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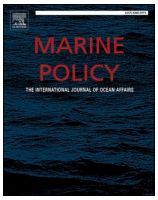

Gender analysis in fisheries: The case of the shelled mollusc fisheries in Kenya

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ABSTRACT

Analysing gender in small-scale fisheries (SSF) is vital for understanding the contributions of women and men and detecting potential inequalities. In this study, the shelled mollusc fishery was examined through the gender lens using quantitative and qualitative data collected from 132 shelled mollusc fishers accross five sites in coastal Kenya. In Kenya, both women and men participate in shelled mollusc fisheries. The study incorporated in its analyses the main components that intersect with gender to investigate whether similarities and differences exist in SSF in coastal Kenya in terms of access to shelled mollusc fisheries resources and the distribution of monetary benefits from the fishery. Most women respondents (73%, n = 91) relied on shelled mollusc fishing as their primary occupation compared to men (17%, n = 41) whose primary occupation was finfish fishing (69%, n = 41). There was no significant difference ($p > 0.05$) between women and men fishers in terms of income per individual fisher, time spent fishing, the number of species caught per individual fisher, as well as the monetary value of shells caught. There are several similarities between women and men in this fishery, but with a very important distinction that women more often consider this fishery their primary occupation. Thus, women constitute a large and important part of this fishery in Kenya. To advance coastal and fisheries management, it is essential that women, as well as gender aspects, are included in policy and decision-making processes related to SSF.

1. Introduction

Gender considerations are often ignored, seldom considered, and not focused on in small-scale fisheries (SSF) worldwide [1–5]. Typically, SSF is considered a cultural, social, economic or religious activity mainly conducted by men [6]. More recently, the gender aspect has been highlighted in SSF, often focusing on fishing and postharvest activities [1,7]. One notable example of women's engagement in fisheries occurs along tropical coastal shores where women target invertebrates, such as shelled molluscs, catching them with bare hands or simple gear [8–12]. This SSF is often referred to as gleaning [8,9]. A recent study established that women are over-represented in this fishery [7]. Since the shelled mollusc fishery is mainly perceived as a women's activity, this results in the undervaluation and underestimation of women's contribution to the SSF management and policy-making process [3,5,9,13,14], which may lead to their isolation from the resources they depend on and their exclusion in management [15–17]. This is partly attributable to the subsistence nature of their fishing activities which are often unpaid, underpaid, informal, part-time, or considered an extension of women's household responsibilities [3,4,8,18,19]. Participation of women in SSF is gaining recognition as fisheries data is increasingly disaggregated by gender [6,10,18]. However, limited data exist on shelled mollusc fisheries to conduct a gender analysis of the fishery and draw meaningful conclusions [20]. Previous studies have demonstrated through this disaggregation that women are actively involved in shelled mollusc fisheries and that shelled molluscs are one of the most harvested

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resources typically caught by men after fish [16,21]. Moreover, studies have demonstrated that the shelled mollusc fishery significantly contributes to livelihood and food security [1,9,18,22], thereby securing the social resilience of fishing families and communities [23]. Therefore, the disaggregation of shell fishery data can play a crucial role in filling important data gaps that are vital for decision-making processes geared towards sustainable ocean-based livelihoods [24,25].

One of the major challenges encountered by women fishers is access to fisheries resources [4,26]. Traditional beliefs, norms and laws limit women's access to fisheries resources and assets [27,28]. Consequently, women engaged in shelled mollusc fishing often experience reduced access to fishing grounds and highly valued species than men, resulting in lower incomes [5,12,29,30]. In particular, women are usually associated with invertebrate fishing in the upper intertidal zone, while men are associated with finfish fishing in the deeper coral reef areas [5,31]. The socioeconomic status of shelled mollusc fishers also plays a crucial role, with men typically having greater access to capital items such as boats and diving equipment than women. Consequently, they can reach less exploited fishing grounds further from the shore, where more fisheries resources are available [30,32]. In contrast, women tend to catch nearshore shallow-water shelled molluscs using their hands and simpler gear. Therefore, the coastal shell fishery conducted by women predominantly takes place near the shore and is synchronized with their social roles, which limit how far they can go fishing [5,33]. In addition, it is noteworthy that individuals with extensive experience in shelled mollusc fishing are predominantly men and thus have higher catch rates because they are more skilled and possess better knowledge of fishing grounds [19]. This perceived inequality generally results in women having a higher risk perception than men [34]. Given that women also make significant contributions to global fisheries landings [6,14], it is becoming increasingly necessary to examine fisheries data through the gender lens. This approach allows for a more comprehensive understanding of the diversity and totality of human fishing efforts. It also provides a better view of fisheries and the social context of fisheries. Consequently, it forms the basis for recommending more appropriate interventions that are inclusive of both women and men [35].

Women in many societies around the world remain economically, politically, and culturally disadvantaged compared to men, with the extent of gender inequality varying from one society to another. A recent United Nations report that monitors global progress on the 2030 Agenda for Sustainable Development highlights that women's representation in management remains below their share in total employment [36]. The report emphasises that Sub-Saharan Africa has made the most progress, reaching 38.2% in 2021 [36]. Feminist studies argue that many inequalities between women and men are a socially produced matter of gender rather than a natural quality of sex. Therefore, these inequalities are open to challenge and change [37]. As such, feminist activities continue to be present at local to global levels and in the form of a wide range of pressure groups including self-help groups, community organizations, trade unions and political institutions [38]. Through these activities, feminists underscore the need to challenge the underlying 'rules of the game' in people's everyday lives, which emphasise the non-random nature of male privilege and female disadvantage if there is to be meaningful gender equality [37]. Here, women and men interact with different natural environments and gender interests offer them access to different resources. Since men have historically dominated fishing studies, available scientific knowledge from women is scarce hence the need to emphasise gender while incorporating social location and intersectional analyses [39]. An intersectional perspective introduces relational structures, such as ethnicity and spatial divides, that intersect with gender to position women and men within the fishery in relation to the benefits they can generate [40].

In coastal Kenya, increasing economic difficulties are forcing more women to progressively turn to shelled mollusc fishing as it represents one of the few remaining economic options to sustain livelihoods and contribute to food provisioning in their households [41]. The women exercise creative agency in everyday gendered practices around income and food provisioning in their households, driving subtle changes in gender relations [42]. However, there is a dearth of sex-disaggregated scientific data that shows the actual contribution of women in shelled mollusc fishing for food provisioning and supplementing meagre household incomes. As a result, it is often assumed that men earn more income than women because of their involvement in a wider range of fishing activities [5,12,27]. Quantitative and qualitative accounts of the contexts of women are lacking in fisheries statistics and census data in Kenya or not even considered fishing, leading to their continued marginalization [1,5,12,33].

The non-inclusion of women in fisheries data could result in policies and interventions failing to create sustainable livelihoods based on marine resources [17,24]. Understanding potential gender disparities among fishers in coastal Kenya is, therefore, urgent and critical for fisheries management [13]. This is all the more true given the increasing decline of shelled mollusc species populations at an unprecedented rate due to interacting threats and the associated adverse impacts on livelihoods and food security of resource users [9,11,12]. Although both women and men fish shelled molluscs, gender analyses of invertebrate fisheries performed by both women and men remains scarce, particularly in East Africa [5,9,12]. Additionally, most gender studies are usually descriptive and lack a strong economic analysis [43]. Conducting a gender analysis to highlight inequalities in perceptions of shelled mollusc fishers is, therefore, critical if decision-making processes aimed at more sustainable ocean-based livelihoods are to be successfully achieved [24]. Gender analysis also plays a pivotal role in developing policies that are in line with the Sustainable Development Goals (SDG) targets and small-scale fisheries guidelines on gender equality [6], marine spatial planning initiatives [5] and the inclusion of women into governance institutions [17,44].

