

# Transnational Intersectionality at Sea: Gender, Appearance, Ethnicity, Age, and Marine Knowledge Production

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## Abstract

Knowledge production is inherently social, as humans interpret their environment. Scientific knowledge production differs from non-scientific production in its systematic data collection for validation, yet both involve a social element shaping our understanding of the world. This article investigates social contestation processes as part of knowledge production processes on a German research vessel and in German and Brazilian marine science institutes, with a particular focus on the social identity markers of gender, ethnicity, and age and how they affect team-based sense-making processes. Methodologically, our research draws on participant observation of marine scientists and associated non-scientists in their daily working routines as well as semi-structured interviews. This took place on a research vessel in 2021 and in marine science institutes from 2022 to 2024. Conceptually, the research follows approaches of the sociology of knowledge and intersectional approaches that integrate transnational experiences across national borders and other (physical) boundaries. Based on this empirical research, we assess transnational intersectional sense-making practices at sea. Our findings show that (sexual) harassment in marine knowledge production processes occurs independent of localities, intersectional discrimination at sea leads either to emancipation processes or to withdrawal, and tensions arise in particular between scientists and non-scientists, which broadens the gap between these social groups and knowledge systems. We conclude by providing recommendations for a more diverse workforce at sea and in marine sciences so that the conduct of research and work at sea can be more inclusive, equal, and safe.

## Keywords

blue economy; gender equality; intersectionality; knowledge sociology; marine science

## 1. Introduction

Among the “transformative ocean science solutions” in the mission of the UN Decade of Ocean Science for Sustainable Development is the aimed-for outcome of “open and equitable access to data, information and technology and innovation” during and after the decade ending in 2030 (Intergovernmental Oceanographic Commission, 2021, p. 8). Empowering women in marine sciences, science policy, and other marine occupations represents a crucial component of these goals (Intergovernmental Oceanographic Commission, 2021). Although the *Global Ocean Science Report* (Intergovernmental Oceanographic Commission, 2020) states that 39% of marine scientists globally are women, women remain underrepresented in decision-making and leadership roles (Shellock et al., 2022, 2023; Sun et al., 2023). Only 1.28% of seafarers globally are women and these mainly work in stereotypical roles in catering and hotel sections of vessels (Kitada, 2022). The maritime industry sector and marine sciences still represent homogenous work environments dominated by men (Giakoumi et al., 2021; Johannesen et al., 2023). Yet, women’s contributions are often overlooked, including their socio-ecological linkages to fisheries, maritime industries and blue economy, sustainable development, and marine conservation (Gissi et al., 2018). Besides gender imbalances in marine (science) institutes and organisations such as the International Council for the Exploration of the Sea, and a female gender gap at senior-levels (Johannesen et al., 2023; Shellock et al., 2022), barriers exist to the collection of gender-related data in marine sciences (Kitada et al., 2023). Therefore, collecting disaggregated data on gender in marine sciences on the micro-level (cf. Elliker, 2017) beyond armchair analyses remains crucial and constitutes a research gap we aim to fill. We even take a further step by mapping thus far neglected intersectionality in marine knowledge production processes and analysing the effects of intersectional discrimination in working at sea.

## 2. Following Seafarers, Marine Scientists, and Technicians: An Ethnography of Work at Sea

Our analysis is based on in-depth ethnographic fieldwork conducted on land and at sea between April 2021 and January 2024. Methods used include participant observation and go-along (Kusenbach, 2003) on a German research vessel and two merchant vessels, as well as in laboratories, meetings, workshops, conferences, and everyday work at offices in five Brazilian and German marine science institutes and universities. The country and interlocutor selections are based on an interdisciplinary joint project of Brazilian and German research institutes that aims to expand marine carbon observations (for more details see Funding). Our primary research interest was the analysis of knowledge production processes in marine carbon observations. We approached the field in an explorative and inductive way and realised that topics of gender, transcultural, and epistemic (in)equalities, as well as (sexual) verbal or physical harassment and discrimination, emerged repeatedly throughout the research. As part of the research, 82 semi-structured interviews with marine scientists and (laboratory) technicians in science institutes, and with seafarers of the German research vessel *Maria S. Merian* were conducted during a seven-week expedition (for the interview questions, see Supplementary File). We guaranteed the anonymity of the interviewees and audio-recorded and transcribed the interviews. Of the interviews, 30 were conducted in English and 52 in German; 35 interviewees identified as women and 47 as men. No interviewee identified as non-binary. Only one woman, compared to 25 men, worked as a non-scientist, e.g., as a crewmember of the research vessel or as a (laboratory) technician. Out of the 24 crewmembers on the research vessel *Maria S. Merian*, two were women (one of whom declined the interview request), reflecting the low proportion of female seafarers (cf. Kitada, 2022). Of the interviewees, 34 females and 22 males worked as (marine) scientists.

We aggregated the information on the interviewees through the creation of categories, which makes it easier to put the referenced 82 interviewees into the context of age, gender, and ethnicity (see Table 1). The term “ethnicity” includes nationality as both concepts shape social identities, belonging, and group memberships. In our interviews, these concepts were used interchangeably by the interviewees and reflected their origin, culture, collective identity, and language—both applicable to nationality and ethnicity.

