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Gender analysis for social equity in aquatic food systems: a research agenda for strengthening fisheries science to support transformational change

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Women's involvement in the fisheries and aquaculture sector remains invisible and undervalued, and women have been relatively excluded from national development policies and programs. The neglect of post-harvesting activities and the exclusion of women from research and policy have created gender inequities and differential impacts on men and women – often to women's detriment. Failure to account for sex, gender and other social factors in fisheries and aquaculture research furthermore results in weak science and, often, policy failure. While much progress has been made in documenting women's roles in aquatic food systems, broadening and deepening the scope of theoretically informed gender analysis in fisheries and aquaculture research is not only necessary for achieving social equity in the sector, it is critical for the development of robust fisheries and aquaculture science. This essay delineates several concepts and presents a framework for gender analysis that will strengthen fisheries and aquaculture science and may support transformational change toward gender equity in aquatic food systems.

KEYWORDS

gender, gender analysis, women's work, fisheries, aquatic food systems, fisheries science, fisheries development planning

1 Introduction

Despite a growing interest in gender equality within aquatic food systems and a proliferation of gender research in fisheries and aquaculture over the past four decades, women's contributions to aquatic food systems remain invisible and undervalued, and women remain relatively excluded from national fisheries and aquaculture development policies and program (see also Williams et al., 2025; Wabnitz et al., 2021). In addition, fisheries science suffers from significant gaps in gender-disaggregated data (Lord et al., 2025; Kleiber et al., 2015), and theoretically-informed gender analysis remains underdeveloped within the sector. Yet, rigorous, theoretically-informed gender analysis is required if we are to strengthen fisheries science and advance gender equity and equality within aquatic food systems.[1]

My perspective on this issue is informed by over 30 years of teaching gender and development theory, conducting research on gender in fisheries and food systems, conducting workshops and seminars on gender analysis for fisheries and aquaculture development

1 Similar opinions are shared by other gender scholars working in fisheries and aquaculture. For example, see Kusakabe et al. (2025); Frangoudes et al. (2019); Koralagama et al. (2017).

professionals, engaging in scholarly discussions with other gender specialists at fisheries conferences, and reviewing numerous manuscripts for fisheries journals. What stands out is my observation that although rigorous analytical studies of gender in fisheries do exist, and gender transformative approaches have begun to be deployed in fisheries and aquaculture development (e.g., McDougall et al., 2023; Adam et al., 2021; Cole et al., 2014), much of the literature to date remains predominantly descriptive in nature. Many efforts describe women's roles, delineating gender divisions of labor in fish economies. Less work goes beyond these descriptions to analyze the implications of gendered differences for a range of issues and developments impacting aquatic food systems.

In this Perspectives essay, I thus focus on the question of how we broaden and deepen the scope of theoretically-informed gender analysis in fisheries and aquaculture research and why it is important to do so. I argue that expanding such research is not only necessary for achieving social equity in the sector, it is critical for both the development of robust fisheries and aquaculture science and the transformation of aquatic food systems to achieve Sustainable Development goals. I proceed as follows: I first summarize our knowledge to date and discuss why theoretically-informed gender research is important for fisheries and aquatic food system science. I then propose a set of concepts and framework that are required to advance gender research in this field and conclude with a reflection on how gender research might support the equitable transformation of aquatic food systems.

2 Research on women, sex, and gender in fisheries and aquaculture

Worldwide women play an integral role in all aspects of fisheries and aquaculture economies and thus contribute significantly to household livelihoods that rely on aquatic food systems (Harper et al., 2007, 2017, 2023; Williams et al., 2002). These roles vary across geographic context and change over time (Weeratunge et al., 2010), but women are especially prominent in post-harvest activities and in some regions play a vital role in supporting the entire fishing industry (Overa, 1993; Walker, 2002). Yet, post-harvest activities have received less attention in conventional research and development policy than fish harvesting, and women's involvement in the sector remains broadly invisible and undervalued (Pedroza-Gutiérrez and Hapke, 2021; Santos, 2015; Bennett, 2005).