The shelled mollusc fishery in Kenya is an exciting case for o exploring gender inequality in East African coastal fisheries. This is because it is a multi-species fishery that has traditionally been carried out by both women and men [9,11,12]. The present study, therefore, examines the shelled mollusc fishery along the Kenyan coast through the gender lens. It incorporates in its analyses some of the main components that intersect with gender to moderate gender discrimination, domination or oppression in the fishery [45]. The objective of the study is to determine the presence of gender inequalities within small-scale fisheries along coastal Kenya. It specifically focuses on two main components that intersect with gender in SSF: 1) participation in shelled mollusc fishing, and 2) income generated from shelled mollusc fisheries. This study is part of a larger project. A previous paper focused on shifting baselines in shelled mollusc fisheries along the Kenyan coast [11]. This paper investigates the presence of gender disparities among shelled mollusc fishers along the Kenyan coastline. A total of 132 shelled mollusc fishers comprising 91 women and 41 men were interviewed at five villages on the Kenyan coast. The study discusses the implications of the findings and outlines its limitations and directions for future SSF research to disaggregate fisheries data by gender.

2. Materials and methods

2.1. Study area

Kenya's coastline extends approximately 600 km, stretching from 1°40 S to 4°41′S, and it shares its borders with Somalia to the north and Tanzania to the south (Fig. 1). The coastline is characterised by coral reefs, seagrass meadows and mangrove ecosystems, which are protected by fringing reef crests, forming a natural barrier to wave energy from the ocean [46]. During spring tides, benthic habitats located in the intertidal zone are exposed, providing a suitable fishing ground for shelled mollusc fishing. Shelled mollusc fishing typically occurs throughout the year, with a wide variety of marine shelled molluscs being caught along the entire Kenyan coastline. However, it is more prevalent during the

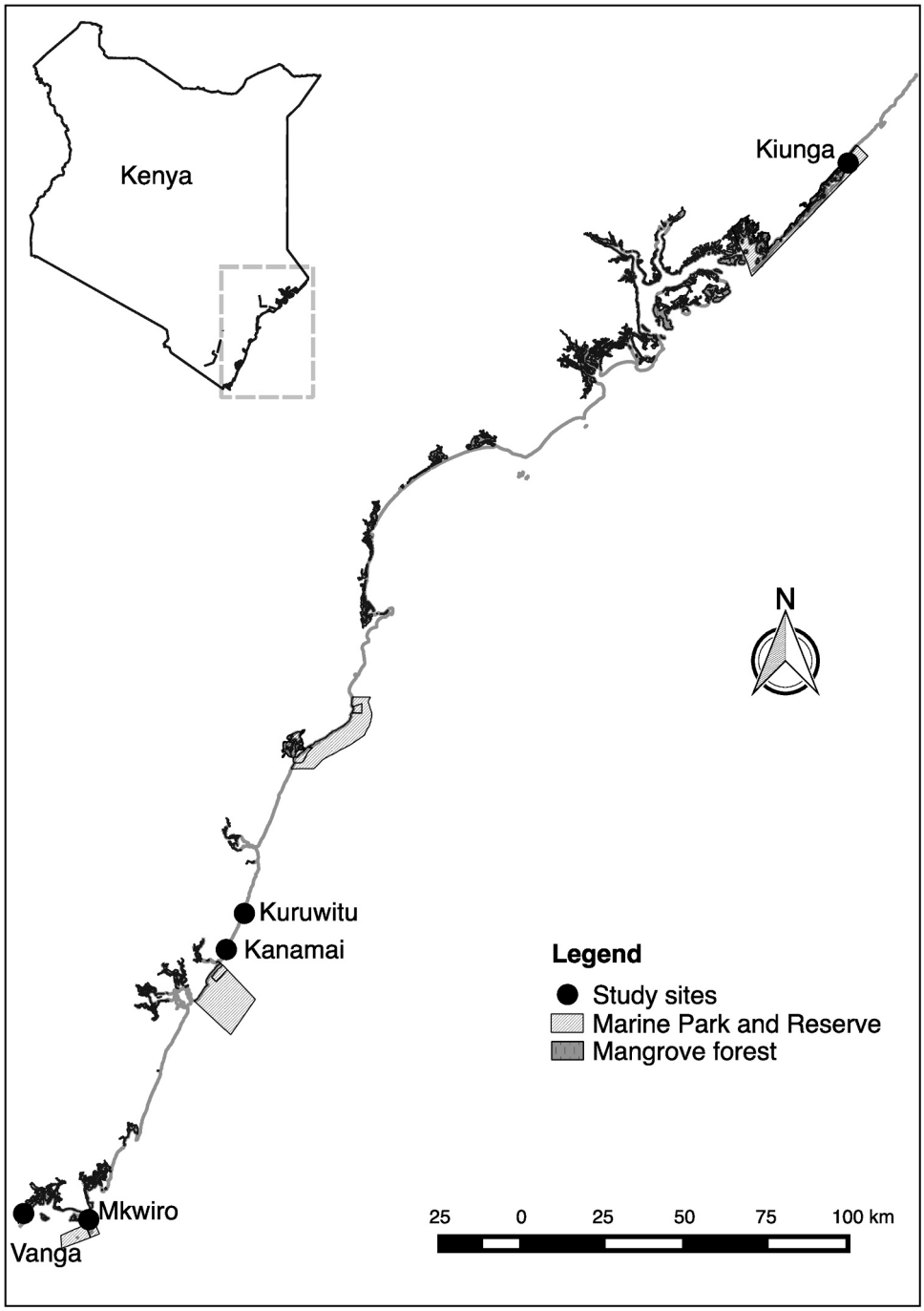

Fig. 1. Location of study sites.

southeast monsoon (SEM) season [47].

Monsoon winds influence the climatic conditions on the Kenya coast. They blow from the northeast during December to March) and from the southeast from May to October, with transition periods lasting 1–2 months characterised by variable and reduced wind patterns [46]. The NEM season is characterized by calm seas, elevated sea surface temperatures, lower primary productivity and high-water salinity while the SEM season is characterized by rough seas, cool weather, higher primary productivity and lower water salinity [48]. Furthermore, the northern part of the Kenyan coast is bathed seasonally by the Somali Current System, receiving cold upwelling waters which are pushed southwards during the NEM season [46]. Therefore, these two seasons, the NEM and the SEM, influence fishing activities. During the SEM season,when the sea is too rough, fishers tend to concentrate their efforts in inshore waters. Conversely, during the NEM season, when the sea is calm, they can access fishing grounds beyond the reef [48]. In this study, five study sites were selected based on their historical recordof catching marine-shelled molluscs [49]. The sites, as shown in Fig. 1, include Kiunga (1° 44' 40.92'' S; 41° 29' 54.96'' E), Kuruwitu (3° 49' 12'' S; 39° 49' 48'' E), Kanamai (3° 55' 12'' S; 39° 47' 2.4'' E), Mkwiro (4° 40' 30'' S; 39° 23' 60'' E) and Vanga (4° 39' 0'' S; 39° 14' 16.8'' E). Kiunga and Mkwiro fishing grounds occur in marine reserves with some level of government protection. Kuruwitu fishing grounds occur adjacent to a community-managed marine area while Kanamai and Vanga fishing grounds occur in unprotected, fished reefs. Kanamai and Mkwiro are bordered by tourist hotels, while Vanga, Kuruwitu and Kiunga are bordered by villages/residences. Tourists regularly visit all the sites except Vanga.

2.2. Data collection

A total of 132 shelled mollusc fishers (91 women and 41 men) were interviewed during the NEM season between December 2015 and February 2016 at five study sites: 30 respondents at Kiunga, 31 at Kuruwitu, 14 at Kanamai, 47 at Mkwiro, and ten at Vanga. This represents about 34% of the 376 invertebrate fishers recorded during a frame survey conducted in coastal Kenya in 2016 [50]. Respondents were selected by snowball sampling by relying on referrals based on their involvement in fishing marine shelled molluscs and their willingness and availability to participate in the interviews. A deliberate effort was made to ensure that there was a representation of both women and men and to ensure gender inclusivity. Nonetheless, female shelled mollusc fishers were not available during the time of the survey in Vanga despite efforts undertaken to reach them. All respondents were interviewed individually either at landing sites when they had completed the day's fishing activities or at their homes during the daytime. All interviews were conducted in Swahili and each interview took approximately 1 h.