**Table 1.** Interviewees (scientists and non-scientists) categorised by gender, age group, ethnicity, highest degree, country of work, and interview group.

Gender	Age group	Ethnicity	Highest degree	Country of work	Referred to as	No. of interviewees
<b>Scientists</b>						
female	19–37	Brazilian (5) Colombian (1)	BA (1) MA (3) PhD (2)	Brazil (4) UK (1) Germany (1)	Interview group 1	6
male	19–37	Brazilian (2)	MA (2)	Brazil (1) Germany (1)	Interview group 2	2
female	19–37	German (11) Sweden (1) New Zealander (1)	A-level (3) BA (3) MA (2) PhD (5)	Germany (13)	Interview group 3	13
male	19–37	German (7)	A-level (1) BA (4) MA (1) State examination (1)	Germany (7)	Interview group 4	7
female	38–62	Brazilian (10) Brazilian-German (1) Brazilian-UK (1) Mexican (1)	Post-Doc (3) Professorship (10)	Brazil (12) Germany (1)	Interview group 5	13
male	38–62	Brazilian (5)	Post-Doc (1) Professorship (2) Director (1) Vice Director (1)	Brazil (5)	Interview group 6	5
female	38–62	German (2)	Post-Doc (2)	Germany (2)	Interview group 7	2
male	38–62	German (7) Canadian (1)	Post-Doc (4) Professorship (4)	Germany (7) Canada (1)	Interview group 8	8
<b>Non-scientists</b>						
female	28	German (1)	BA (1)	Germany (1)	Interview 8	1
male	19–37	German (25)	Apprenticeship (5) BA (4)	Germany (25)	Interview group 9	9
	38–65		Apprenticeship (7) medicine (1)* MA (5)** PhD (3)**		Interview group 10	16
						Total: 82

Notes: \* Ship’s doctor; \*\* Five interviewees hold an MA degree and three a PhD, but they work as (laboratory) technicians, which does not require such a degree.

Moreover, field notes of everyday working processes and team negotiations, as well as scientific and secondary literature, contributed to the empirical data. Besides the quantification of the categories in Table 1 and the numbers in Section 4, we want to note that we only collected qualitative data and did not aim for a quantification of intersectionality at sea. The number of interviewees ( $n = 82$ ) and the interview questions (see Supplementary File) support our claim not necessarily to reduce gender inequality, intersectional harassment, and discrimination to quantification (cf. Morley, 2011), but rather to give voice to the affected people through interview quotes.

### 3. Transnational Intersectionality at Sea: A Research Gap and a Conceptual Framework

Research on diversity, inequality, and discrimination in marine sciences and industry predominately focuses on gender (in)equality and thus on female scientists or seafarers. Kitada (2022, p. 240) researched women working in the maritime sector, where they face (sexual) harassment in their workplace or during their training. She moreover revealed that shipping companies tend to avoid employing women since their bodies are “considered as possible risks at work.” Similarly, Grasmeyer (2022) reports misogynistic behaviour and masculine work culture in the cargo shipping industry. The male-dominated working culture and (sexual) harassment on a marine research vessel were also observed and documented by Hornidge (2018, 2020). Moreover, studies of early-career researchers found that junior female scientists were more likely to be downgraded from a paper to a poster presentation than male or more senior scientists at an international marine science conference (Johannesen et al., 2023). Giakoumi et al. (2021), Johannesen et al. (2022), and Shellock et al. (2022) pointed to a relative gender balance in early-career stages of ocean-going science, but to a growing gap between the number of women and men represented in senior positions, leadership, funding, and publishing. In European marine science institutes only 13% to 24% of women occupy senior positions in marine sciences and female marine scientists are less likely to be first authors on publications (Giakoumi et al., 2021). Johannesen et al. (2022) cite social norms at sea, gender-insensitive design of marine facilities, lack of security at sea, and imbalances in responsibility for family care duties as some of the reasons. Legg et al. (2023) add further reasons, such as former bans on female involvement in sea-going research, restrictions on women’s employment in oceanography, and harassment at sea.

Other studies provide solutions or interventions for more equal (work) opportunities in maritime careers. McLaughlin and Fearon (2022) propose to increase female participation in seafaring by introducing policies on discrimination, raising the awareness of girls and young women of job opportunities in the sector, and promoting career counselling and female role models. Van Stavel et al. (2021) provide suggested solutions for advancing diversity and inclusion in ocean observation through self-assessment by, for example, continuously reassessing our own biases. Giakoumi et al. (2021) argue for mechanisms that promote a more transparent hiring process and shared family responsibilities. Shellock et al. (2023) propose strategies for the empowerment of early-career female marine scientists, such as equitable access to funding, a more inclusive culture, and mentoring opportunities. Hendry et al. (2020), moreover, mention increased awareness of, and training for, chief scientists to support team members during expeditions, the provision of sanitary bins on research vessels for those menstruating, and more inclusive sizes of personal protective equipment for women and smaller people, as well as further measures to create a more inclusive environment for sea-going scientists.

