClure, L. A., Pagoto, S. *et al.* 2020b. Turning chutes into ladders for women faculty: a review and roadmap for equity in academia. Journal of Women's Health, 29: 721–733.

Care, O., Bernstein, M., Chapman, M., Diaz Reviriego, I., Dressler, G., Felipe-Lucia, M., Friis, C. *et al.* 2021. Creating leadership collectives for sustainability transformations. Sustainability Science. 16: 703–708.

Carson, T. L., Aguilera, A., Brown, S. D., Peña, J., Butler, A., Dulin, A., Jonassaint, C. R. *et al.* 2019. A seat at the table: strategic engagement in service activities for early career faculty from underrepresented groups in the academy. Academic medicine: journal of the Association of American Medical Colleges, 94: 1089.

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Casad, B. J., Franks, J. E., Garasky, C. E., Kittleman, M. M., Roesler, A. C., Hall, D. Y., and Petzel, Z. W. 2021. Gender inequality in academia: problems and solutions for women faculty in STEM. Journal of Neuroscience Research, 99: 13–23.

Cech, E. A., and Waidzunas, T. J. 2021. Systemic inequalities for LGBTQ professionals in STEM. Science Advances, 7: eabe0933.

Chiarinotti, M., and Weber, I. 2020. Progress in Gender Equality. New Practices on Structural Change in Marine Sciences. Kiel, Germany.

Cho, A. H., Johnson, S. A., Schuman, C. E., Adler, J. M., Gonzalez, O., Graves, S. J., Huebner, J. R. *et al.* 2014. Women are underrepresented on the editorial boards of journals in environmental biology and natural resource management. PeerJ, 2014: 1–11.

Christian, K., Johnstone, C., Larkins, J. A., Wright, W., and Doran, M. R. 2021. A survey of early-career researchers in Australia. eLife, 10: 1–19.

Clancy, K. B. H., Lee, K. M. N., Rodgers, E. M., and Richey, C. 2017. Double jeopardy in astronomy and planetary science: women of color face greater risks of gendered and racial harassment. Journal of Geophysical Research: Planets, 122: 1610–1623.

Clavero, S., and Galligan, Y. 2021. Delivering gender justice in academia through gender equality plans? Normative and practical challenges. Gender, Work and Organization, 28: 1115–1132.

Corona-Sobrino, C., García-Melón, M., Poveda-Bautista, R., and González-Urango, H. 2020. Closing the gender gap at academic conferences: a tool for monitoring and assessing academic events. PLoS One, 15: e0243549.

Cowper-Coles, M., Glennie, M., Mendes, B., and Schmid, C. 2021. Bridging the gap? An analysis of gender pay gap reporting in six countries. 174.

Crenshaw, K. 1989. Demarginalizing the intersection of race and sex: A black feminist critique of antidiscrimination doctrine, feminist theory and antiracist politics. The University of Chicago Legal Forum: Chicago, USA 1 Article 8.

Cvitanovic, C., Shellock, R. J., Mackay, M., van Putten, E. I., Karcher, D. B., Dickey-Collas, M., and Ballesteros, M. 2021. Strategies for building and managing 'trust' to enable knowledge exchange at the interface of environmental science and policy. Environmental Science and Policy, 123: 179–189.

Dattani, K. 2021. Rethinking social reproduction in the time of COVID-19. The Journal of Australian Political Economy. 85: 51–56.

Davies, S. W., Putnam, H. M., Ainsworth, T., Baum, J. K., Duplouy, A., Bove, C. B., Crosby, S. C. *et al.* 2021. Promoting inclusive metrics of success and impact to dismantle a discriminatory reward system in science. PLoS Biology, 19: e3001282.

de Vries, J. 2011. Mentoring for change. Universities Australia Executive Women, Melbourne.

de Vries, J. A., and van den Brink, M. 2016. Transformative gender interventions: linking theory and practice using the "bifocal approach". Equality, Diversity and Inclusion, 35: 429–448.

De Welde, K., and Laursen, S. 2011. The glass obstacle course: informal and formal barriers for women ph. D. students in STEM fields. International Journal of Gender, Science and Technology, 3: 571–595.

de Winde, C. M., Sarabipour, S., Carignano, H., Davla, S., Eccles, D., Hainer, S. J., Haidar, M. *et al.* 2021. Towards inclusive funding practices for early career researchers. Journal of Science Policy & Governance, 18: 1–26.