The interview form was designed to gather data for two separate studies: 1) shifting baselines in shelled mollusc fisheries along the Kenyan coast with a focus on shelled mollusc species collected, habitat preference and threats to shelled molluscs abundance and distribution [11] and 2) gender inequalities in small-scale fisheries in coastal Kenya with a focus on participation in the fishery and income. These studies were complementary. The first study aimed to explore the concept of shifting baselines across different generations of shelled mollusc fishers, while the second examined factors that intersect with gender to moderate gender discrimination, domination, or oppression in the fishery such as participation income. During the interviews conducted for this study, the respondents were asked to estimate the income they earned from selling the shelled species they caught and the frequency at which they sold the shells. The interviews also sought to explore the following information from the respondents: age, sex, primary and secondary occupation, fishing experience (years), time spent fishing, and preferred habitat (Interview questions are available in Supplementary Material). Qualitative data were obtained by conducting participant observation and conducting two key informant interviews per site. The two approaches were used to explore knowledge and perceptions of women and men fishers regarding their access to shelled molluscs.

2.3. Data analysis

Summary statistics and frequency tables were used to describe the socio-demographic characteristics of the respondents. A Welch's ANOVA was conducted to test for differences between male and female respondents in terms of age, experience, income, and monetary value of the shelled species targeted. A one-way SIMPER analysis was conducted to determine which species had the greatest impact on the differences between females and males. Patterns were also identified from qualitative data obtained through key informant interviews and participant observations. Multivariate analysis was done in PRIMER version 6 software packages. Statistical and graphical data analysis was conducted using R version 2022.07.1 [51] and Microsoft Excel 2019.

3. Results

3.1. General characteristics of respondents

Responses from 132 respondents at five sites along the Kenyan coast were analysed. Table 1 presents the characteristics of the interviewed respondents, including information on gender, age, fishing experience, and monthly income. The proportion of women (69.50%, n = 132) respondents in the study was higher than that of men (30.50%, n = 132). The villages with higher proportions of women than men respondents included: Kiunga (76.67%, n = 30), Kanamai (69.23%, n = 14) and Mkwiro (96.23%, n = 47). A higher proportion of men (57.14%, n = 31) than women (42.86%, n = 31) were interviewed at Kuruwitu. All respondents at Vanga were men (100%, n = 10). A significant difference in age and years of fishing experience was found between female and male shelled mollusc fishers ($p < 0.05$). However, there were no differences in the monthly income, number of species caught per individual fisher or the number of hours an individual spent fishing in a day between female and male shell fishers ($p > 0.05$). The daily income of half (52.63%) of women and 34.29% of male shell fishers in our study was below the extreme poverty line of USD 2.15 a day.

Table 1
Summary of key descriptions of respondents across the five different study communities (n = 132).

Site	Gender	Proportion of respondents interviewed (%)	Age (± SD)	Years of experience (± SD)	Hours spent fishing in a day (± SD)	Catch per unit effort (CPUE) (Kg/fisher/day) (± SD)	Number of species caught per individual fisher (± SD)	Annual income per individual fisher (USD/Year) (± SD)	Proportion of respondents living below the global extreme poverty line of USD 2.15 a day (%)
Kanamai	Women	69.23	38.89 ± 11.73	3.39 ± 1.65	3.22 ± 2.03	0.97 ± 1.01	1.67 ± 0.50	553.89 ± 525.02	77.78
	Men	30.77	67.00 ± 3.16	40.00 ± 17.91	2.63 ± 0.48	0.57 ± 0.57	12.00 ± 6.16	2545.45 ± 1112.69	-
Kiunga	Women	76.67	43.91 ± 16.63	18.74 ± 10.95	2.99 ± 0.83	4.01 ± 6.38	4.78 ± 6.23	1507.48 ± 885.35	30.43
	Men	23.33	58.43 ± 9.78	37.57 ± 8.70	3.14 ± 0.38	2.65 ± 6.02	3.43 ± 1.72	1311.12 ± 1102.25	42.86
Kuruwitu	Women	42.86	32.07 ± 7.80	2.27 ± 2.25	2.80 ± 1.50	0.94 ± 2.28	4.27 ± 3.20	870.36 ± 881.16	78.57
	Men	57.14	52.00 ± 11.33	32.95 ± 14.20	3.19 ± 1.00	1.05 ± 1.55	12.37 ± 6.26	1776.15 ± 1082.83	29.41
Mkwiro	Women	96.23	39.45 ± 14.20	18.26 ± 16.40	3.79 ± 1.09	1.52 ± 3.07	13.18 ± 5.43	1573.35 ± 2382.15	51.02
	Men	3.77	41.00 ± 9.90	25.00 ± 11.31	4.50 ± 0.71	4.68 ± 8.76	9.00 ± 0.00	1660.08 ± 335.39	50.00
Vanga	Men	100	39.40 ± 9.47	18.40 ± 9.79	4.00 ± 0.00	2.39 ± 5.74	9.44 ± 6.44	1184.58 ± 803.18	50.00
Total	Women	69.50	39.27 ± 14.11	14.52 ± 14.57	3.41 ± 1.28	1.84 ± 3.81	8.12 ± 6.83	1357.22 ± 1827.28	52.63
	Men	30.50	50.98 ± 12.87	30.60 ± 14.30	3.24 ± 0.89	1.95 ± 4.86	10.03 ± 6.40	1616.37 ± 1031.79	34.29
p-value			$p < 0.05$	$p < 0.05$	$p > 0.05$	$p < 0.05$	$p > 0.05$	$p > 0.05$	

3.2. Shelled mollusc fishers' primary and secondary occupation

Both women and men shelled mollusc fishers conducted primary and secondary income-generating activities (Fig. 2). The proportion of female fishers whose primary occupation was shelled mollusc fishing was four times greater than that of men. Subsequently, the majority of women (73%, n = 91) engaged in shelled mollusc fishing considered it their primary occupation, whereas only 17% (n = 41) of male shelled mollusc fishers ranked shelled mollusc fishing as their primary occupation. In Kanamai, all female shelled mollusc fishers (100%, n = 10) reported shelled mollusc fishing as their primary occupation. The highest proportion (75.00%, n = 4) of male shelled mollusc fishers in Kanamai reported fishing as their primary occupation, while only 25.00% (n = 4) of these fishers reported shelled mollusc fishing as their primary occupation. In Kiunga, the largest proportion of female shelled mollusc fishers (82.61%, n = 23) reported shelled mollusc fishing as their primary occupation. This was followed by engagement in small-scale business (8.70%, n = 23), octopus fishing (4.35%, n = 23) and farming (4.35%, n = 23). In Kiunga, the majority of male shelled mollusc fishers reported finfish fishing (43%, n = 23) as their primary occupation, followed by shelled mollusc fishing (28.57%, n = 7). In Kuruwitu, the primary occupation of the majority of female shelled mollusc fishers was reported as farming (40%, n = 13), followed by shelled mollusc fishing (33.3%, n = 13), employment (13.3%, n = 13), and small-scale business (13.3%, n = 13). None of the shelled mollusc fishers 0% (n = 18) in Kuruwitu reported shelled mollusc fishing as their primary occupation. In Mkwiro, the majority of female shelled mollusc fishers (56.86%, n = 45) reported shelled mollusc fishing as their primary occupationas. This was followed by engagement in octopus fishing (15.69%, n = 45), small-scale business (13.73%, n = 45), seaweed farming (5.88%, n = 45), employment (3.92%, n = 45), and fish trading (3.92%, n = 45). Half of the male shelled mollusc fishers (50%, n = 2) in Mkwiro reported fish trading as their primary occupation, while the remaining half (50%, n = 2) reported employment as their primary occupation. In Vanga, the highest proportion of the male shelled mollusc fishers reported finfish fishing (50%, n = 10) as their primary occupation, followed by fish trading (40%, n = 10), and farming (10%, n = 10).

