



# Unveiling Women's Roles and Inclusion in Mexican Small-Scale Fisheries (SSF)

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The contributions of women to fisheries are often invisible, ignored, and unrecognized even though they represent 47% of the global fisheries workforce, especially in pre- and post-production activities. Poor data systems lead to incorrect assumptions about the gender division of labor in fisheries. This causes the role of women in fisheries to be overlooked. To evaluate the contribution of women in the value chain, a participatory methodology was implemented in three small-scale, fisheries in Mexico: California spiny lobster (*Panulirus interruptus*) fishery from the northern Mexican Pacific, penshell (*Atrina maura*) fishery from the Gulf of California, and Caribbean spiny lobster (*Panulirus argus*) fishery from the Mesoamerican Reef region. This study shows an unequal inclusion of men and women as members of the fishing cooperatives where only 4%, 5%, and 20% are women in spiny lobster, red lobster, and penshell, respectively, and in the distribution of direct jobs (1 out of 6.7 jobs was held by a woman). These results indicate limited opportunities for women to access leadership positions. However, the participation percentages increased dramatically when we considered the fishery system (i.e., both direct and indirect jobs), with women accounting for 43%, 21%, and 37% of the California spiny lobster, penshell, and Caribbean spiny lobster fishery workforce, respectively. Women represented 39% of the workforce in pre-production activities, 2% in production, 29% in post-production, and 56% in complementary to production. Women tended to participate in two or more activities at the same time, generally combining work, household, and community activities. The participation of women in fisheries could be equivalent to a second working day, and even when this effort is present in similarly in three fisheries, their contribution is yet to be acknowledged in order to incorporate women in decision-making. The analysis of the value chain and the fishery system provided a more realistic picture of the contribution of women to fisheries than an analysis focused solely on extraction. This work further analyzed the importance and degree of participation of women in fishing cooperatives and the decision-making process. Strategies to reduce gender disparity are needed to encourage inclusion of women in fisheries decision-making.

**Keywords:** fishery system, employment, Mexico, small-scale fishery, fisheries value chain, gender division of labor, women, gender equality

## INTRODUCTION

According to the Food and Agriculture Organization (FAO), approximately 60 million people indirectly or directly work, either full or part time, in the primary sector of capture fisheries and aquaculture worldwide, and 14% of the global population of individuals are directly involved in the fisheries and aquaculture sector are women (FAO, 2020). However, when fisheries have been evaluated in their entirety [i.e., including processing and commercialization, ca. 260 million (Teh and Sumaila, 2013)], women have been found to constitute half of the global fisheries workforce when post-production activities are included (World Bank, 2012; FAO, 2020). In addition to participating in pre- and post-production activities, women are primarily responsible for running households and raising children. When harvesting, women mostly engage in shore gleaning (Harper et al., 2013; Kleiber et al., 2014; Torre et al., 2019), although they also participate in boat-based fishing activities. Most of the catch that is obtained by women is intended for feeding their families or sold locally, whereas the majority of the catch that is obtained by men enters the market (Harper et al., 2013).

Women contribute enormously to fisheries worldwide, especially in activities that require spending more time on land, such as manufacturing and fixing fishing gear, processing the catch, inspecting quality, commercializing the catch, and participating in conservation-related activities (Harper et al., 2013; Kleiber et al., 2014; Torre et al., 2019). In addition, women also act as small-scale entrepreneurs, particularly at the household level, when appropriate technologies and sufficient capital are in place (FAO, 2020), which stimulates local economies and boosts community wellbeing.

Despite the substantial presence of women in fisheries, national fishery data collection systems hide their real contributions to small-scale fisheries (SSF) and aquaculture with regard to employment, production, and commercialization (FAO, 2013). Non-inclusive statistics based on catch and production data fail to reflect the actual participation of women in fisheries, resulting in a quantitative data gap (Kleiber et al., 2014; Torre et al., 2019). This results in the contributions of women remaining Invisible, Ignored, and Unrecognized (IUU; WSI, 2020). The collection of sex-disaggregated data and the integration of a gender perspective in SSF statistics by quantitatively and qualitatively describing the activities carried out by women as well as the characteristics of these activities (e.g., pay, benefits, and access to healthcare) are especially important in developing countries (FAO, 2020).

Fishing is an important economic driver in the 11,000 communities that are found along the coasts of Mexico (<15,000 inhabitants; Gabriel-Morales and Perez-Damian, 2006). The FAO ranked Mexico thirteenth in the world in terms of seafood production, yet in spite of its importance in Mexico, official statistics differ with regard to the number of people that are employed by fisheries. The official data ranges from 270,000 individuals (CONAPESCA, 2013; FAO, 2020), with non-existing gender-disaggregated data, to 180,000 individuals, of which 14,000 are women employed in coastal fisheries and 92% are men (INEGI, 2014).

In Mexico, fishing sector information is generally collected from catch and boat registration data as well as from the number of permits or concessions that are granted. Women are widely absent from this census due to their low access to boat ownership, permits, or concessions (Torre et al., 2019; Castañeda et al., 2020). Even though studies have recognized that women from coastal Mexican communities participate throughout the value chain (Torre et al., 2019), supporting fisher families and communities (Harper et al., 2013), a nation-wide characterization of their contributions has not yet been conducted.