Despite growth in research on women and gender in fisheries since the 1980s, gender scholarship itself has existed at the margins of fisheries and aquaculture science and policy due to two long-standing biases: (1) disproportionate attention to harvesting activities and neglect of post-harvest activities such as processing, and trade; and (2) gender-blind biases on the part of fisheries and food system scientists who have overlooked or minimized women's roles in aquatic food systems (Pedroza-Gutiérrez and Hapke, 2021; Williams, 2008; Davis and Nadel-Klein, 1992, 1988). This neglect of post-harvest activities and the exclusion of women from fisheries research, technological innovation, governance, and policy around the world have created or perpetuated gender inequities and differential impacts of economic change on men and women – often to the detriment of women – and have failed to empower women in the sector. For example, science and technology studies document how men and women's technological needs differ, how innovation and adoption of technology are powerfully mediated by gender-specific norms and constraints (Aregu et al., 2019) and how women have not benefitted from technological innovation to the same degree as men as a result (Bray, 2007; Wajcman, 2010). Research on commercialization, globalization, and economic transformations within aquatic food systems demonstrates how women are often negatively impacted in uniquely gendered ways (e.g., Harper et al., 2023; Arthur et al., 2021; Bennett, 2005; Nies et al., 2005; Hapke, 1996, 2001a; Rubinoff, 1999). Yet these differential needs and impacts are unacknowledged, excluded from, or minimized in policy decision making.

We also know that aquatic food systems are constituted by social relationships that govern economic relations and transactions and are deeply embedded in social-cultural systems characterized by gender inequality (Kruijssen et al., 2018; Hapke, 2016; Weeratunge et al., 2010). Aquatic food systems are structured by multiple social divisions of labor such as gender, caste, ethnicity, religion, age, etc. that differentially construct people's access to resources and opportunities and their experiences of development and economic change. Gender norms and ideologies define women's work and their mobility in particular ways that impact how they are able to work and what opportunities and constraints they face as economic development unfolds. For example, if new production technology demands a shift in where and when fish is landed, and prevailing gender norms do not support women traveling to distant harbors at night, women may be shut off from sources of cheap fish (Hapke, 2001a). Or, if economic transactions become more commercialized, and women do not have access to credit because of the way they are socially situated in household and market hierarchies, they will be negatively impacted. These structures become significant when development interventions are introduced because they inform who benefits and who loses – often in unanticipated ways. Furthermore, different groups of men and women experience economic and technological transformation differently depending on a range of factors such as age, ethnicity, economic status, experience and stage in work-life course, familial obligations, household pressures, and entrepreneurial inclination (Porter et al., 2008; Bennett, 2005; Nies et al., 2005; Hapke and Ayyankeril, 2004).

Even as biological systems, fisheries and aquaculture resources are influenced by sex differences (Tannenbaum et al., 2019; Ellis et al., 2017). Yet, sex analysis is largely overlooked in marine science (Tannenbaum et al., 2019). A recent systematic review of ocean acidification literature, for example, revealed that only 3.7% of recent studies tested for sex differences, and 85% of studies failed to consider sex at all (Ellis et al., 2017). The lack of inclusion and transparency in reporting of sex and gender-related variables hinders reproducibility and can lead to inaccuracies, research inefficiency and difficulty generalizing results.

In short, failure to account for sex, gender, and other social factors in fisheries research results in *weak science, weak technology uptake,* and often, *policy failure* adversely impacting our ability to effectively manage ecosystems and set conservation priorities.

Analyzing results by sex, in the case of biological research, and gender in socio-economic and technological innovation research improves accuracy and aids avoiding misinterpretation. It also opens the door to discovery and innovation through providing new approaches, insights, and understandings that lead us to rethink research and technological priorities and outcomes, revise concepts

and theories, and ask new questions - all of which can deepen, expand, and enrich scientific knowledge and better inform innovation interventions.

3 Key concepts for theoretically informed gender research

Ample scholarship has demonstrated the value of a gender lens for understanding how food systems work and how change results in unequal outcomes for men and women and other differently positioned social groups (e.g., Sachs, 1996, 2019; Rajaratnam et al., 2020). Although we know a lot about women's *roles* in aquatic food systems, we can do much more to deepen our knowledge and understanding of *gender dynamics* in these systems. Such understanding is critical for identifying gender inequities and transforming unequal gender relations, and for delivering research that can richly inform policy (McDougall et al., 2023; Kleiber et al., 2015). So, what do we need?