Occupational multiplicity was observed with 79.59% (n = 91) of female mollusc fishers and 86.05% (n = 41) of male mollusc fishers reporting that they had access to secondary livelihood activities. In Kanamai, a high proportion of female (77.78%, n = 10) and male (50%, n = 2) shelled mollusc fishers reported that they had access to secondary livelihood activities. In Kiunga, a high proportion of women (65%, n = 23) and men (100%, n = 18) shelled mollusc fishers reported that they had access to secondary livelihood activities. In Kuruwitu, 80.00% (n = 13) of women shelled mollusc fishers and 90.00% (n = 18) of male shell fishers reported having access to secondary livelihood activities. In Mkwiro, 86.27% (n = 45) of female shelled mollusc fishers and 100.00% (n = 2) of male shelled mollusc fishers reported having access to secondary livelihood activities. In Vanga, 80.00% (n = 10) of male shelled mollusc fishers reported having access to secondary livelihood activities. Among male respondents (n = 41), the most significant secondary sources of income included shelled mollusc fishing (43%, n = 41), farming (32%, n = 41) and finfish fishing (15%, n = 41). For female respondents (n = 91), the most significant secondary sources of income were shelled mollusc fishing (49%, n = 91), small-scale business (24%, n = 91), and farming (10%, n = 91).

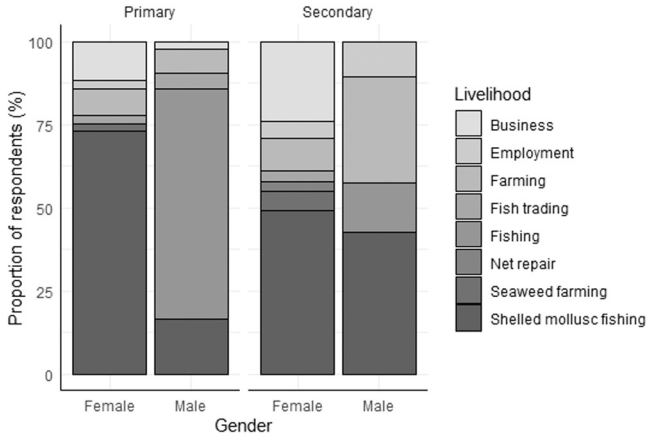

Fig. 2. Perceptions of primary and secondary livelihood activities for female and male shelled mollusc fishers combined across the study sites.

3.3. Perceptions of resource use

The types of habitats that respondents preferred for fishing shelled molluscs are shown in Fig. 3. They include seagrass beds, rubbles, rocky areas, a mixture of seagrass and sand, mangrove forests, coral reefs and bare areas. In general, the majority of female shelled mollusc fishers preferred to catch shelled molluscs in seagrass beds (58.78%; n = 91), whereas most male shelled mollusc fishers preferred to catch shells in coral reefs (33.33%; n = 41). In Kanamai, a significant proportion of female shelled mollusc fishers preferred to fish in seagrass beds (40.91%; n = 10). Similarly, in Kiunga, the majority of female shelled mollusc fishers preferred to fish in seagrass beds (95.24%; n = 23), as did those in Kuruwitu (39.39%; n = 13), and Mkwiro (62.50%; n = 45). In Kanamai, the majority of male fishers preferred to catch shelled molluscs in bare areas (36.36%; n = 10) and coral reefs (33.33; n = 10). In Kuruwitu, the majority of male fishers preferred to catch shelled molluscs in bare areas (31.91%; n = 13) and coral reefs (29.79%; n = 13), while in Vanga, the majority of male fishers preferred to catch shelled molluscs in bare areas (33.33%; n = 10) and coral reefs (33.33%; n = 10). In Kiunga, the majority of the male fishers preferred to catch shelled molluscs in coral reefs (57.14%; n = 23).

3.4. Perception of the monetary value of targeted species

The estimated average monetary value of shelled mollusc species across all sites and genders in Kenya was 93.30 ± 171.22 USD/ individual fisher/year. There was no significant difference in the perceived monetary value of shells caught by male and female shelled mollusc fishers (p = 0.697443). The average monetary value of shells targeted by a female shelled mollusc fisher was estimated to be 91.77 ± 181.64 USD/ individual fisher/year, while the monetary value of shells caught by a male shelled mollusc fisher was estimated to be 96.22 ± 149.56 USD/ individual fisher/year. A Non-metric multidimensional scaling ordination analysis revealed that there was no variation in the monetary value of targeted species based on gender. However, there was a significant difference in the estimated monetary value of shells perceived to be caught between sites ($p < 0.05$). The highest estimated monetary value of shell species was reported by male shelled mollusc fishers in Kiunga (208.59 ± 204.89 USD/individual fisher/year). This was followed by the estimated monetary value of shelled mollusc species perceived to be targeted by female mollusc fishers in Kanamai (195.20 ± 208.87 USD/ individual fisher/year). Mollusc shell species that were identified by respondents to possess the lowest estimated monetary value were caught by male shelled mollusc fishers in Mkwiro (56.71 ± 67.91 USD/ individual fisher/year) and Vanga (54.69 ± 83.85 USD/ individual fisher/year). The species that played a significant role in the disparity between women and men included *Monetaria annulus*, *Monetaria moneta*, *Purpuradusta gracilis*, and *Erosaria miliaris*. These species were perceived to possess high monetary values by female fishers. Conversely, *Charonia tritonis* was the only species perceived to have significantly high monetary value by male shelled mollusc fishers (Table 2).

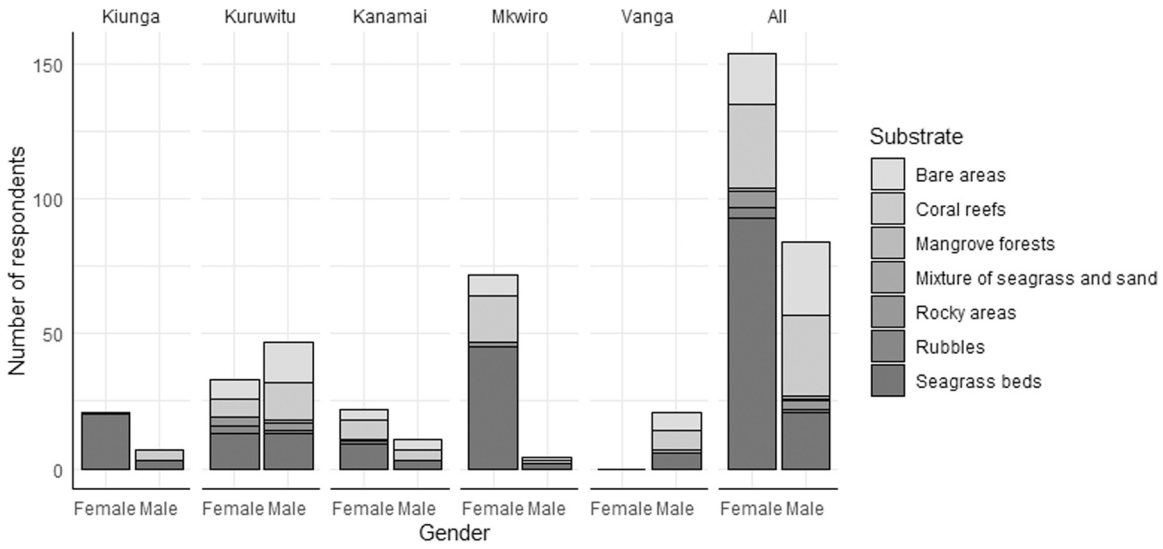

Fig. 3. Perceived resource partitioning in space between female and male shelled mollusc fishers. The higher number of responses than n in each category is because each respondent could mention more than one substrate. Number of respondents for Kanamai n = 14 (Female = 10; Male = 4); Kiunga n = 30 (Female = 23; Male = 7); Kuruwitu n = 31 (Female = 13; Male = 18); Mkwiro n = 47 (Female = 45; Men = 2); Total respondents = 132 (Female = 91; Men = 41).

Table 2
Percent contributions of 37 most influential species contributing to the dissimilarity between women and men. The asterisks in the p-value column denote statistically significant differences (* < 0.05; ** <0.01, ***<0.001). For a full list of species caught in this fishery, please see Alati et al., 2020.