Dewidar, O., Elmestekawy, N., and Welch, V. 2022. Improving equity, diversity, and inclusion in academia. Research Integrity and Peer Review, 7:1–10.

Dewitty, V. P., Tabloski, P. A., Millett, C. M., Hambrick, M. E., Shreffler, M., Downing, C. A., and Huerta, C. G. 2016. Diversifying the pipeline into doctoral nursing programs: developing the doctoral advancement readiness self-assessment. Journal of Professional Nursing, 32: 68–75.

Dovidio, J. F., Hewstone, M., Glick, P., and Esses, V. M. 2010. Prejudice, stereotyping and discrimination: theoretical and empirical overview. In The SAGE Handbook of Prejudice, Stereotyping and Discrimination, pp. 3–28. Ed. by J. F. Dovidio, M. Hewstone, P. Glick, and V. M. Esses. SAGE Publications, London.

Drew, E. 2022. Navigating unChartered waters: anchoring athena SWAN into Irish HEIs. Journal of Gender Studies, 31: 23–35.

Durbin, S., Lopes, A., and Warren, S. 2020. Challenging male dominance through the substantive representation of women: the case of an online women's mentoring platform. New Technology, Work and Employment, 35: 215–231.

Dustmann, C., and Schönberg, U. 2012. Expansions in maternity leave coverage and children's long-term outcomes. American Economic Journal: Applied Economics, 4: 190–224.

Duvander, A. Z., Lappegård, T., and Andersson, G. 2010. Family policy and fertility: fathers' and mothers' use of parental leave and continued childbearing in Norway and Sweden. Journal of European Social Policy, 20: 45–57.

Dworkin, T. M., Maurer, V., and Schipani, C. A. 2012. Career mentoring for women: new horizons/Expanded methods. Business Horizons, 55: 363–372.

Eagly, A. H., Wood, W., and Diekman, A. B. 2000. Social role theory of sex differences and similarities: a current appraisal. The developmental social psychology of gender, 12: 174.

Eagly, A., and Carli, L. 2007. Through the Labyrinth: The Truth about how Women Become Leaders. Center for Public Leadership. Harvard Business School Press, Boston.

Efstathiou, J. A., Drumm, M. R., Paly, J. P., Lawton, D. M., O'Neill, R. M., Niemierko, A., Leffert, L. R. *et al.* 2018. Long-term impact of a faculty mentoring program in academic medicine. PLoS One, 13: 1–12.

European Institute for Gender Equality. 2016. Gender Equality in Academia and Research: GEAR tool. Publications Office of the European Union, Luxembourg. http://eige.europa.eu/gender-mainstreaming (last accessed 29 November 2022).

European Institute for Gender Equality. 2021. Gender Equality in Academia and Research. https://eige.europa.eu/gender-mainstreaming/toolkits/gear/legislative-policy-backgrounds/germany (last accessed 13 July 2022).

European Institute for Gender Equality. 2022. What is gender mainstreaming. https://eige.europa.eu/gender-mainstreaming/what-is-gender-mainstreaming (last accessed 13 July 2022).

Evans, L. S., Hicks, C. C., Cohen, P. J., Case, P., Prideaux, M., and Mills, D. J. 2015. Understanding leadership in the environmental sciences. Ecology and Society, 20: 18.

Evans, T. M., Bira, L., Gastelum, J. B., Weiss, L. T., and Vanderford, N. L. 2018. Evidence for a mental health crisis in graduate education. Nature Biotechnology, 36: 282–284.

Fisher, B. J., Shiggins, C. J., Naylor, A. W., Rawlins, L. D., Tallentire, G. D., van den Heuvel, F., Poku, C. *et al.* 2021. Interventions to prevent pandemic-driven diversity loss. Communications Earth & Environment, 2: 8–11.

Fisher, J. J., and James, J. L. 2022. Know the game: insights to help early career researchers successfully navigate academia. Placenta, 125: 78–83.

Fiske, S. T. 1998. Stereotyping, prejudice, and discrimination. In The Handbook of Social Psychology, pp. 357–411. Ed. by D. Gilbert, S. T. Fiske, and G. Lindzey. McGraw-Hill. Boston, USA.

Flyvbjerg, B. 2006. Five misunderstandings about case-study research. Qualitative Inquiry, 12: 219–245.

Forrester, N. 2021. Mental health of graduate students sorely overlooked. Nature, 595: 135–137.