So far, research on issues relating to gender, social class, age, ethnicity, or sexual orientation at sea is fairly limited, and on the issue of intersectionality even more so. Bourabain (2021), for example, studies the intersection of female early-career researchers and their ethnicity in social sciences and humanities. Sherlock et al. (2022) found that 28% of interviewed female ocean researchers ( $n = 34$ ) mention experiencing, in addition to gendered discrimination, racial discrimination and prejudice. Eaton et al. (2020) used an experimental design that showed a gender and racial bias towards the selection of Post-Docs in biology and physics. Hornidge et al. (2023) look at inequalities in the marine science system, especially at the intersection of neglected knowledge systems, such as indigenous and feminist knowledges, and their influence on ocean governance. Yet, a research focus on intersectionality in marine sciences is so far lacking, as is research on the potential effects of intersectional discrimination and (sexual) harassment at sea.

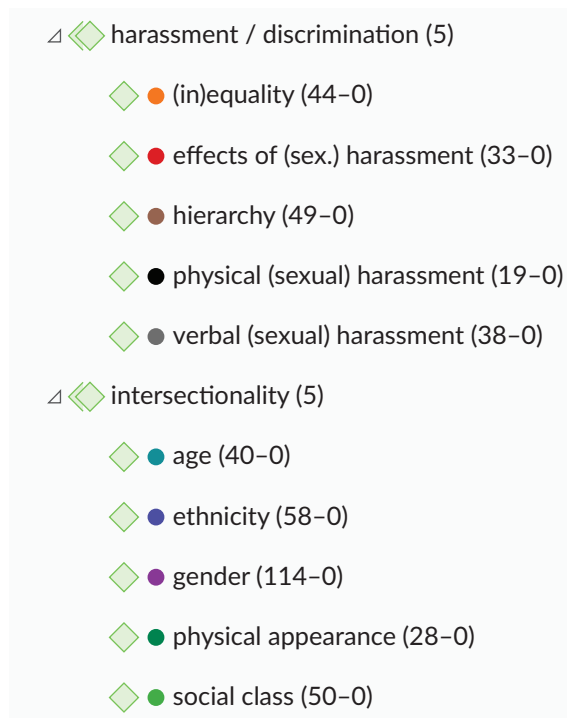
The term intersectionality was first introduced by Crenshaw (1989, p. 139) “to develop a Black feminist criticism because it sets forth a problematic consequence of the tendency to treat race and gender as mutually exclusive categories of experience and analysis.” In her framework, she emphasises the multidimensional discrimination women experience due to heritage, social class, sex, race, gender, and ethnicity. In the later work of Crenshaw (1991), she introduces three different forms of intersectionality: (a) structural intersectionality, which highlights the complexity of intersectional marginalisation; (b) political intersectionality, in which intersectionally marginalised individuals experience different treatments from that experienced by white women; and (c) representational intersectionality, which emphasises the non-visibility of intersectional identities in the media.

Although Crenshaw’s framework is still influential and valid, we use the term transnational intersectionality coined by Grabe and Else-Quest (2012), which incorporates postcolonial and transboundary experiences of individuals, as well as social hierarchies. We want to note that sexism, racism, white supremacy, socially constructed gender norms, and heteronormativity are still manifested in contemporary societies (cf. Kessel, 2022; Phipps et al., 2018) and that they influence power dynamics and inequalities in marine sciences. Traditional gender norms and stereotypes, historical exclusion of women in marine sciences, opposing cultural narratives, and male-dominated homogenous working environments (Hendry et al., 2020; Legg et al., 2023) still contribute to gender inequality at sea. We, as “WEIRD” (Western, educated, industrialised, rich, democratic; Henrich et al., 2010) female researchers share the critique on mainstream and Western feminist approaches, as well as so-called Third World feminisms as overly essentialist and neo-colonial (Butler, 2002; Mohanty, 2003). By considering an individual’s experienced discrimination along diverse intersections, such as gender, sex, ethnicity, social class, social hierarchy, and age, as well as continued cross-border dynamics (cf. Patil, 2013), transnational processes, epistemic inequalities caused by (post-)colonialism, and diverse (national) science systems that may enable or continue path dependencies of, e.g., racism, rape culture, and Western sexism and misogyny (cf. Mercer, 2018), we aim for a comprehensive conceptualisation of transnational intersectionality at sea.

Marine sciences and related sectors, such as shipping companies, still operate in (neo-)colonial and territorial spaces, yet the ocean remains inherently transboundary and transcultural and thus requires transnational marine governance. In line with Tacheva (2022), we argue for a transnational feminist approach, which we aim to extend to a transnational intersectionality approach in marine sciences. In our understanding, such an approach is dynamic, culturally diverse, heterogeneous, and includes different types of knowledge. We are aware of our positionality and embedded micropolitics as Western female social scientists, which can limit

the scope of our research. Yet, by having collected the aforementioned qualitative data on marine knowledge production processes, and by including the voices of, for example, women of colour, diverse age groups, and non-scientific marine staff, we aim to make intersectionality at sea and its effects on structural change in the organisation of work at sea, the blue economy, and marine knowledge production processes visible.