Species	Females	Males	Cumulative sum	p
Monetaria annulus	12.25	1.4	0.077	**0.001** * **
Cypraea tigris	16.5	5	0.149	0.162
Monetaria moneta	13	1	0.203	**0.001** * **
Cypraecassis rufa	5.75	6.2	0.247	0.082
Pleuroploca trapezium	10.5	4.2	0.29	0.33
Lambis lambis	5.25	4.4	0.325	0.147
Cassis cornuta	7	5.2	0.36	0.104
Charonia tritonis	1.5	4.8	0.392	**0.007** * *
Chicoreus ramosus	4.25	2	0.414	0.25
Lambis chiragra arthritica	2.75	3.4	0.435	0.829
Chelycypraea testudinaria	3.25	3	0.452	0.879
Lambis truncata	3.5	2	0.469	0.585
Turbo marmoratus	0.75	3.2	0.484	0.913
Tridacna maxima	0.25	2.8	0.498	0.909
Mauritia mauritiana	2.75	1.4	0.511	0.764
Arestorides argus	1.5	2	0.523	0.951
Pleuroploca filamentosa	2.5	1	0.533	0.588
Volema pyrum	2.25	0.8	0.544	0.358
Ovula ovum	1.75	1.6	0.554	0.949
Erronea caurica	2.25	0.4	0.564	0.116
Anadara antiquata	2.5	0.6	0.574	0.541
Lyncina lynx	2.75	0.2	0.583	0.069
Erosaria erosa	2.5	0.6	0.593	0.259
Erronea errones	1.75	0.2	0.602	0.102
Tridacna squamosa	0.25	1.6	0.611	0.902
Charonia lampas	1.25	1.4	0.62	0.917
Erosaria miliaris	1.25	0	0.629	**0.039** *
Purpuradusta gracilis	0.75	0.2	0.637	**0.014** *
Terebralia palustris	1.5	0.8	0.645	0.777
Melicerona felina	1.75	0	0.652	0.039 *
Harpa harpa	0.75	1.4	0.66	0.939
Mauritia arabica	2	0	0.667	0.112
Murex pecten	0.5	1	0.675	0.518
Littoraria scabra	0.25	1.2	0.682	0.634
Palmadusta clandestina	1.5	0.4	0.689	0.339
Leporicypraea mappa	1.25	0.2	0.696	0.116
Acanthopleura brevispinosa	3.5	0	0.703	0.248

3.5. General perceptions of marine shelled mollusc fishing

Qualitative data collected from 10 key informants (two per site) and participant observations revealed that male shelled mollusc fishers accessed fishing grounds using boats or dugout canoes and caught shelled molluscs using diving gear. In contrast, female shelled mollusc fishers caught shelled molluscs using their hands and sticks while walking in shallow water during low spring tide. Qualitative data further revealed that male shelled mollusc fishers, especially those primarily engaged in finfish fishing,caught valuable shells whenever they encountered them while fishing. Some women and men were opportunistic. For instance, some women caught shelled molluscs whenever there was a demand for specific species such as *Monetaria annulus* and *Monetaria moneta* from shell dealers. During this period, the number of shelled mollusc fishers at a site increased significantly because even those who were not actively fishing for shelled molluscs returned to the sea to meet the demand for these shelled molluscs. Therefore, for some female shelled mollusc fishers, their fishing was motivated by the market, where shell dealers bought shells from them. In addition, both women and men engaged in fishing other marine resources such as octopuses alongside their shelled mollusc fishing.

Women primarily caught shelled molluscs in fishing grounds near their homes. In contrast, men moved more freely at sea because they used boats or dugout canoes to access distant fishing grounds that were beyond the reach of women fishers. Men also used diving equipment to search for and catch shelled molluscs. They possessed significantly greater fishing experience than women, were more skilled, and possessed superior knowledge regarding fishing grounds. Moreover, men had swimming abilities that enabled them to access sub-tidal areas and dive into deeper waters.

4. Discussion

4.1. Perceptions of gender participation in the fishery

The absence of gender-disaggregated data to illuminate how women and men participate in SSF can limit our capacity to make comparisons [52]. This study employs a combination of qualitative and quantitative methodologies to provide a comprehensive view of how women and men participate in the shelled mollusc SSF. Our findings reveal that a larger proportion of women compared to men participate consistently in the fishing activity. In many developing countries, women mostly rely

on this fishery for their primary livelihood, while men view it as secondary [12,16,21,22]. The difference in participation between women and men, therefore, provides valuable insights into habitat status, species populations, fishery conditions and socioeconomic trends [9,11,14,52]. Our results reveal that opportunistic women are primarily motivated to join the fishery by fellow women fishers [53,54], and market demand from middlemen. These women typically fish during the low spring tide and when the weather conditions are favorable for fishing activities [55]. In contrast, men's fishing activities are less constrained by space, time, or market demand, as observed in Zanzibar [12], Nicaragua [56], and the Solomon Islands [57]. They fish during both neap and spring tides and can easily access remote areas [12,56]. This inequality results in women having a lower adaptive capacity [58] and is exacerbated by intersectional differences in access and control over capital and resource knowledge [21,26,31,45] leading to economic inequalities [5,12,21,31]. These results, therefore, provide valuable insights into how participation intersects with gender, shaping roles and interactions in SSF [45,57].

As the number of women participating in this fishery as their primary livelihood increases [9,12,16,55], it has the potential to promote gender equality [59,60] helping to counter prevailing gender norms that often prioritize women's reproductive labour [20,28,61]. In coastal Kenya, women often rely on men in the household for financial support [62,63]. This fishery, therefore, has the potential to increase gender equity [64] enabling women to earn income independently from the marine environment.

With degrading coral reefs, increased storminess and local extirpation of historically exploited shelled molluscs [11,12], men could start targeting species of low value in shallower areas [12,65] potentially displacing female shell fishers from their traditional fishing grounds. This displacement through competition and cultural norms could subordinate women and perpetuate gender disparities [4,66,67]. This could limit women's income accumulation and their contribution to community sustainability. Previous studies have shown that increasing participation of women in SSF decision-making can potentially enhance habitats, livelihoods and food security [16,53,68–71]. Encouraging their active participation in male dominated decision-making processes is vital for their empowerment [69,70]. It shifts policy attention away from the generalized perception of women as fish processors and marketers and emphasizes their important role in SSF governance.

4.2. Perceptions of gender inequality in income from the fishery

Coastal communities are increasingly turning to shelled mollusc fishing as a means of earning additional income because of prevailing economic crises [16]. In particular, women's involvement in this fishery has increased significantly in many countries [64]. Coastal Kenya exemplifies this trend, where women are joining the fishery more than men, particularly during lean seasons to supplement household income [41,72]. Nonetheless, women's contributions to local economic systems remains underpaid [18,19], often due to the perception that men have higher catch success rates and income [16,31]. However, counter to expected gender disparities [5,12,31], the present study found no significant difference in income between women and men shelled mollusc fishers. This could imply that women employed creative flexibility and agency to change actual power relations [42]. Therefore, these findings strengthen the significance of intersectional gender studies underscoring the interplay between gender and income in shaping interactions within SSF [45,57].

The present study suggests that income from shelled mollusc fishing is relatively inconsistent and modest. Consequently, women engaged in this fishery contribute less to their households compared to those engaged in other fisheries activities such as fish trading [73,74], as demonstrated previous studies conducted in Zanzibar [5,75] and Comoros island [55]. This economic situation results in a significant proportion of women who rely on this fishery to live below the extreme poverty line of USD 2.15 per day. Previous studies have demonstrated how poverty intersection with gender tends to decrease women's decision-making power in SSF [45]. In response to extreme poverty, women are increasingly turning to secondary occupations for survival [56,75,76], which was not the case in the past [77]. However, the additional income generated from secondary occupations is very low to lift an individual beyond the extreme poverty line. As such, disruptions in fishing livelihoods, markets [78] and declining shelled mollusc populations [9,11,79] may highlight and exacerbate existing gender inequalities [75,80,81]. It is, therefore, important to recognize and quantify the role of both women and men in fisheries to ensure equal access to fisheries resources and markets, facilitating unrestricted participation in fishing activities [14].