Fox, C. W., Ritchey, J. P., and Paine, C. E. T. 2018. Patterns of authorship in ecology and evolution : first, last, and corresponding authorship vary with gender and geography. Ecology and Evolution, 8: 11492–11507.

Fulweiler, R. W., Davies, S. W., Biddle, J. F., Burgin, A. J., Cooperdock, E. H. G., Hanley, T. C., Kenkel, C. D. *et al.* 2021. Rebuild the academy: supporting academic mothers during COVID-19 and beyond. PLoS Biology, 19: 1–11.

Downloaded from https://academic.oup.com/icesjms/article/80/1/56/6916918 by guest on 05 September 2025

Gao, J., Yin, Y., Myers, K. R., Lakhani, K. R., and Wang, D. 2021. Potentially long-lasting effects of the pandemic on scientists. Nature Communications, 12: 6–11.

Gardiner, M., Tiggemann, M., Kearns, H., and Marshall, K. 2007. Show me the money! an empirical analysis of mentoring outcomes for women in academia. Higher Education Research and Development, 26: 425–442.

Gaucher, D., Friesen, J., and Kay, A. C. 2011. Evidence that gendered wording in job advertisements exists and sustains gender inequality. Journal of Personality & Social Psychology, 101: 109–128.

GEW, UCU, and SULF. 2011. Quality in Academia and Life. A joint strategy to improve Work-Life Balance. UK.

Ghosh, R., and Reio, T. G. 2013. Career benefits associated with mentoring for mentors: a meta-analysis. Journal of Vocational Behavior, 83: 106–116.

Giakoumi, S., Pita, C., Coll, M., Fraschetti, S., Gissi, E., Katara, I., Lloret-Lloret, E. *et al.* 2021. Persistent gender bias in marine science and conservation calls for action to achieve equity. Biological Conservation, 257: 109134. .

Gibson, E. M., Bennett, F. C., Gillespie, S. M., Güler, A. D., Gutmann, D. H., Halpern, C. H., Kucenas, S. C. *et al.* 2020. How support of early career researchers can reset science in the post-COVID19 world. Cell, 181: 1445–1449.

Greider, C. W., Sheltzer, J. M., Cantalupo, N. C., Copeland, W. B., Dasgupta, N., Hopkins, N., Jansen, J. M. *et al.* 2019. Increasing gender diversity in the STEM research workforce. Science, 366: 692–695.

Gunaratnam, Y. 2003. Researching Race and Ethnicity: Methods, Knowledge and Power. Sage, London.

Handley, I. M., Brown, E. R., Moss-Racusin, C. A., and Smith, J. L. 2015. Quality of evidence revealing subtle gender biases in science is in the eye of the beholder. Proceedings of the National Academy of Sciences of the United States of America, 112: 13201–13206.

Hansford, B., Ehrich, L., and Tennent, L. 2004. Mentoring in education and other professions. Education Adminstration Quarterly, 40: 518–540.

Hein, C. J., Ten Hoeve, J. E., Gopalakrishnan, S., Livneh, B., Adams, H. D., Marino, E. K., and Susan Weiler, C. 2018. Overcoming early career barriers to interdisciplinary climate change research. Wiley Interdisciplinary Reviews: Climate Change, 9: 1–18.

Holzinger, F., Schiffbänker, H., Reidl, S., Hafellner, S., and Streicher, J. 2018. Implementing measures to promote gender equality and career opportunities of early career researchers. In Gender and Precarious Research Careers: A Comparative Analysis, pp. 209–235. Ed. byA. Murgia ,B.Poggio , andRoutledge , London, UK.

Hopp, M. D. S., Stoeger, H., Ziegler, A., Jordan, A., and Melton, T. N. 2020. The supporting role of mentees' peers in online mentoring: a longitudinal social network analysis of peer influence. Frontiers in Psychology, 11: 1–17.

Huang, J., Gates, A. J., Sinatra, R., and Barabási, A. L. 2020. Historical comparison of gender inequality in scientific careers across countries and disciplines. Proceedings of the National Academy of Sciences of the United States of America, 117: 4609–4616.

ICES. 2021. Training the next generation of editors, 2021. https://www.ices.dk/news-and-events/news-archive/news/Pages/IJMSmentor.aspx (last accessed 11 July 2022).

IOC-UNESCO. 2017. Global Ocean Science Report. The Current Status of Ocean Science around the World. Paris. https://unesdoc.unesco.org/ark:/48223/pf0000250428 (last accessed 13 December 2022).

Jeffrey, M. 2021. Racial disparities mark Ph.D. financing. Science, 374: 1038.