First, a theoretical approach is required that goes beyond a focus on gender *roles* to examine gender *relations*. Gender roles approaches, which are drawn on most frequently in fisheries and aquaculture research and development, *describe* women's and men's roles and their relative access to and control over resources (March et al., 1999) but fail to generate deep analyses of gender systems and structures of inequality. The methods and strategies deployed narrowly understand gender as a characteristic of individuals (Cole et al., 2014) and tend to address the *symptoms* of gender inequality rather than interrogate underlying causes (McDougall et al., 2023). The gender relations approach, in contrast, focuses on gendered and other social power relations that perpetuate inequalities. This approach moves beyond the individual and household to include the community, region, market, and state institutions and seeks to uncover differences between women and men further divided by other social factors such as class, race, ethnicity, age, and so on. This approach aims to understand the dynamics of gender relations and women's bargaining position in different institutional contexts to identify underlying causes of inequality and to formulate strategies to improve this. Research conducted within this framework often produces theoretically and contextually rich analyses, which are what is required if we are to advance fisheries science that supports social equity in aquatic food systems. Several key concepts are central to a gender relations approach:

3.1 Patriarchy

As a social system that varies in specific form over time and across space *Patriarchy* provides a useful starting point for understanding both gendered economy and the marginalization of gender analysis in fisheries science (see Hapke, 2013). Patriarchy refers to systemic societal structures that institutionalize male physical, social, economic, political, and cultural power over women. Patriarchal structures and relations encompass the economy (relations of production and reproduction, property rights, access to resources); the state (political-legal institutions); sexuality (ideologies that constrain women's sexual freedom and orient them toward marriage as a means of control); culture/ideology (discourses on femininity and masculinity); and the household/family (marriage-kin and residential systems, patterned behavior between intimates).

Questions about patriarchy and gender that we might incorporate into aquatic food systems research include: How do gender ideologies and norms take shape in different economic and cultural contexts and across geographic scale? In what ways do patriarchal economic, political, and socio-cultural factors converge; in what ways do they contradict and counteract one another? How do these convergences and contradictions shape men and women's work and life experiences within aquatic food systems? How do patriarchal structures and ideologies shape commodity circuits and value chains? In what ways do women assert agency within patriarchal structures? Where do points for intervention and transformation exist?

3.2 Labor

A second important concept for advancing gender analysis is related to *Labor.* What is required here is to make visible all types of paid and *unpaid* labor – production, reproduction, and community labor – and their gendered interconnections that underpin aquatic food systems and subsidize the generation of value in fish value chains (see Ferolin, 2013).

Waged work is not a simple cost but a complex social relationship (see Dunaway, 2013). Likewise, unpaid work, which subsidizes waged work and food system functioning more broadly, is imbricated in a set of social norms and relationships that need to be investigated if we are to fully understand food system functioning and potential strategies for equitable transformations. In addition to documenting the number of jobs and the gender and racial/ethnic composition of the workforce, it is important to examine the nature of labor processes, forms of workplace control, and the way needs for particular kinds of labor intersect local social relations of gender (see Collins, 2013; Dunaway, 2013). Questions to probe labor relations in aquatic food systems include: What are all the critical activities that keep households, communities, and economies functioning? How does women's unpaid labor supplement and support wage labor and generate value in fish value chains? How does the economic restructuring of aquatic food systems impose new conditions for social reproduction?

3.3 Value

Related to labor is the need to broaden our definition of *Value*. More than just a financial contribution in economic terms, value is a social relation between people that also includes intangible aspects that are beneficial for a household or a community's livelihood(s), e.g., reciprocity, sharing, social status. Value in this sense is context-specific and varies between individuals over time. Workers in each node of a fish value chain generate multiple social values that shape the nature of aquatic food systems. To account for the value of women's work, it is necessary to consider tangible and intangible contributions from work, the quantitative (economic-financial) and the qualitative (social) values (see Pedroza-Gutiérrez and Hapke, 2021).

