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| **Obstacle** | **Individual actions for ECRs** | **Institutional actions** | **Actions by the wider research community** | **Examples in MEASO** |
| **Pressure to network**  The highly competitive nature of modern academia, places huge amounts of pressure on ECRs to network with senior researchers at conferences and meetings. | **Mentoring and sponsorship** | | | |
| * Engage in a mentoring program to develop relationships with senior researchers (Fenton et al. 2016) * Find a personal sponsor who can enhance your visibility, credibility, and professional networks (Gottlieb et al. 2018) | * International and diverse (including generational diversity) supervisory teams * Institutions should introduce opportunities for ECRs to find and network with sponsors * Formal mentor training programmes for supervisory staff | * Create mechanisms for ECRs to contact potential mentors inside and outside their home institution (e.g. APECS mentor database) | * Mentoring program at MEASO 2018 |
| **Involvement in organisations and research networks** | | | |
| * ECRs should get involved in organisations and research networks early to benefit their career (Ansmann et al. 2014; Bohleber et al. 2020) * Utilise social media platforms * ECR workshops can be a less intimidating way to network with other researchers | * Organise and encourage ECR engagement in events such as seminars and workshops | * Options for remotely attending conferences and meetings accommodate ECRs with limited travel funding (Bradley et al. 2020) or disabilities * ECR involvement in local organisations, conference organisation, session chairing, panels and conference-associated workshops should be encouraged and supported * Invite ECRs to give talks in conferences and other events | * Many ECRs were involved in the planning of MEASO2018 * MEASO waived the registration fee for ECR organisers and prize winners * Co-hosted an ECR workshop with APECS * ECRs gave the final remarks of each theme at the end of MEASO2018 * ECRs co-chaired conference sessions * Remote attendance was offered for the MEASO 2019 Woking workshop * A MEASO ECR led Pew funded project conceptualised from MEASO introductions and discussions which resulted in a Nature publication (Cavan et al. 2019) |
| **Competition**  ECRs compete with mid-career and senior researchers, and in some cases their supervisors and team members, for funding and topics in Antarctic science. | **Skill development** | | | |
| * Utilise ECR status to attend training programmes including practical certifications and research training * Engage in writing projects or short-term visits abroad as a principal investigator | * Institutes should encourage a minimum quota of ECRs within research programmes and incorporate career succession into PhD programs * Utilise local expertise to train ECRs in-house * Promote more humane, collaborative, and healthy work environments that discourage competition (Maestre 2019) | * Encourage additional training through course discounts or free online courses * Provide small research grants that support collaborations and publication costs e.g. SCAR and CCAMLR Fellowships | * ECRs were specifically asked to provide content for the SOKI pages on Antarctic and Southern Ocean biota and ecosystems * ECRs lead and co-authored manuscripts for this special issue |
| **Pressure to publish**  Researchers are evaluated based on publication and citation numbers (Chapman et al. 2019). Many ECRs publish within their PhD but are not yet established enough to be invited to co-author manuscripts or take on these additional tasks without support or funding, both of which are imperative to the success of the project. | **Valuing alternative research outcomes and activities** | | | |
| * Recognizing other research outcomes and activities alongside publications | * Contribution to policy reports and online articles, organisation of scientific events, public outreach, teaching and mentoring, all require skill and expertise and should be more valued | * The inclusion of awards for ECRs at scientific events provides measurable CV-specific outputs for potential employers * Awards can lead to tangible outcomes for ECRs further into their careers | * ECR presentations and posters were awarded at the end of the MEASO 2018 conference, many of which were published later, e.g. Ericson et al. (2018), Weldrick et al. (2019), Hellesey et al. (2020) * ECRs were interviewed by local radio stations during the conference |
| **Facilitate the successful publication of ECR research** | | | |
| * Seek involvement in collaborative projects that could lead to research projects and co-authorship | * Mentors and senior researchers should invite meritorious ECRs to contribute to research papers (Maestre 2019) | * Invite ECRs to co-author papers * Establish an ECR quota on fee waivers for ECRs in journals, especially as open access publishing is becoming more common | * Many ECRs participated as lead and co-authors in this special issue as well as in earlier MEASO publications (e.g. Brasier et al. 2019). As MEASO applied an inclusive and collaborative approach, ECRs had a good example of how coauthors should behave for future papers where they are involved. |
| **Academic job market and career uncertainty**  The lack of jobs in academia and highly competitive nature of funding schemes can make relocation for research an essential part of a career in polar science (Skakni et al. 2019).  Short-time term contracts can limit research output and prevent settling into a new job, e.g. meeting colleagues and integrating into a new institute. | **Interdisciplinary networks and parties** | | | |
| * Seek involvement in NGOs, national parties of Antarctic organisations (e.g. CCAMLR) or in international initiatives | * Paid internships and fellowships in different sectors, e.g. policy and management | * Involvement of NGOs, companies, etc. in conferences. | * Policymakers, stakeholders and NGOs were represented at MEASO2018 and consulted throughout manuscript development of MEASO special issue articles |
| **Contracts and funding** | | | |
| * ECRs may combine their short-term fellowships with grants to attend conferences and do short research visits abroad, although these fellowships generally only cover travel plus living costs | * Institutes should prioritize creating long-term contracts (>1 year) * Remove financial barriers by covering the costs of relocation for ECRs * Host workshops on how to attract funding and how to generate successful multidisciplinary funding bids (Sobey et al. 2013) | * Short-term research visits could provide a solution for those unable to relocate, allowing ECRs to acquire the necessary training abroad before returning home to complete their research * Long-term support programs are needed within and between institutions * Research grants should include salaries for ECRs | * MEASO employed several temporary ECR workers from 6-18 months but due to funding uncertainty, longer-term contracts were not possible |