Johannesen, E., Ojwala, R. Auma., Rodriguez, M. C., Neat, F., Kitada, M., Buckingham, S., Schofield, C., Long, R., Jarnsäter, J., and Sun, Z. 2022. The sea change needed for gender equality. Marine Technology Society Journal, 56: 18–24.

Johnson, A., Huggans, M. J., Siegfried, D., and Braxton, L. T. 2016. Strategies for increasing diversity in the ocean science workforce through mentoring. Oceanography, 29: 46–54.

Johnson, M. O., and Gandhi, M. 2015. A mentor training program improves mentoring competency for researchers working with early-career investigators from underrepresented backgrounds. Advances in Health Sciences Education, 20: 683–689.

Johnson, W. B. 2002. The intentional mentor: strategies and guidelines for the practice of mentoring. Professional Psychology: Research and Practice, 33: 88–96.

Johri, S., Carnevale, M., Porter, L., Zivian, A., Kourantidou, M., Meyer, E. L., Seevers, J. *et al.* 2021. Pathways to justice, equity, diversity, and inclusion in marine science and conservation. Frontiers in Marine Science, 8: 1–14.

Jones, M. S., and Solomon, J. 2019. Challenges and supports for women conservation leaders. Conservation Science and Practice, 1: e36.

Kalaitzi, S., Czabanowska, K., Fowler-Davis, S., and Brand, H. 2017. Women leadership barriers in healthcare, academia and business. Equality, Diversity and Inclusion, 36: 457–474.

Kelly, R., Singh, P. A., Cedras, R., Dinoi, A., Giddens, J., Giron-Nava, A., Mason, C. *et al.* 2021. A new generation of ocean leaders. https://theconversation.com/a-new-generation-of-ocean-leaders-158321 (last accessed 1 July 2022).

Kern, C. C., Kenefic, L. S., and Stout, S. L. 2015. Bridging the gender gap: the demographics of scientists in the USDA forest service and academia. Bioscience, 65: 1165–1172.

Keynejad, R. C., Yapa, H. M., and Ganguli, P. 2021. Achieving the sustainable development goals: investing in early career interdisciplinarity. Humanities and Social Sciences Communications, 8: 6–10.

Kong, S., Carroll, K., Lundberg, D., Omura, P., and Lepe, B. 2020. Reducing gender bias in STEM. MIT Science Policy Review, 1: 55–63.

Laland, K. N. 2020. Racism in academia, and why the 'little things' matter. Nature, 584: 653–654.

Latimer, J., Cerise, S., Ovseiko, P. V., Rathborne, J. M., Billiards, S. S., and El-Adhami, W. 2019. Australia's strategy to achieve gender equality in STEM. The Lancet, 393: 524–526.

Latu, I. M., Mast, M. S., Lammers, J., and Bombari, D. 2013. Successful female leaders empower women's behavior in leadership tasks. Journal of Experimental Social Psychology, 49: 444–448.

Lawless, S., Cohen, P. J., Mangubhai, S., Kleiber, D., and Morrison, T. H. 2021. Gender equality is diluted in commitments made to small-scale fisheries. World Development, 140: 105348.

Lee, R. Van Der, and Ellemers, N. 2015. Gender contributes to personal research funding success in the netherlands. PNAS, 112: 12349–12353.

Light, A. E., Benson-Greenwald, T. M., and Diekman, A. B. 2022. Gender representation cues labels of hard and soft sciences. Journal of Experimental Social Psychology, 98: 104234.

Liverman, D., Nying, P., Stendahl, K., Gay-antaki, M., Craig, M., Bynoe, P., Call, F. *et al.* 2022. Survey of gender bias in the IPCC. Nature, 602: 30–32.

Llorens, A., Tzovara, A., Bellier, L., Bhaya-Grossman, I., Bidet-Caulet, A., Chang, W. K., Cross, Z. R. *et al.* 2021. Gender bias in academia: a lifetime problem that needs solutions. Neuron, 109: 2047–2074.

Lupon, A., Rodríguez-Lozano, P., Bartrons, M., Anadon-Rosell, A., Batalla, M., Bernal, S., Bravo, A. G. *et al.* 2021. Towards women-inclusive ecology: representation, behavior, and perception of women at an international conference. PloS One, 16: e0260163.

Maas, B., Pakeman, R. J., Godet, L., Smith, L., Devictor, V., and Primack, R. 2021. Women and global south strikingly underrepresented among top-publishing ecologists. Conservation Letters, 14: e12797.