In doing so, we look at the micro-level of knowledge production processes through a sociological lens (Elliker, 2017). By following the scientists and non-scientists in their everyday working routines, and by conducting fieldwork in diverse places and multiple sites of meaning-making on land and at sea, we contribute to an innovative application of Marcus’s (1995) multi-sited ethnography (cf. Haegele, 2024). With the help of software-based coding (Atlas.ti), we qualitatively analysed our collected data. During the coding, two groups (“harassment and discrimination” and “intersectionality”) each with five sub-codes, evolved, as seen in Figure 1. Patterns emerged as part of the analysis, which we present in Section 4.



**Figure 1.** Coding groups and sub-codes in Atlas.ti. Note: The numbers in brackets refer to the number of sub-codes below the coding group and the frequency of the used sub-codes.

#### 4. From Diverse Localities, Emancipation, and Withdrawal to Conflicts in Marine Knowledge Production

Our findings are structured in terms of four outcomes. First, we mapped intersectionality at sea within our empirical sample. Second, we found that (sexual) harassment in marine knowledge production processes occurred independently of the exact locality. Third, the discrimination at sea led either to emancipation processes or to withdrawal and heightened insecurities of the victims. Fourth, tensions between scientists and non-scientists broadened the gap between these knowledge systems, leading to an intersectional dilemma and thus to a potential problem of transferring and implementing marine knowledges and science, as we explain in more depth in the following sections.

#### 4.1. Mapping Intersectionality in Marine Knowledge Production Processes

During the interviews, 26 out of 35 women reported having experienced (sexual) verbal harassment. Nine women out of these 26 had also been victims of physical sexual harassment. The harassment took place on vessels, in the university, especially in laboratories, or at conferences and was always performed by older men such as senior scientists, colleagues, or crewmembers. As one interviewee said:

We could probably be the daughters of most of them. Someone touched my buttocks, I've been pulled up by the waist...and I don't think that's appropriate....We are the guests here. We're the ones who think five times about whether we really want to go up to the bridge and tell them off because we'd like to come here again. I don't think that's okay....I think that's taking advantage of something: this division of roles between regular crew/guests, younger/older, and those in non-permanent/permanent positions. (interviewee 33, junior female scientist, on older male crewmembers employed by a German company)

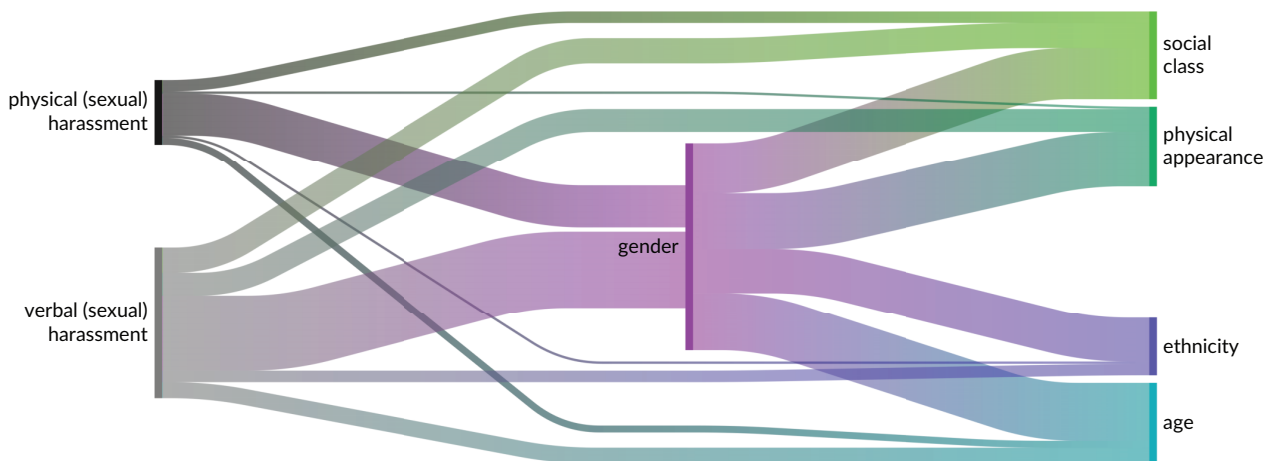
Verbal remarks and bullying were of a sexual nature and mostly directed at the physical appearance of women, including their gender, ethnicity, and age. For example, one interviewee reported:

And this guy, that was the boss of everyone. He said like: “[Her name], you think that you are in the United States, you are not in the United States. We are here [in Germany on a research vessel], we can talk about whatever we want, the way we want. And if you don't want it, you don't have to be here. Hear this, you must be grateful that you haven't been raped—raped in this country.” And I just went out, sorry...[interviewee starts to cry]. (interviewee 51, junior international female scientist, employed by a German marine science institute)

The nine physical assaults included unwanted touching of hips, waist, buttocks, hair, and face, or undesired close physical contact, such as hugs, massages, kisses, or the exposure of genitals and masturbating in front of female scientists (interviewee groups 1, 3, and 5). As seen in Figure 2, harassment predominately occurred along the intersection of gender, social class, physical appearance, ethnicity, and age. Other social identity markers, such as disability or religion, were not mentioned by interviewees or observed in the field. Interview group 5 was mainly affected by (sexual) harassment and discrimination; Brazilian female senior scientists between the ages of 38 and 62, mostly based in Brazil, pointing to postcolonial gender norms and Western sexism and misogyny.