4.3. Limitations of the study

The limitation of this study is the imbalance in gender responses and the absence of secondary data that shows gender participation in this fishery. Moreover, the study does not consider other factors intersecting with gender such as ethnicity, wealth, social networks, religion, location, and education that position women and men within the fishery in relation to the benefits they can generate. Nonetheless, the present study offers valuable insights into gender inequalities in fisheries, enhancing our understanding of SSF.

5. Conclusion

The present study highlights the need for disaggregating fisheries data by gender and considering other factors that intersect with gender, particularly for a fishery that has received little scientific attention. It illustrates how gender intersects with participation and income to generate differences that either increase or decrease an individual's decision-making power. Here, more women than men participated in the SSF as their primary income-generating activity. However, a higher proportion of women than men who are engaged in shelled mollusc fishing live below the extreme poverty line of USD 2.15 a day. This economic disparity could reduce women's decision-making power. To achieve gender-equitable fisheries, the practice of disaggregating fisheries data by gender is essential. This will support the equal representation of women and men in the SSF management and policy-making process.

We recommend that interventions should seek to address the risks and uncertainties that affect women and men through the provision of social safety nets, reduction of income dependence on shelled mollusc fishing, diversification of livelihoods, and improved access to formal insurance schemes [80]. The position of women should be strengthened by pushing for policies that address the needs of women in the fishing industry, recognize and value their contributions, and empower them through equitable management and market systems [5,45]. Moreover, inclusive fisheries policies are needed to ensure that both women and men have equal opportunities to participate in SSF, and that traditional beliefs, norms, and laws do not restrict women's participation in SSF. Increasing women's participation in male dominated SSF decision-making processes is crucial to protect and promote their livelihoods and position in the community, ultimately contributing to fisheries sustainability.

Social science research should transcend the estimation of women participation rates in fisheries [4,6] and move towards assessing potential gender disparities in fishing practices. This is essential for gaining insights into the deferential impacts of fishery regulations on various groups of fishers, enabling targeted training and development programs for those who need them most [21,31]. Furthermore, we recommend that future research should incorporate in their analyses components that intersect with gender, such as ethnicity and education. This will provide a more inclusive understanding of human interactions within fisheries and marine spatial planning. Research should also examine

whether financial contribution and gender roles influence the status and decision-making power [24,74] in households that rely on this fishery. Understanding these dynamics is essential for formulating interventions and policies that not only promote gender equality but also contribute to the sustainability of fisheries.

CRediT authorship contribution statement

Victor Mwakha Alati: Conceptualization, Investigation, Methodology, Funding acquisition, Data curation, Formal analysis, Roles/Writing - original draft, Writing – review & editing, Visualization, Validation, Project administration. **Kennedy Osuka**: Conceptualization, Methodology, Data curation, Formal analysis, Visualization, Writing – review & editing. **Paul Tuda**: Conceptualization, Formal analysis, Visualization, Writing – review & editing. **Levy Michael Otwoma**: Conceptualization, Visualization, Data curation, Writing – review & editing. **Lina Mtwana Nordlund**: Conceptualization, Methodology, Funding acquisition, Data curation, Visualization, Validation, Writing – review & editing, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.marpol.2023.105863.

References

[1] E. Bennett, Gender, fisheries and development, Mar. Policy 29 (2005) 451–459, https://doi.org/10.1016/j.marpol.2004.07.003.
[2] FAO, Towards gender-equitable small-scale fisheries., in: Proceedings of the Expert Workshop on Gender-Equitable Small-Scale Fisheries in the Context of the Implementation of the SSF Guidelines, FAO, Rome, Italy, 2017: p. 80. ⟨https://www.fao.org/fishery/en/publications/6239⟩.
[3] S. Harper, C. Grubb, M. Stiles, U.R. Sumaila, Contributions by women to fisheries economies: insights from five maritime Countries, Coast. Manag. 45 (2017) 91–106, https://doi.org/10.1080/08920753.2017.1278143.
[4] D. Kleiber, L.M. Harris, A.C.J. Vincent, Gender and small-scale fisheries: a case for counting women and beyond, Fish Fish 16 (2015) 547–562, https://doi.org/10.1111/faf.12075.
[5] M. de la Torre-Castro, S. Fröcklin, S. Börjesson, J. Okupnik, N.S. Jiddawi, Gender analysis for better coastal management – Increasing our understanding of social-ecological seascapes, Mar. Policy 83 (2017) 62–74, https://doi.org/10.1016/j.marpol.2017.05.015.
[6] S. Harper, M. Adshade, V.W.Y. Lam, D. Pauly, U.R. Sumaila, Valuing invisible catches: Estimating the global contribution by women to small-scale marine capture fisheries production, PLOS ONE 15 (2020), e0228912, https://doi.org/10.1371/journal.pone.0228912.
[7] FAO, Duke University, WorldFish, Illuminating Hidden Harvests – The contributions of small-scalefisheries to sustainable development, Rome, 2023. ⟨https://doi.org/10.4060/cc4576en⟩.
[8] R.K.F. Unsworth, L.M. Nordlund, L.C. Cullen-Unsworth, Seagrass meadows support global fisheries production, Conserv. Lett. 12 (2019), e12566, https://doi.org/10.1111/conl.12566.
[9] L. Nordlund, J. Erlandsson, M. de la Torre-Castro, N. Jiddawi, Changes in an East African social-ecological seagrass system: invertebrate harvesting affecting species composition and local livelihood, Aquat. Living Resour. 23 (2010) 399–416, https://doi.org/10.1051/alr/2011006.
[10] L.M. Nordlund, R.K.F. Unsworth, M. Gullström, L.C. Cullen-Unsworth, Global significance of seagrass fishery activity, Fish Fish 19 (2018) 399–412, https://doi.org/10.1111/faf.12259.
[11] V.M. Alati, J. Olunga, M. Olendo, L.N. Daudi, K. Osuka, C. Odoli, P. Tuda, L. M. Nordlund, Mollusc shell fisheries in coastal Kenya: Local ecological knowledge reveals overfishing, Ocean Coast. Manag. 195 (2020), 105285, https://doi.org/10.1016/j.ocecoaman.2020.105285.
[12] S. Fröcklin, M. de la Torre-Castro, E. Håkansson, A. Carlsson, M. Magnusson, N. S. Jiddawi, Towards Improved Management of Tropical Invertebrate Fisheries: Including Time Series and Gender, PLoS One 9 (2014), e91161, https://doi.org/10.1371/journal.pone.0091161.
[13] N. Biswas, Towards Gender-Equitable Small-Scale Fisheries Governance and Development: A Handbook in Support Of The Implementation of The Voluntary Guidelines For Securing Sustainable Small-Scale Fisheries In The Context Of Food Security And Poverty Eradication., FAO,, Rome, 2017 https://doi.org/10.18356/e999fb85-en.
[14] S. Harper, D. Zeller, M. Hauzer, D. Pauly, U.R. Sumaila, Women and fisheries: Contribution to food security and local economies, Mar. Policy 39 (2013) 56–63, https://doi.org/10.1016/j.marpol.2012.10.018.
[15] K. Barclay, N. McClean, S. Foale, R. Sulu, S. Lawless, Lagoon livelihoods: gender and shell money in Langalanga, Solomon Islands, Marit. Stud. 17 (2018) 199–211, https://doi.org/10.1007/s40152-018-0111-y.
[16] A. Tilley, A. Burgos, A. Duarte, J. dos Reis Lopes, H. Eriksson, D. Mills, Contribution of women's fisheries substantial, but overlooked, in Timor-Leste, Ambio 50 (2021) 113–124, https://doi.org/10.1007/s13280-020-01335-7.
[17] M. de la Torre-Castro, Inclusive management through gender consideration in small-scale fisheries: the why and the how, Front. Mar. Sci. 6 (2019). ⟨https://www.frontiersin.org/article/10.3389/fmars.2019.00156⟩.
[18] N. Weeratunge, K.A. Snyder, C.P. Sze, Gleaner, fisher, trader, processor: understanding gendered employment in fisheries and aquaculture, Fish Fish 11 (2010) 405–420, https://doi.org/10.1111/j.1467-2979.2010.00368.x.
[19] M. Zhao, M. Tyzack, R. Anderson, E. Onoakpovike, Women as visible and invisible workers in fisheries: A case study of Northern England, Mar. Policy 37 (2013) 69–76, https://doi.org/10.1016/j.marpol.2012.04.013.
[20] K. Frangoudes, S. Gerrard, D. Kleiber, Situated transformations of women and gender relations in small-scale fisheries and communities in a globalized world, Marit. Stud. 18 (2019) 241–248, https://doi.org/10.1007/s40152-019-00159-w.
[21] S.W. Purcell, A. Tagliafico, B.R. Cullis, B.J. Gogel, Understanding gender and factors affecting fishing in an artisanal shellfish fishery, Front. Mar. Sci. 7 (2020), 297, https://doi.org/10.3389/fmars.2020.00297.
[22] D. Kleiber, L.M. Harris, A.C.J. Vincent, Improving fisheries estimates by including women's catch in the Central Philippines, Can. J. Fish. Aquat. Sci. (2014), https://doi.org/10.1139/cjfas-2013-0177.
[23] L. Szaboova, M. Gustavsson, R. Turner, Recognizing women's wellbeing and contribution to social resilience in fisheries, Soc. Nat. Resour. 35 (2022) 59–74, https://doi.org/10.1080/08941920.2021.2022259.
[24] A.B. Ameyaw, A. Breckwoldt, H. Reuter, D.W. Aheto, From fish to cash: Analyzing the role of women in fisheries in the western region of Ghana, Mar. Policy 113 (2020), 103790, https://doi.org/10.1016/j.marpol.2019.103790.
[25] R. Grantham, J. Lau, D. Kleiber, Gleaning: beyond the subsistence narrative, Marit. Stud. 19 (2020) 509–524, https://doi.org/10.1007/s40152-020-00200-3.
[26] K. Bradford, R.E. Katikiro, Fighting the tides: A review of gender and fisheries in Tanzania, Fish. Res. 216 (2019) 79–88, https://doi.org/10.1016/j.fishres.2019.04.003.
[27] S. Fröcklin, M. de la Torre-Castro, L. Lindström, N.S. Jiddawi, Fish traders as key actors in fisheries: gender and adaptive management, AMBIO 42 (2013) 951–962, https://doi.org/10.1007/s13280-013-0451-1.
[28] C.L. Manyungwa, M.M. Hara, S.K. Chimatiro, Women's engagement in and outcomes from small-scale fisheries value chains in Malawi: effects of social relations, Marit. Stud. 18 (2019) 275–285, https://doi.org/10.1007/s40152-019-00156-z.
[29] R.B. Bird, Fishing and the Sexual Division of Labor among the Meriam, Am. Anthropol. 109 (2007) 442–451, https://doi.org/10.1525/aa.2007.109.3.442.
[30] S.W. Purcell, N.J. Fraser, S. Tagica, W. Lalavanua, D.M. Ceccarelli, Discriminating catch composition and fishing modes in an artisanal multispecies fishery, Front. Mar. Sci. 5 (2018), 243, https://doi.org/10.3389/fmars.2018.00243.
[31] S.V. Siar, Knowledge, gender, and resources in small-scale fishing: the case of Honda Bay, Palawan, Philippines, Environ. Manag. 31 (2003) 569–580, https://doi.org/10.1007/s00267-002-2872-7.
[32] L. Campling, E. Havice, P.M. Howard, The political economy and ecology of capture fisheries: market dynamics, resource access and relations of exploitation and resistance, J. Agrar. Change 12 (2012) 177–203, https://doi.org/10.1111/j.1471-0366.2011.00356.x.
[33] A. Randrianantoandro, A. Ward, A.S. Barraza, Gender and Food Loss in Sustainable Fish Value Chains in Africa, Food & Agriculture Org,, Rome, 2022.
[34] A. Olofsson, S. Rashid, The White (Male) effect and risk perception: can equality make a difference? Risk Anal. 31 (2011) 1016–1032, https://doi.org/10.1111/j.1539-6924.2010.01566.x.