Mackay, B., Roux, J.-P., and Bouwer, R. 2020. Building capacity in early career researchers: insights from an international climate research programme. https://www.africaportal.org/publications/building-research-capacity-early-career-researchers-insights-international-climate-research-programme/ (last accessed 29 November 2022).

Maddrell, A., Thomas, N., and Wyse, S. 2019. Glass ceilings and stone floors: an intersectional approach to challenges UK geographers face across the career lifecycle. Geografiska Annaler: Series B Human Geography, 101: 7–20.

Downloaded from https://academic.oup.com/icesjms/article/80/1/56/6916918 by guest on 05 September 2025

Mahmoudi, M., and Keashly, L. 2021. Filling the space: a framework for coordinated global actions to diminish academic bullying. Angewandte Chemie - International Edition, 60: 3338–3344.
Malisch, J. L., Harris, B. N., Sherrer, S. M., Lewis, K. A., Shepherd, S. L., McCarthy, P. C., Spott, J. L. *et al.* 2020. Opinion: in the wake of COVID-19, academia needs new solutions to ensure gender equity. Proceedings of the National Academy of Sciences of the United States of America, 117: 15378–15381.
Manchester, C. F., Leslie, L. M., and Kramer, A. 2013. Is the clock still ticking? an evaluation of the consequences of stopping the tenure clock. Industrial and Labor Relations Review, 66: 3–31.
Manfredi, S. 2017. Increasing gender diversity in senior roles in HE: who is afraid of positive action? Administrative Sciences, 7: 19.
Marshall, N. A., Friedel, M., van Klinken, R. D., and Grice, A. C. 2011. Considering the social dimension of invasive species: the case of buffel grass. Environmental Science and Policy, 14: 327–338.
Maxwell, N., Connolly, L., and Ní Laoire, C. 2019. Informality, emotion and gendered career paths: the hidden toll of maternity leave on female academics and researchers. Gender, Work and Organization, 26: 140–157.
McKinnon, M., and O'Connell, C. 2020. Perceptions of stereotypes applied to women who publicly communicate their STEM work. Humanities and Social Sciences Communications, 7: 1–8.
Minello, A. 2020. The pandemic and the female academic. Nature: 17–19.
Mitchneck, B., Smith, J. L., and Latimer, M. 2016. A recipe for change: creating a more inclusive academy. Science, 352: 148–149.
Moher, D., Naudet, F., Cristea, I. A., Miedema, F., Ioannidis, J. P. A., and Goodman, S. N. 2018. Assessing scientists for hiring, promotion, and tenure. PLoS biology, 16: e2004089.
Moran , Karlin, L., Lauchlan, E., Rappaport, S.J., Bleasdale, B., Wild, L., and Dorr, J. 2020. What researchers think about the culture they work in. Wellcome Open Research. https://wellcomeopenresearch.org/articles/5-201/v1 (last accessed 13 December 2022).
Mori, A. S. 2021. Diversity, equity, and inclusion in academia to guide society. Trends in Ecology & Evolution, 37: 1–4.
Mtwisha, L., Jackson, J., Mitchel, A., de-Graft Aikins, A., Kebirungi, H., Outtara, K., and Viney, C. 2021. Early- and mid-career transitions to research leadership in Africa. Wellcome Open Research, 6: 1–13.
Murphy, M. C., Steele, C. M., and Gross, J. J. 2007. Signaling threat. How situational cues affect women in math, Science, and Engineering Settings. Psychological Science, 18: 879–885.
Nash, K. L., Alexander, K., Melbourne-Thomas, J., Novioaglio, C., Sbrocchi, C., Villanueva, C., and Pecl, G. T. 2021. Developing achievable alternate futures for key challenges during the UN decade of ocean science for sustainable development. Reviews in Fish Biology and Fisheries, 32: 19–36.
National Academies of Sciences, E. and M. 2020. Promising Practices for Addressing the Underrepresentation of Women in Science, Engineering, and Medicine: Opening Doors. National Academies Press, Washington.
Nature. 2022. The case for lotteries as a tiebreaker of quality in research funding. Nature, 609: 653.
Ni, C., Smith, E., Yuan, H., Larivière, V., and Sugimoto, C. R. 2021. The gendered nature of authorship. Science Advances, 7: eabe4639.
Nicholas, D., Watkinson, A., Boukacem-Zeghmouri, C., Rodríguez-Bravo, B., Xu, J., Abrizah, A., Świgoń, M. *et al.* 2019. So, are early career researchers the harbingers of change? Learned Publishing, 32: 237–247.
Nielsen, W., Alegria, S., Börjeson, L., Falk-krzesinski, H. J., Joshi, A., Leahey, E., Smith-doerr, L. *et al.* 2017. Correction: gender diversity leads to better science. Proceedings of the National Academy of Sciences of the United States of America, 114: E2796.