Three men out of 47, two junior scientists (interviewee group 4) and one crewmember (interviewee group 9) reported verbal (sexual) harassment due to their gender, age, and physical appearance. The crewmember's harassment was perpetrated by a female senior scientist on a research vessel. He remembers his feeling of discomfort: “When the scientists [came] on board and one of the women pointed to one of the sailors and said, ‘all right, you're mine for the next six weeks’” (interviewee 7, male crewmember). The two junior scientists were discriminated by senior male crewmembers along the intersection of their age and physical appearance, as one of them reports, “sometimes I hear someone say that I'm too weak...for a man” (interviewee 32, junior male scientist).





**Figure 2.** (Sexual) physical and verbal harassment caused by gender, social class, physical appearance, ethnicity, and age displayed in a code-co-occurrence Sankey diagram. Note: The thickness of the lines refers to the frequency of occurrence of the codes, e.g., the highest co-occurrence of codes appeared at the intersection of verbal harassment, gender, and age.

#### 4.2. No Boundaries in Transnational Intersectional Harassment at Sea: The Politics of Localities

Intersectional discrimination appeared in all marine scientific knowledge production sites—on vessels, at the university, in the laboratory, and at workshops and conferences. Thus, marine sciences, and its adjacent localities and workplaces of marine knowledge production, seem to enable an operation of power in the enclosed vicinity of a ship or a laboratory, as well as a spatial structuring of inequality (cf. Certomà et al., 2012). In our analysis, we refer to these localities as physical spaces, although we are well aware that spaces can also be a form of mobility or a distance (see the discussions in political geography on the multidimensionality of space, cf. Delaney & Leitner, 1997; Jessop et al., 2008; Jones & Jessop, 2010). To illustrate this, one of our interviewees said:

There's a nice saying: What happens on the ship stays on the ship, and there's a reason for that. And we are, I think, at a critical mark of seven weeks. These are really periods of time where perhaps the desire for closeness...continues to grow. (interviewee 6, German male technician)

The data collection on a vessel or in a laboratory requires the collaboration of scientists and non-scientists in very compact and narrow rooms and for a long period, which has led to multiple cases of intersectional discrimination in marine knowledge production processes (interviewee groups 1, 3, 4, 5, 7, and 9). One female interviewee discloses a case:

He [head of the laboratory] started love bombing, like “oh, you are important. Come to my laboratory. You're perfect, we need you.” And then when things didn't feel OK, he started to undermine my qualities and work....It took me a few years to understand there was a lot of moral harassment. (interviewee 79, junior female scientist, based in Brazil)

In an earlier study by Hornidge (2020), she documents the use of the saying “what happens on the ship stays on the ship” on a different German research vessel. She assesses it as a discursive practice, contributing to the construction of an in-group, as opposed to the out-group who are not sharing the experience. Our data



collected beyond the vessel show that (sexual) harassment in marine knowledge production does not stop on land. While 20 cases of (sexual) harassment occurred on vessels, nine happened on land during coastal fieldwork and conferences, as well as at universities and laboratories. Three men were harassed at sea, while 17 women experienced harassment on vessels and nine on land. Interviewees reported verbal (sexual) harassment, bullying, and discrimination due to their gender, ethnicity, and age among colleagues at university or (international) meetings or scientific conferences. As one interviewee reports, “as a female expert, I was pushed by a male expert who said he was now more of an expert than me” (interviewee 59, senior female scientist, based in Germany).

### **4.3. Building a Wall or Joining Intersectional Forces: Effects of Intersectional Discrimination**

The effects of intersectional discrimination and harassment have led to two different outcomes or adaptation strategies: withdrawal and heightened insecurities, or emancipation. Similar to these observed strategies, Hornidge (2020) finds authoritarian, hierarchical, and repressive censorship in a remote Uzbek field station, and open resistance and emancipation against (sexual) harassment on a German research vessel. In the research presented here, 20 of the 29 interviewees who experienced harassment, reacted with withdrawal and heightened insecurities and nine with emancipation as a coping strategy. Yet, it is important to note that these coping strategies do not always follow a linear process. The often lengthy and difficult process can be dynamic and might involve both liberation and withdrawal. For example, an initial emancipation through reporting the (sexual) harassment may be followed by withdrawal and a departure from the marine job sector (cf. interviewee 51). This simultaneity of emancipation and withdrawal was also found in earlier research by Ford et al. (2021). The authors concluded that the resilience of victims decreases after reporting their experiences and when victims decide to leave their employer (Ford et al., 2021):