[35] M.J. Williams, Why look at fisheries through a gender lens? Development 51 (2008) 180–185, https://doi.org/10.1057/dev.2008.2.

[36] U.N. DESA, The Sustainable Development Goals Report 2023: Special edition Towards a Rescue Plan for People and Planet, UN Department of Economic and Social Affairs,, New York, 2023. ⟨https://unstats.un.org/sdgs/report/2023/⟩.

[37] V. Bryson, Feminist Political Theory: An Introduction, 2nd ed., Palgrave, Macmillan,, New York, 2003. ⟨https://link.springer.com/book/10.1007/978-1-349-22284-1⟩.

[38] V. Bryson, Marxism and feminism: can the 'unhappy marriage' be saved? J. Political Ideol. 9 (2004) 13–30, https://doi.org/10.1080/1356931032000167454.

[39] S. Harding, Gendered standpoints on nature, in: J. Lorber (Ed.), Gender Inequality: Feminist Theories and Politics, 5th ed..,, Oxford University Press, New York, 2012, pp. 182–192.

[40] M. Galappaththi, A.M. Collins, D. Armitage, P.K. Nayak, Linking social wellbeing and intersectionality to understand gender relations in dried fish value chains, Marit. Stud. 20 (2021) 355–370, https://doi.org/10.1007/s40152-021-00232-3.

[41] J. Ochiewo, Changing fisheries practices and their socioeconomic implications in South Coast Kenya, Ocean Coast. Manag. 47 (2004) 389–408, https://doi.org/10.1016/j.ocecoaman.2004.07.006.

[42] N. Kawarazuka, C. Locke, J. Seeley, Women bargaining with patriarchy in coastal Kenya: contradictions, creative agency and food provisioning, Gend. Place Cult. 26 (2019) 384–404, https://doi.org/10.1080/0966369X.2018.1552559.

[43] M. Williams, Expanding the horizons: connecting gender and fisheries to the political economy, Marit. Stud. 18 (2019) 399–407, https://doi.org/10.1007/s40152-019-00149-y.

[44] K. Frangoudes, B. Marugán-Pintos, J.J. Pascual-Fernandez, Gender in Galician shell-fisheries: transforming for governability, in: M. Bavinck, R. Chuenpagdee, S. Jentoft, J. Kooiman (Eds.), Governability of Fisheries and Aquaculture: Theory and Applications, Springer Netherlands, Dordrecht, 2013, pp. 241–261, https://doi.org/10.1007/978-94-007-6107-0_13.

[45] M. Axelrod, M. Vona, J. Novak Colwell, K. Fakoya, S.S. Salim, D.G. Webster, M. de la Torre-Castro, Understanding gender intersectionality for more robust ocean science, Earth Syst. Gov. 13 (2022), 100148, https://doi.org/10.1016/j.esg.2022.100148.

[46] D.O. Obura, Kenya, Mar Pollut Bull. 42 (2001) 1264–1278. https://doi.org/10.1016/s0025–326x(01)00241–7.

[47] F. Le Manach, C.A. Abunge, T.R. McClanahan, D. Pauly, Tentative reconstruction of Kenya's marine fisheries catch, 1950–2010, University of British Columbia, Fisheries Centre, 2015.

[48] T.R. McClanahan, Seasonality in East Africa's coastal waters, (1988).

[49] S.M. Evans, G. Knowles, C. Pye-Smith, R. Scott, Conserving shells in Kenya, Oryx 13 (1977) 480–485, https://doi.org/10.1017/S0030605300014538.

[50] Government of Kenya, Marine Artisanal Fisheries Frame Survey 2016 Report, Ministry Agriculture Livestock and Fisheries, State Department of Fisheries, 2016. ⟨https://aquadocs.org/handle/1834/8858⟩ (accessed August 12, 2021).

[51] R Core Team, RStudio: Integrated Development for R. RStudio, (2022). ⟨http://www.rstudio.com/⟩.

[52] M. Szymkowiak, M. Rhodes-Reese, Addressing the gender gap: using quantitative and qualitative methods to illuminate women's fisheries participation, Front. Mar. Sci. 7 (2020), https://doi.org/10.3389/fmars.2020.00299. ⟨https://www.frontiersin.org/articles/⟩ (accessed May 25, 2023).