Niner, H. J., and Wassermann, S. N. 2021. Better for whom ? Leveling the Injustices of International Conferences by Moving Online. Frontiers in Marine Science, 8: 1–15. 638025.
Noon, M. 2010. The shackled runner: time to rethink positive discrimination? Work, Employment and Society, 24: 728–739.
Norström, A. V., Cvitanovic, C., Löf, M. F., West, S., Wyborn, C., Balvanera, P., Bednarek, A. T. *et al.* 2020. Principles for knowledge coproduction in sustainability research. Nature Sustainability, 3: 182–190.
Nyboer, E. A., Reid, A. J., Jeanson, A. L., Kelly, R., Mackay, M., House, J., Arnold, S. M. *et al.* 2022. Goals, challenges, and next steps in transdisciplinary fisheries research: perspectives and experiences from early-career researchers. Reviews in Fish Biology and Fisheries.
O'Connell, C., and McKinnon, M. 2021. Perceptions of barriers to career progression for academic women in STEM. Societies, 11: 27.
Odedina, F. T., and Stern, M. C. 2021. Role of funders in addressing the continued lack of diversity in science and medicine. Nature Medicine, 27: 1859–1861.
OECD. 2021. Challenges and new demands on the academic research workforce. OECD Science, Technology and Innovation Outlook 2021: Times of Crisis and Opportunity. OECD Publishing, Paris.
Ovseiko, P. V., Chapple, A., Edmunds, L. D., and Ziebland, S. 2017. Advancing gender equality through the athena SWAN charter for women in science: an exploratory study of women's and men's perceptions. Health Research Policy and Systems, 15: 1–13.
Pannell, J. L., Dencer-Brown, A. M., Greening, S. S., Hume, E. A., Jarvis, R. M., Mathieu, C., Mugford, J. *et al.* 2019. An early career perspective on encouraging collaborative and interdisciplinary research in ecology. Ecosphere, 10: 1–12.
Pardo, J. C. F., Ramon, D., Stefanelli-Silva, G., Elegbede, I., Lima, L. S., and Principe, S. C. 2020. Advancing through the pandemic from the perspective of marine graduate researchers: challenges, solutions, and opportunities. Frontiers in Marine Science, 7: 1–7.
Park, H. J., Cohen, G. L., Cook, J. E., Smyth, J. M., and Purdie-greenaway, V. 2022. Lower SES Ph.D students experience interpersonal disconnection from others both inside and outside of academia. Journal of Social Issues: 1–29.
Parmaxi, A., and Vasiliou, C. 2015. Communities of interest for enhancing social creativity: the case of womenpower platform. Proceedings of INTED2015 Conference 2nd–4th March 2015. 2838–2847pp.
Penfield, T., Baker, M. J., Scoble, R., and Wykes, M. C. 2014. Assessment, evaluations, and definitions of research impact : a review. Research Evaluation, 23: 21–32.
Pietri, E. S., Hennes, E. P., Dovidio, J. F., Brescoll, V. L., Bailey, A. H., Moss-Racusin, C. A., and Handelsman, J. 2019. Addressing unintended consequences of gender diversity interventions on women's sense of belonging in STEM. Sex Roles, 80: 527–547.
Pinar, M., and Unlu, E. 2020. Evaluating the potential effect of the increased importance of the impact component in the research excellence framework of the UK. British Educational Research Journal, 46: 140–160.
Reese, T. A., Harris-Tryon, T. A., Gill, J. G., and Banaszynski, L. A. 2021. Supporting women in academia during and after a global pandemic. Science Advances, 7: 2–4.
Research Excellence Framework. 2021. Results and submissions https://results2021.ref.ac.uk (last accessed 8 July 2022).
Reuben, E., Sapienza, P., and Zingales, L. 2014. How stereotypes impair women's careers in science. Proceedings of the National Academy of Sciences of the United States of America, 111: 4403–4408.
Reynolds, A., O'Mullan, C., Pabel, A., Martin-Sardesai, A., Alley, S., Richardson, S., Colley, L. *et al.* 2018. Perceptions of success of women early career researchers. Studies in Graduate and Postdoctoral Education, 9: 2–18.
Rollock, N. 2019. Staying power: the career experiences and strategies of UK black female professors. UN Technical Report. 1–40.
Rosa, R., and Clavero, S. 2022. Gender equality in higher education and research. Journal of Gender Studies, 31: 1–7.
Sarabipour, S., Khan, A., Seah, Y. F. S., Mwakilili, A. D., Mumoki, F. N., Sáez, P. J., Schwessinger, B. *et al.* 2021. Changing scientific meetings for the better. Nature Human Behaviour, 5: 296–300.
Sardelis, S., Oester, S., and Liboiron, M. 2017. Ten strategies to reduce gender inequality at scientific conferences. Frontiers in Marine Science, 4: 1–6.