Because of that, I built a wall and “No, I’m here for work, I don’t interact.” Like I would talk and everything, but I would not give any space for misinterpretation or anything. But still, if I can, I prefer not to participate in those cruises anymore. (interviewee 57, junior international female scientist, based in Germany)

Female scientists, especially of interviewee groups 1, 3, and 5, used adaptation strategies, such as changing the way they talk in meetings or presentations (interviewees 59 and 76), the way they dress (interviewees 1 and 3), especially during fieldwork (interviewees 37 and 72), pointing to the intersection of gender and physical appearance—or they felt ashamed and did not report the (sexual) harassment and discrimination (interviewees 1, 8, 24, 32, 39, 51, 59, 69, 70, 73, 79, and 80). Female marine scientists with a different ethnicity from that of the country they worked in were especially likely to have experienced harassment and to have reacted with withdrawal and heightened insecurities. One senior international female scientist based in Germany said, “I learned that I have to step back” (interviewee 60). Another interviewee changed her behaviour on subsequent research cruises after having experienced harassment, resulting in a disadvantage to herself:

Even when I was the person that had the most expertise on the thing that they were doing, I was never involved....I don’t think that has to do with being a woman, but it has to do to [with being] a foreigner....When I was on a vessel again, I was super rude with everyone in the crew, all the time, because I didn’t want them to be near to me...because otherwise...you know this self-blaming

when things happen, so you are at least sure that you did everything to prevent this to happen. (interviewee 51, junior international female scientist, based in Germany)

Another female scientist changed her physical appearance while on board:

I'm a woman [laughs] so, I don't know, I make sure that my neckline doesn't go all the way down, and I also pay attention to what pants I wear, and I've noticed that people here have already said, yes, do you have to wear leggings so tight that you can see all the details? (interviewee 37, junior female scientist, based in Germany)

In some cases, female researchers decided not to finalise their PhD or to leave academia and their employment (interviewees 39, 51, 59, 79, and 80) due to (sexual) harassment, which can be analysed as the ultimate form of withdrawal. As one interviewee stated, "there are a lot of women, who say "I can't cope with it anymore" and then leave and I think that's an incredible waste of know-how, of knowledge....I think that's super unfortunate" (interviewee 59, senior female scientist, based in Germany, who herself changed from being a marine scientist to a science communicator).

Other female scientists employed similar withdrawal mechanisms, as the following interview quotes show:

There have been cases of sexual harassment and that's [a] difficult path to walk for everyone and makes it difficult to even want to be there [in academia]. (interviewee 70, senior female scientist, based in Brazil)

She was a professor at the faculty of Geology at [a Brazilian University], then she had to leave this university because she could not collaborate with the other professors of her own faculty. Really. They refused to cooperate since she was a woman. (interviewee 73, senior female scientist, based in Brazil)

It was the worst onboard experience of my life because I felt like, if someone hit on me, it will be my fault. It was awful. It's not only people that are on board but also people that are on land and determined. It's awful, so I left the job. (interviewee 79, junior female scientist, based in Brazil)

Another female scientist reported the assaults she experienced, trying to achieve justice and emancipate herself, but then left her job:

I told my boss; he didn't do anything. And I know that the equal opportunities officer is a marionette. She interrupts speakers to say to us: "Oh, you are a woman. We are trying to succeed in a male-dominated place, we must act like a man"...To be honest it took me like maybe six months to process this and to start to talk about it....After getting depression, I just quit. (interviewee 51, junior international female scientist, based in Germany)

The minority of victims of transnational intersectional discrimination at sea made a stand against their harassers and emancipated themselves. We refer to emancipation as an active resistance by the victim towards his/her/them oppressor and/or employer. During the German research cruise in which 37 of the 82 interviews were conducted, multiple (sexual) verbal and physical harassments were perpetuated by a

male crewmember. Six junior female researchers joined forces, collected the incidents in written form and reported them to the chief scientist, who then went to the captain. The crewmember received a formal warning as a result (interviewee group 3). On a Brazilian navy vessel, which is commonly used for marine research, a female researcher experienced sexual harassment. She “went to the police when the ship arrived back and it was a military guy and there was a complaint” (interviewee 62, senior female scientist, based in Brazil). During a marine field trip, a male crewmember physically harassed a female scientist, who reported the incident (interviewee 81). Afterwards, many other female researchers reported the same and the crewmember was finally fired (interviewee 81). Another Brazilian female researcher reported using the following protective device: “A knife inside my boots, it was normal because we are working the field and I sleep with my knife [under the] cushion” (interviewee 72, senior female scientist, based in Brazil). To be able to stay in academia, one female professor explains the following:

I balance my feminine side because I’m pretty much facing stereotypes all the time, so, if I can, I present myself just like a man and look like a man and identify myself with men and being very masculine and being very aggressive and talking with my voice more in a male way. But if they know that I have a vagina, it changes everything....We face a lot of stereotypes...a Brazilian woman comes with a burden because people associate Brazil many times with sex. A lot. Regardless of where you are, regardless of what you do, regardless of everything....And then I start the class, and everything changes because I’m not aggressive, but I am very assertive. I’m being more male. I have to do that, otherwise they going to question me. So, my voice, that helps me...because I don’t have like a female voice. (interviewee 76, senior female scientist, based in Brazil)