[53] J. Torre, A. Hernandez-Velasco, F.F. Rivera-Melo, J. Lopez, M.J. Espinosa-Romero, Women's empowerment, collective actions, and sustainable fisheries: lessons from Mexico, Marit. Stud. 18 (2019) 373–384, https://doi.org/10.1007/s40152-019-00153-2.

[54] N. Kabeer, Resources, agency, achievements: reflections on the measurement of women's empowerment, Dev. Change 30 (1999) 435–464, https://doi.org/10.1111/1467-7660.00125.

[55] M. Hauzer, P. Dearden, G. Murray, The fisherwomen of Ngazidja island, Comoros: Fisheries livelihoods, impacts, and implications for management, Fish. Res. 140 (2013) 28–35, https://doi.org/10.1016/j.fishres.2012.12.001.

[56] B. Crawford, M.D. Herrera, N. Hernandez, C.R. Leclair, N. Jiddawi, S. Masumbuko, M. Haws, Small scale fisheries management: lessons from cockle harvesters in Nicaragua and Tanzania, Coast. Manag. 38 (2010) 195–215, https://doi.org/10.1080/08920753.2010.483174.

[57] J. Rohe, A. Schlüter, S.C.A. Ferse, A gender lens on women's harvesting activities and interactions with local marine governance in a South Pacific fishing community, Marit. Stud. 17 (2018) 155–162, https://doi.org/10.1007/s40152-018-0106-8.

[58] F. Pike, N.S. Jiddawi, M. de la Torre-Castro, Adaptive capacity within tropical marine protected areas – Differences between men- and women-headed households, Glob. Environ. Change 76 (2022), 102584, https://doi.org/10.1016/j.gloenvcha.2022.102584.

[59] D.L. Davis, J. Nadel-Klein, Gender, culture, and the sea: Contemporary theoretical approaches, Soc. Nat. Resour. 5 (1992) 135–147, https://doi.org/10.1080/08941929209380782.

[60] M. Gustavsson, K. Frangoudes, L. Lindström, M.C. Ávarez Burgos, M. de la Torre-Castro, Gender and Blue Justice in small-scale fisheries governance, Mar. Policy 133 (2021), 104743, https://doi.org/10.1016/j.marpol.2021.104743.

[61] J. Stiepani, N. Jiddawi, L. Mtwana Nordlund, Social-ecological system analysis of an invertebrate gleaning fishery on the island of Unguja, Zanzibar, Ambio 52 (2023) 140–154, https://doi.org/10.1007/s13280-022-01769-1.

[62] V. Mochache, G. Wanje, L. Nyagah, A. Lakhani, H. El-Busaidy, M. Temmerman, P. Gichangi, Religious, socio-cultural norms and gender stereotypes influence uptake and utilization of maternal health services among the Digo community in Kwale, Kenya: a qualitative study, Reprod. Health 17 (2020), 71, https://doi.org/10.1186/s12978-020-00919-6.

[63] D. Ciekawy, Women's "work" and the construction of witchcraft accusation in coastal kenya. Women's Studies International Forum, Elsevier,, 1999, pp. 225–235.

[64] L. McClenachan, A. Moulton, Transitions from wild-caught fisheries to shellfish and seaweed aquaculture increase gender equity in Maine, Mar. Policy 146 (2022), 105312, https://doi.org/10.1016/j.marpol.2022.105312.

[65] R.K.F. Unsworth, L.J. McKenzie, L.M. Nordlund, L.C. Cullen-Unsworth, A changing climate for seagrass conservation? Curr. Biol. 28 (2018) R1229–R1232, https://doi.org/10.1016/j.cub.2018.09.027.

[66] M. Murunga, Towards a better understanding of gendered power in small scale fisheries of the Western Indian Ocean, Glob. Environ. Change 67 (2021), 102242, https://doi.org/10.1016/j.gloenvcha.2021.102242.

[67] M. Medard, H. van Dijk, P. Hebinck, Competing for kayabo: gendered struggles for fish and livelihood on the shore of Lake Victoria, Marit. Stud. 18 (2019) 321–333, https://doi.org/10.1007/s40152-019-00146-1.

[68] D. Kleiber, L. Harris, A.C.J. Vincent, Gender and marine protected areas: a case study of Danajon Bank, Philippines, Marit. Stud. 17 (2018) 163–175, https://doi.org/10.1007/s40152-018-0107-7.

[69] J. House, D. Kleiber, D.J. Steenbergen, N. Stacey, Participatory monitoring in community-based fisheries management through a gender lens, Ambio 52 (2023) 300–318, https://doi.org/10.1007/s13280-022-01783-3.

[70] S. Aswani, P. Weiant, Scientific evaluation in women's participatory management: monitoring marine invertebrate refugia in the Solomon Islands, Hum. Organ. 63 (2005) 301–319, https://doi.org/10.17730/humo.63.3.r7kgd4thktmyf7k1.

[71] F. Nunan, D. Cepić, Women and fisheries co-management: Limits to participation on Lake Victoria, Fish. Res. 224 (2020), 105454, https://doi.org/10.1016/j.fishres.2019.105454.

[72] E. Chuku, J. Adotey, E. Effah, S. Abrokwah, R. Adade, I. Okyere, D. Aheto, K. Kent, B. Crawford, The Estuarine and Mangrove Ecosystem-Based Shellfisheries of West Africa: Spotlighting Women-Led Fisheries Livelihoods, Graduate School of Oceanography, University of Rhode Island,, Narragansett, RI, USA, 2021.

[73] N. Matsue, T. Daw, L. Garrett, Women fish traders on the Kenyan coast: livelihoods, bargaining power, and participation in management, Coast. Manag. 42 (2014) 531–554, https://doi.org/10.1080/08920753.2014.964819.

[74] M. Adjei, A.H.N. Chan, What women do, believe in, and financially contribute—what matters more in couples' decision making? Gender inequality in Ghana's small-scale fisheries, Rural Sociol. 88 (2022) 220–251, https://doi.org/10.1111/ruso.12474.

[75] M. de la Torre-Castro, L. Lindström, N.S. Jiddawi, F. Pike, A. Max, Women and adaptive capacity to climate change in East African seascapes – Zanzibar as an example, Front. Mar. Sci. 9 (2022). ⟨https://www.frontiersin.org/articles/10.3389/fmars.2022.931883⟩.

[76] N. Solano, I. Lopez-Ercilla, F.J. Fernandez-Rivera Melo, J. Torre, Unveiling Women's Roles and Inclusion in Mexican Small-Scale Fisheries (SSF), Front. Mar. Sci. 7 (2021). ⟨https://www.frontiersin.org/articles/10.3389/fmars.2020.617965⟩.

[77] J.E. Cinner, Ö. Bodin, Livelihood diversification in tropical coastal communities: a network-based approach to analyzing 'livelihood landscapes, PLoS One 5 (2010), e11999, https://doi.org/10.1371/journal.pone.0011999.

[78] J. Lau, S. Sutcliffe, M. Barnes, E. Mbaru, I. Muly, N. Muthiga, S. Wanyonyi, J. E. Cinner, COVID-19 impacts on coastal communities in Kenya, Mar. Policy 134 (2021), 104803, https://doi.org/10.1016/j.marpol.2021.104803.

[79] L.C. Newton, E.V.H. Parkes, R.C. Thompson, The effects of shell collecting on the abundance of gastropods on Tanzanian shores, Biol. Conserv. 63 (1993) 241–245, https://doi.org/10.1016/0006-3207(93)90719-H.

[80] C. Béné, B. Hersoug, E.H. Allison, Not by rent alone: analysing the pro-poor functions of small-scale fisheries in developing countries, Dev. Policy Rev. 28 (2010) 325–358, https://doi.org/10.1111/j.1467-7679.2010.00486.x.

[81] C. Lakner, D.G. Mahler, M. Negre, E.B. Prydz, How much does reducing inequality matter for global poverty? J. Econ. Inequal. (2022) https://doi.org/10.1007/s10888-021-09510-w.