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Schadeberg, A., Ford, E., Wieczorek, A. M., Gammage, L. C., López-acosta, M., Buselic, I., Dermastia, T. T. *et al.* 2022. Productivity, pressure, and new perspectives: impacts of the COVID-19 pandemic on marine early-career researchers. ICES Journal of Marine Science, 79: 1–13.

Schipper, E. L. F., Ensor, J., Mukherji, A., Mirzabaev, A., Fraser, A., Harvey, B., Totin, E. *et al.* 2021. Equity in climate scholarship: a manifesto for action. Climate and Development, 13: 853–856.

Schriever, V., and Grainger, P. 2019. Mentoring an early career researcher: insider perspectives from the mentee and mentor. Reflective Practice, 20: 720–731.

Sellberg, M. M., Cockburn, J., Holden, P. B., Lam, D. P. M., Sellberg, M. M., Cockburn, J., Holden, P. B. *et al.* 2021. Towards a caring transdisciplinary research practice: navigating science, society and self. Ecosystems and People, 17: 292–305.

Shah, A., Lopez, I., Surnar, B., Sarkar, S., Duthely, L. M., Pillai, A., Salguero, T. T. *et al.* 2021. Turning the tide for academic women in STEM : a postpandemic vision for supporting female scientists. ASC Nano, 15: 18647–18652.

Shaw, A. K., and Stanton, D. E. 2012. Leaks in the pipeline: separating demographic inertia from ongoing gender differences in academia. Proceedings of the Royal Society B: Biological Sciences, 279: 3736–3741.

Shellock, R. J., Cvitanovic, C., Mackay, M., McKinnon, M. C., Blythe, J., Kelly, R., van Putten, I. E. *et al.* 2022. Breaking down barriers: the identification of actions to promote gender equality in interdisciplinary marine research institutions. One Earth, 5: 687–708.

Sheltzer, J. M., and Smith, J. C. 2014. Elite male faculty in the life sciences employ fewer women. PNAS, 111: 10107–10112.

Shen, H. 2013. Mind the (gender) gap. Nature, 495: 22–24.

Smith, N. S., Côté, I. M., Martinez-Estevez, L., Hind-Ozan, E. J., Quiros, A. L., Johnson, N., Green, S. J. *et al.* 2017. Diversity and inclusion in conservation: a proposal for a marine diversity network. Frontiers in Marine Science, 4: 1–7.

Snyder, H. 2019. Literature review as a research methodology: an overview and guidelines. Journal of Business Research, 104: 333–339.

Sobey, A. J., Townsend, N. C., Metcalf, C. D., Bruce, K. D., and Fazi, F. M. 2013. Incorporation of early career researchers within multidisciplinary research at academic institutions. Research Evaluation, 22: 169–178.

St Clair . 2021. Sexual Harassment in Marine Science. Women in Ocean Science C.I.C.

Staniscuaski, F., Kmetzsch, L., Soletti, R. C., Reichert, F., Zandonà, E., Ludwig, Z. M. C., Lima, E. F. *et al.* 2021. Gender, race and parenthood impact academic productivity during the COVID-19 pandemic: from survey to action. Frontiers in Psychology, 12: 1–14.

Staniscuaski, F., Reichert, F., Werneck, F. P., de Oliveira, L., Mello-Carpes, P. B., Soletti, R. C., Infanger Almeida, C. *et al.* 2020. Impact of COVID-19 on academic mothers. Science, 368: 724.

Starman, A. B. 2013. The case study as a type of qualitative research. Journal of Contemporary Educational Studies, 64: 28–43.