3.4 The household

A fourth key concept is the *Household*, specifically theorizations of the household that emphasize power relations and problematize the pooling of and access to resources by different members. The

household is an institution that produces and consumes global commodities while ensuring the social reproduction of laborers. Households diversify livelihoods, pool and redistribute labor, income and resources, and spread risk in multiple ways, but they do so *inequitably* (Agarwal, 1997; Sen, 1990; Folbre, 1986). Furthermore, households repeatedly alter their composition in response to economic cycles and over longer-term socio-economic change (e.g., Hapke, 2001b). Dunaway (2013) argues that households represent millions of structural units that enable value chains to conceal the economic benefits they acquire from workers, particularly unpaid women and girl workers. Incorporating the household as a key institution in aquatic food system research in this way allows us to make visible women's labor and contributions to value to aquatic food systems, which is a first step toward achieving social equity.

3.5 Intersectionality

Finally, *Intersectionality* refers to the interconnected nature of social categorizations, or identities, such as ethnicity/race, class, caste and gender, age, disability as they create overlapping and interdependent systems of experience, discrimination or disadvantage. Rather than isolate one identity category and privilege it over other points of marginalization, intersectional theory sheds light on the ways various vectors of identity impact one another to form unique subjectivities and experiences for different groups of people. It is important to ask and explore how gender intersects other social identities to create different experiences for different groups of men and women in aquatic food systems (Hapke et al., 2024).

Second, we need a methodological approach that (a) roots analyses of gender relations in broader economic, political-legal, technological, social, and cultural-ideological relations and processes; (b) is multi-scalar and historical in perspective; (c) draws on both material and cultural understandings of economy and gender to understand how both are dialectically related, and (d) reveals complex configurations of culture, economy, polity, and society. Materialist feminism provides a useful conceptual and methodological framework to accomplish these requirements.

4 A materialist feminist framework for gender analysis

Following Jackson (2001), the materialist feminist framework I delineate below foregrounds the social and views the economic as a realm of social relations. It situates the material conditions of people's lives at the intersection of four spheres of human life – the economic-technical-environmental, the political-legal-institutional, the social, and the cultural-ideological – and asks how gender cross-cuts and links these spheres over time and across space (see Figure 1). For example, how do gender norms and ideologies underpin economic roles and opportunities? How do political-legal-institutional norms and practices reinforce economic and social relations and cultural ideologies?

This framework suggests a series of questions about each dimension that may be deployed to understand the gendered nature of aquatic food systems. Within the *Economic, Environmental, Technological* dimension, we need to ask about the local resource base and how the economy or sector is organized, but also about what