As shown in the previous example, Brazilian female marine scientists who experienced (sexual) harassment specifically pointed to their ethnicity as a major reason for discrimination. In Brazil, the prevalence of the machismo culture, gender-based violence, silencing, and victim blaming are still predominant (Rodrigues, 2024). Yet, in Brazil, a group of female marine scientists joined forces and founded the Women’s League for the Oceans (Liga das Mulheres pelo Oceano, 2022), as well as a blog to write about their experiences (interviewees 79, 80, 81, and 82). The group has now more than 2,500 members from marine sciences, politics, and the non-profit and maritime private sectors.

#### ***4.4. Beyond Boundaries: Intersectional Discrimination Broadens the Gap Between Knowledge Systems***

As the previous section has shown, a pattern of harassment that has also been found by Hornidge (2020) regarding research sites of proximity (a research vessel and an isolated research station), led the victims to join forces and take action against their harassers. In most cases of our research, though, it did lead to further forms of withdrawal and heightened insecurities. Besides gender as a social identity marker, our analysis shows that discrimination mostly occurred due to the intersection of gender, ethnicity, physical appearance, and age, as well as between knowledge systems, for example between scientists and non-scientists. This accumulation of discrimination and (social class) conflicts further increases distrust between science systems and disrupts work at sea:

Sometimes it really clashes, and then there’s...also bullying approaches where you almost think “holy cow! What’s going on here?” But you’ve also noticed that many people try to counteract it, but you can’t get a grip on it because nobody can take a weekend at home to...reset....At some point, you see

them during the day and that's a completely different kind of psychological stress. (interviewee 39, junior female scientist based in Germany about conflicts on research vessels)

We observed a recurring pattern of conflicts that arose from the contact between scientific and non-scientific knowledges by conducting fieldwork on the micro-level (cf. Elliker, 2017). On the vessel, but also in the laboratories and universities, authoritarian expert knowledge clashes with the non-scientific knowledge of technicians and crewmembers. As one interviewee put it: "There are many stories about harassment, especially onboard navy ships, and it is a clash of cultures, so that is not that easy" (interviewee 79, junior female scientist, based in Brazil). Fifty-six of our interviewees were scientists (see Table 1), from which 26 female scientists experienced (sexual) harassment and discrimination during marine knowledge production processes. These incidences were perpetrated by both male scientists and non-scientists fairly evenly (47% by scientists and 53% by non-scientists). Twenty-six of our interviewees were non-scientists, such as crewmembers or technicians. Two out of 26 non-scientists experienced (sexual) harassment in contributing to marine science making. One interviewee was verbally harassed by a scientist and the other by both—a scientist and a non-scientist in two different situations.

As Tessnow-von Wysocki and Vadrot (2022) already pointed out by using the example of intergovernmental negotiations, tensions exist between opposing views on which types of knowledges are considered relevant to the addressing of climate and environmental issues. Our research observed these tensions between scientists and non-scientists, such as technicians in laboratories (interviewees 43, 52, 53, and 54) or crewmembers on the vessels (interviewees 21, 29, and 31), in everyday knowledge production processes and adjacent negotiations. This clash of knowledge and belief systems results in an intersectional dilemma (cf. Bauman, 2012; Giddens, 1991) in which intersectional discrimination occurs while, simultaneously, diverse knowledges are seen as superior. This power is also reflected in the Brazilian cooperation of the navy and marine sciences:

They have the power because they are [the] navy. I think you must separate things from the marine and things from science. I don't like this system, that you go to the navy. I don't like my students going there....[The navy] are a Machismo....They think that they are there to get women or boys. (interviewee 69, senior female scientist, based in Brazil, who decided to no longer send her students on research cruises, pointing to withdrawal)

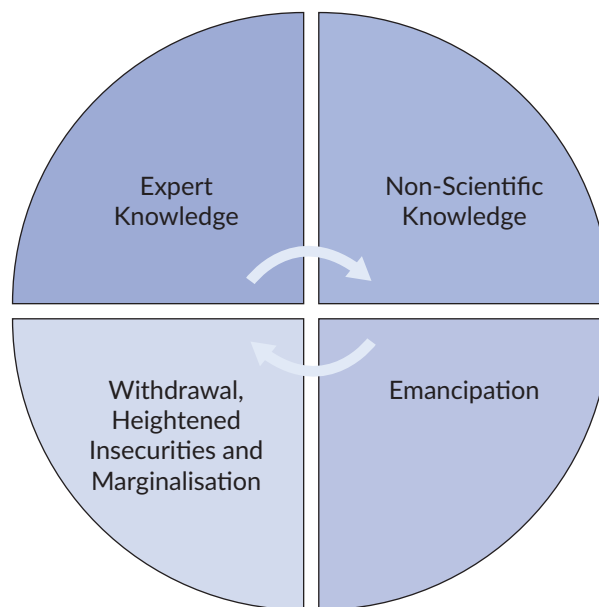
Societal power structures, misogyny, and (racial) inequalities are a global phenomenon, which is also reflected in marine sciences and echoes these societal path dependencies. The clash of scientific and non-scientific knowledges mirrors a social class conflict, which condenses along the intersection of hierarchy, gender, and age (cf. Grabe & Else-Quest, 2012):