| **Work-life balance**  Maintaining a work-life balance runs parallel to the academic culture of productivity and publication outputs (Bielczyk et al 2019). Without consideration for personal well-being, ECRs run the risk of experiencing burn out and mental health issues (e.g. Petersen 2011). | **Support and self-care** | | | |
| * Negotiating flexible working arrangements to meet individual well-being needs * Select research laboratory groups with project leaders that support flexibility (Maestre 2019) * Seek help and guidance in times of need | * Designated counselling staff with (free) drop-in sessions available on a regular basis * Well-being workshops, e.g. sport or stress relief sessions * Mental-health first aid training should be compulsory for at least all supervisors and faculty | * Discussion of healthy work-life balance and mental health issues must be normalized | * Meeting notes were circulated for those unable to attending online lead author and committee meetings |
| **Family-friendly support** | | | |
| * Joining parenting networks at work or online can support isolated groups and provide resources for parents in academia, e.g. aKIDemic life (https://akidemiclife.com/) | * Workplace adjustments to create a family-friendly environment, including parental leave for both parents, flexible working arrangements, and establishing institutional childcare * Funding agencies and fellowships do not cover childcare as a travel expense (Bradley et al. 2020) which should change * Provide care and support staff for PhD students and ECRs. With opportunities for regular catch ups or drop in sessions | * Conference organisers should include family-friendly options (see Calisi 2018 for details) | * MEASO2018 provided free on-site childcare facilities and personnel for all attendees |
| **Language barriers**  ECRs that come from non-English speaking countries cannot easily express their ideas effectively in an English-only environment. This limits their potential output and restricts the reach of their research.  Additionally, terminology between disciplines can be a barrier for collaboration across science, policy, and the social sciences (Pannell et al. 2019). | **Language training** | | | |
| * ECRs should make use of language training programs offered on both web-based and local platforms | * Institutes should offer additional language training with reduced costs | * The provision of translators or interpreters at conferences to remove language barriers and increase communication * Translation of conference materials and meeting outcomes to the main languages of the attendees |  |
| **Terminology** | | | |
| * Involvement in national parties of Antarctic organisations (e.g. CCAMLR) or in international initiatives (such as MEASO) | * Free or discounted copy-editing services for non-English speaking ECRs * Increase awareness among non-English speaking ECRs of such services * Increase the impetus on the English-speaking ECR community to support their non-English-speaking ECR colleagues by offering proof-reading services | * Panell et al. (2019) suggest that facilitated knowledge sharing and normalizing progress reporting between projects could overcome terminological barriers | * MEASO2018 held a session that brought together policymakers and scientists to find common ground in terms of language and knowledge exchange * MEASO will publish a plain English summary highlighting key messages for policymakers and stakeholders * At the MEASO Woking workshop there was discussion about translating the MEASO summary for policymakers into languages used by the Antarctic Treaty System |
| **Voicing an opposing opinion**  ECRs can be hesitant to publish controversial research or object to proposed projects (e.g. comment on the Australian Aerodrome EPBC act) for fear of damage to future career prospects in Antarctic science. | * Utilise opportunities to discuss your scientific opinions or research ideas in a safe space before voicing to a larger audience. * By teaming up with other ECRs from the same institute or research network, opinions are more likely to be voiced and taken into consideration | * Institutes should offer related workshops to help establish a culture of exchanging different opinions | * Invoke a code of conduct that aims to provide a harassment-free conference experience for the attendees (including ECRs) | * The MEASO process aimed to provide an unbiased assessment of the literature which represented diverse scientific perspectives |
| **Discrimination**  ECRs often provide new perspectives and offer novel solutions for a problem, which allows them to question traditional methods and theories. However, due to their early career status or gender, they are often not taken seriously by established researchers. Discrimination as a result of someone's age, career stage, class, race and gender should not be tolerated. | * Join groups that promote diversity in science such as Pride in Polar Research or Women in Polar Science * Make use of counselling sessions and seek guidance on how best to report harassment or misconduct | * Institutes should have clear and accessible reporting mechanisms for harassment, abuse or bullying at the workplace with appropriate penalties and transparent processes. * Discrimination based on career stage or sex will be reduced by establishing diverse leadership teams at institutions * Senior researchers need to re-evaluate priorities so that mentorship and investment in the success of ECRs are part of their legacy and valued as part of their accomplishments (e.g. the APECS mentorship award) | * Supporting working groups that promote diversity e.g. Pride in polar science and Women in Polar Science * Supporting ECR voices by recognizing the power differentials in the hierarchical nature of science * Promote diversity by leading by example e.g. representation on selection panels and committees (Nash et al. 2019). | * MEASO 2018 hosted a Women in Antarctic Science breakout session * MEASO ensured that on-site participation for the workshop in June 2019 was diverse across gender, nations, expertise, and experience |

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