STEM Women. 2019. Positive action vs positive discrimination: what can your company do to lawfully encourage more female applicants? https://www.stemwomen.com/positive-action-vs-positive-discrimination-what-can-your-company-do-to-lawfully-encourage-more-female-applicants (last accessed 6 July 2022).

Sylvia, B., Hewlett, A., Luce, C. B., Servon, L. J., Sherbin, L., Shiller, P., Sosnovich, E. *et al.* 2008. The Athena Factor: Reversing the Brain Drain in Science, Engineering, and Technology. Harvard Business Review: Boston, USA.

Täuber, S., and Mahmoudi, M. 2022. How bullying becomes a career tool. Nature Human Behaviour, 6: 475.

The Scientist. 2019. As Visa Difficulties Persist, Scientists Push for Change. https://www.the-scientist.com/news-opinion/as-visa-difficulties-persist--scientists-push-for-change-66114P (last accessed 29 November 2022).

Thomson, A., Palmén, R., Reidl, S., Barnard, S., Beranek, S., Dainty, A. R. J., and Hassan, T. M. 2022. Fostering collaborative approaches to gender equality interventions in higher education and research: the case of transnational and multi-institutional communities of practice. Journal of Gender Studies, 31: 36–54. .

Thomson Reuters Practical Law. 2022. Positive action. https://uk.practicallaw.thomsonreuters.com/7-200-3418?transitionType=Default&contextData=(sc.Default)&firstPage=true (last accessed 2 December 2022).

UN Women. 2022. Women's Leadership and Political Participation. https://www.unwomen.org/en/what-we-do/leadership-and-political-participation (last accessed 7 October 2022).

United Nations General Assembly. 2015. Transforming Our World: The 2030 Agenda for Sustainable Development. United Nations, New York, USA.

Universities and Colleges Employers Association, The European Federation of Education Employers, and European Trade Union Committee for Education. 2015. Supporting Early Career Researchers in Higher Education in Europe: The Role of Employers and Trade Unions. http://educationemployers.eu/wp-content/uploads/2016/07/Final-Report-Supporting-ECR.pdf (last accessed 2 December 2022).

Van Noorden, R. 2018. Leadership problems in the lab. Nature, 557: 294–296.

Van Oosten, E. B., Buse, K., and Bilimoria, D. 2017. The leadership lab for women: advancing and retaining women in STEM through professional development. Frontiers in Psychology, 8: 2138.

Van Stavel, J., Horstmann, C., Satterthwaite, E., Elsler, L., Muller-Karger, F., Bushnell, M., Pearlman, J. *et al.* 2021. Towards an increase in diversity, equity and inclusion in international ocean observing practices and initiatives. OCEANS 2021, San Diego, Porto, 1–6.

Vasquez, R., and Pandya, A. G. 2020. Successful mentoring of women. International Journal of Women's Dermatology, 6: 61–62.

Velin, L., Lartigue, J. W., Johnson, S. A., Zorigtbaatar, A., Kanmounye, U. S., Truche, P., and Joseph, M. N. 2021. Conference equity in global health: a systematic review of factors impacting LMIC representation at global health conferences. BMJ Global Health, 6: 1–14.

Vila-Concejo, A., Gallop, S. L., Hamylton, S. M., Esteves, L. S., Bryan, K. R., Delgado-Fernandez, I., Guisado-Pintado, E. *et al.* 2018a. Steps to improve gender diversity in coastal geoscience and engineering. Palgrave Communications, 4: 1–9.

Welch, J. L., Wiehe, S. E., Palmer-Smith, V., and Dankoski, M. E. 2011. Flexibility in faculty work-life policies at medical schools in the big ten conference. Journal of Women's Health, 20: 725–732.

Wijnen, M. N., Massen, J. J. M., and Kret, M. E. 2021. Gender bias in the allocation of student grants. Scientometrics, 126: 5477–5488. .

Wiley. 2021. Early career researcher editorial boards: turning engagement into inclusion. https://www.wiley.com/network/archive/early-career-researcher-editorial-boards (last accessed 11 July 2022).

Woolston, C. 2021. The blight of burnout and imposter syndrome. Nature, 599: 703–705.

Yousaf, R., and Schmiede, R. 2017. Barriers to women's representation in academic excellence and positions of power. Asian Journal of German and European Studies, 2: 1–13.

Zhang, L., Sivertsen, G., Du, H., Huang, Y., and Glänzel, W. 2021. Gender differences in the aims and impacts of research. Scientometrics, 126: 8861–8886.

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