When there is a pretty girl...you're very careful, and then you prefer not to go into detail or something. So, if you're sitting in the bar having a drink, and somehow you talk to a scientist, hit on her...and you have a nice evening, and the next day she thinks "what an asshole," she goes to the captain, then you're fired. (interviewee 29, male crewmember, about interaction with female scientists)

It's still the case, many of the doctoral students I've accompanied here, for whom I've also built devices, have unfortunately lost their grounding. They don't say "hello" anymore. I then say "boy, we built this

together” and then they don’t see you anymore. No, they just look past you and then I just think “what an asshole.” (interviewee 54, senior male laboratory technician at a German marine science institute, about male scientists)

Thus, in line with Grabe and Else-Quest (2012) and Patil (2013), we argue that the social class conflict of diverse marine knowledges and knowledge production processes at sea manifest a continuation or even expansion of transnational intersectionality rooted in transboundary social hierarchies, (post-)colonial epistemic inequalities, and science systems that continue path dependencies (Figure 3).



**Figure 3.** An intersectional dilemma through emancipation and withdrawal and heightened insecurities strategies and the (social class) conflict of scientific and non-scientific knowledges.

Our findings, moreover, point to the diversity of science systems and distrust between them. The observed and reported intersectional discriminations in the marine work sector continue to solidify and narrow expert knowledge. Without the non-scientific knowledge of technicians and crewmembers, experts can neither operationalise nor implement their knowledge. Who has the power and authority? Who remains marginalised? An intersectional dilemma between those with expert scientific knowledge and those with non-scientific knowledge emerges and disrupts urgently needed marine sciences for climate change scenarios and mitigation strategies. Moreover, through transnational intersectional harassment, the knowledge system loses diverse knowledges, emotional intelligence, and socio-cultural competencies through disempowerment and marginalisation.

## 5. Conclusion

Our research showed a pattern of intersectional discrimination, bullying, and (sexual) harassment that occurred in particular along the lines of gender, age, social class, ethnicity, and physical appearance. Young female scientists with a different ethnicity from that predominant in their working environment were most likely to experience intersectional discrimination. The majority of perpetrators were male crewmembers and

white male scientists, usually in a hierarchically more senior work relationship with the victim. Nine out of 29 intersectional incidents were physical, while the remainder were verbal.

The harassment occurred independently of the precise localities or spatial characteristics of where they took place and led to either emancipation or withdrawal, heightened insecurities, and further marginalisation of the victim. Through these strategies and the conflict of scientific and non-scientific knowledges, an intersectional dilemma emerges in which distrust of gained knowledge develops, and even disrupts urgently needed marine scientific work.

A shift towards intersectionally shared knowledge is needed. Diverse types of knowledge must become part of the collective identity in marine science projects, regardless of the localities in which knowledge production takes place. Scientific knowledge and non-scientific knowledge are of the same value, and only through the combination of both will research for climate change scenarios be successful. (Scientific) employers and shipping companies need to develop training and proactive institutional responses to increase diversity among their employees, especially at the senior-levels, and mitigate and prosecute racist, sexual, and homophobic misconduct.

We do recognise that we still live in a society in which internalised gender norms, misogyny, patriarchal power structures, and rape culture are unfortunately predominant, which also characterises the specific case-study context. Nevertheless, we argue that intersectional and transnational (sexual) harassment and discrimination in marine sciences and the blue economy require increased awareness by (national) science and knowledge systems and by marine employers and employees. The building of an intersectionally equal working environment and the establishment of an institutional framework for a sustainable blue and gender-sensitive future are urgently needed.

Moreover, future research on intersectionality at sea is required. Our qualitative research approach to the micro-level of knowledge production processes in marine sciences gave voice to people who have experienced or are experiencing intersectional discrimination, and our analysis points to the as-yet unrecognised impact of intersectional discrimination on scientific efforts to combat climate change while working at sea. Yet, both contributions need further expansion. A mixed-method approach of a global quantitative survey and qualitative interviews on experienced discrimination and harassment of marine scientists and seafarers would ascertain at which intersections discrimination and harassment occur at an international-level. Thus, an analysis of these findings would allow further and more concrete (policy) recommendations for blue justice and intersectional equality within the blue economy.

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### Conflict of Interests

The authors declare no conflict of interests.

### Data Availability

Due to the nature of this research and for ethical reasons, detailed interview transcripts will not be shared publicly, so supporting data are not available. The authors guaranteed the anonymity of interviewees. Yet, the authors provided their interview guidelines in the supplementary material.

### Supplementary Material

Supplementary material for this article is available online in the format provided by the author (unedited).

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