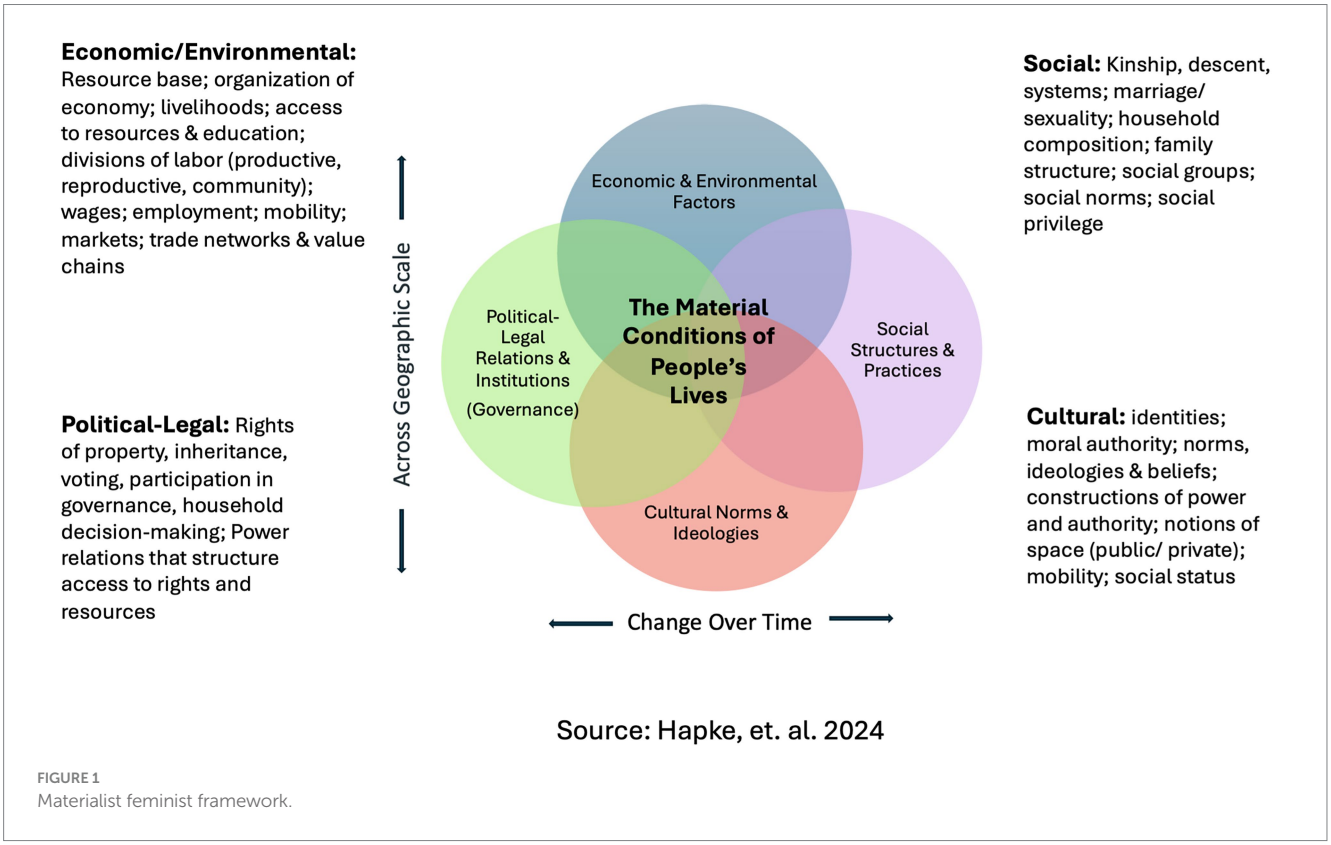

FIGURE 1
Materialist feminist framework.

divisions of labor characterize the food system both within the household and local economy. What economic activities underpin local livelihood strategies, *and* what opportunities exist for different individuals to engage in or expand the scope of these activities? Additionally we need to ask: In what spaces do economic activities occur, who has access to those spaces, and why? How is economic value generated by paid and unpaid labor? What kinds of technologies are needed or developed, for whom and for what tasks, and who benefits? How is technological innovation and adoption impacted by gender relations and divisions of labor and differential access to resources?

Political-Legal-Institutional Questions ask how are resource rights defined and operationalized? Who has access and who controls access to resources/property? In what ways are rights regimes gendered? In what ways do they support or constrain men and women's livelihood activities and efforts? *Social Questions* to investigate ask how gender relations organize households, kin systems, and local communities within aquatic food systems. Who has power? How is it exercised and challenged? Why are some people's voices heard more than others? What can we do to hear a greater diversity of voices? Critical *Cultural Questions* probe prevailing norms and ideologies around gender – especially with respect to social, cultural, economic, and political roles and responsibilities. What cultural factors shape women's mobility and access to economic resources and activities? E.g., How is space defined in terms of gender? How is sexuality understood in a cultural sense, and how does this influence women's ability to move through social space and engage in economic activities?

Finally, the framework cross-cuts *geographic scale* and is *historical* in orientation. In what ways are individuals and households linked to regional, national and global political economies? What important political economy trends have emerged at the regional, national and global levels and how have these impacted local communities and economies? How do impacts differ for different groups of men and women? In what ways do local institutions mediate meso- and macro-scale processes? What factors are driving change? Who wins, who loses, and why?

5 Conclusion

Research on sex and gender in fisheries and aquaculture rooted in materialist feminism as delineated above enhances the robustness of fisheries science because it leads to deeper and more complete understanding of how aquatic food systems function. This, in turn, provides a scientific foundation to support stronger policy with potential to advance social equity in food system transformation. But to realize the full potential of robust gender analysis, we need to move beyond simply documenting women's work and describing gender divisions of labor. What is required is the deployment of theoretical concepts that allow us to rigorously interrogate the social relationships that underpin aquatic resource economies. Feminist approaches to food systems, such as the materialist feminist framework described here offer a path toward understanding pressing questions about sustainability and prosperity in aquatic and agricultural food systems that will allow us to work more effectively to achieve gender equity and sustainable development goals.

Author's note

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Data availability statement

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

Ethics statement

This essay does not present research on animals or people that requires ethical approval for study.

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