Neglecting women in fisheries leads to biases and is the result of a deficient data capture process. In turn, this lack of information leads to an incomplete understanding of coastal livelihoods that underestimates the total amount of anthropogenic pressure on natural resources. As such, more gender inclusive, fishery-focused data that takes into account the roles of women will improve management decisions (Monfort, 2015) and fisheries sustainability. After years of capacity building, empowerment, and collective action (Torre et al., 2019) through participation in community leadership programs (COBI, 2020), workshops, and conferences (Harper et al., 2013), Mexican women are ready to build a fairer position for themselves in SSF.

During the last decade, the contributions of women to fisheries are becoming more visible, which has been fostered by the publication of an increasing number of studies. However, only a few studies have specifically described how women come to obtain direct jobs in pre-harvest (e.g., repairing fishing gear, obtaining bait, and preparing fishing trips), harvest (e.g., fishing or farming), and post-harvest (e.g., size and weight sorting, preparation, cleaning, canning, distribution, and commercialization) activities (Germain et al., 2015; Perea-Blazquez and Flores-Palacios, 2016; Harper et al., 2017; Hernández-Félix et al., 2017; Pedroza-Gutiérrez, 2019; Torre et al., 2019).

When examining management entities and the decision-making arenas, it is clear that women also face discrimination with regard to access. In Mexico, SSF organize themselves into cooperatives. In a cooperative, when a fisher passes away, his membership is preferably inherited by his sons instead of by his wife or daughters. This is a reflection of the cultural construct that fishing is an activity for men. Moreover, in order to become a member of a fishing cooperative without having inherited a legacy membership, a candidate must work exclusively for several years performing extractive activities (Castañeda et al., 2020). As women usually contribute to either pre- or post-production activities that are not extractive and thus do not accrue time in extractive activities, they are excluded from becoming formal members of cooperatives and the decision-making process.

According to FAO (2014) fisheries value chain traditionally include the production (fishing or farming), aggregation (sorting by size, species, etc.), processing (cleaning, canning, packing, etc.), and distribution (wholesale and retail). The participation of women in indirect fishing activities, such as parenting, running the household, surveilling and patrolling the community, and participating in conservation and monitoring efforts, has not yet been fully considered in the fisheries value chain (Fulton et al., 2019a; Torre et al., 2019). Thus, these activities are not

being monetarily compensated (Germain et al., 2015; Perea-Blazquez and Flores-Palacios, 2016; Espinosa-Romero et al., 2017; Hernández-Félix et al., 2017), and some activities are seen as extensions of the domestic work to which women have traditionally been culturally bound (Siegert, 2017).

In Mexico fishing is defined in the legislation as “the act of extracting, capturing, or collecting, by any method or procedure, biogenic elements or biological species whose lives occur totally, partially, or temporarily in water” (DOF, 2007). Although fishing is sometimes used as a synonym for the fishing sector in general, in this study, fishing is used according to the Espinosa-Romero et al. (2017) definition. Fishery system is used to describe the ecological and social interactions that occur in fisheries. These complex social-ecological systems (SES), which were proposed by Ostrom (2009), define the anthropogenic use of natural resources and include two or more subsystems, such as the fishery system, resource units, users, and governance systems (FAO, 2015).

This study researched about women’s roles in three high-economic value fisheries whose access rights through fishing concessions can be similar to those on TURFs. In Mexico, SSF effort is regulated through fishing permits and concessions granted by the national fishing authority, the *Comisión Nacional de Acuacultura y Pesca* (CONAPESCA). The selected fisheries operate according to fishing concession, granted only to one fishing organization in a limited area, which guarantee long-term (5–20 years) fishing rights to harvest species which are usually of high economic value (like penshell and lobster) and low mobility (Afflerbach et al., 2014; DOF, 2018b).

The three studied fisheries were red lobster (*Panulirus interruptus*) from the Pacific, penshell (*Atrina maura*) in the Gulf of California, and spiny lobster (*Panulirus argus*) in the Caribbean. As well as limiting the fishing effort (concessions), they are regulated by catch size (only adults or sub-adults), season closures during the reproductive season of each species, and fishing gear (wire traps for red lobster, hookah and beach gleaning for penshell, free diving and “casitas” for spiny lobster) (DOF, 2012, 2018a). Fishing quotas are not established for these fisheries.

According to the Mexican law that regulates the operation of cooperatives (*Ley General de Sociedades Cooperativas*) (DOF, 1994), cooperatives must be constituted by at least five members with equally distributed benefits, obligations, and responsibilities. All members must have a voice and vote in the cooperative. Mandatory requirements include having a general assembly which democratically elects an administrative and supervisory council (i.e., board of directors).

Being a member of a fishing cooperative implies holding rights as convened in the permit or concession, as well as reporting obligations. Members of fishing cooperatives share the management of fishing resources, and access to relatively secure job and salary. They have voice and vote in the decision-making of the cooperative, since this system is one of the fairest forms of social organization as its principles are based on solidarity and common good, which is achieved through collaboration and a shared goal: to professionally use and manage common resources, and benefit derived from them (DOF, 1994).

The mechanism for becoming a member of the cooperative is defined in its internal statutes, which are agreed upon by the general assembly. The number of members may vary in each cooperative, and membership can be inherited by another family member. In the cooperatives with which we collaborated in this study, potential members engaged in paid work until good performance was demonstrated and an opportunity opened to become a member of the cooperative; for the purposes of this study, we categorized them as temporary employees. Both the members (i.e., the general assembly) and the board of directors participate in the decision-making process. The temporary employees, on the other hand, do not have a voice or vote. However, some cooperatives invite them into the general assembly as observers.

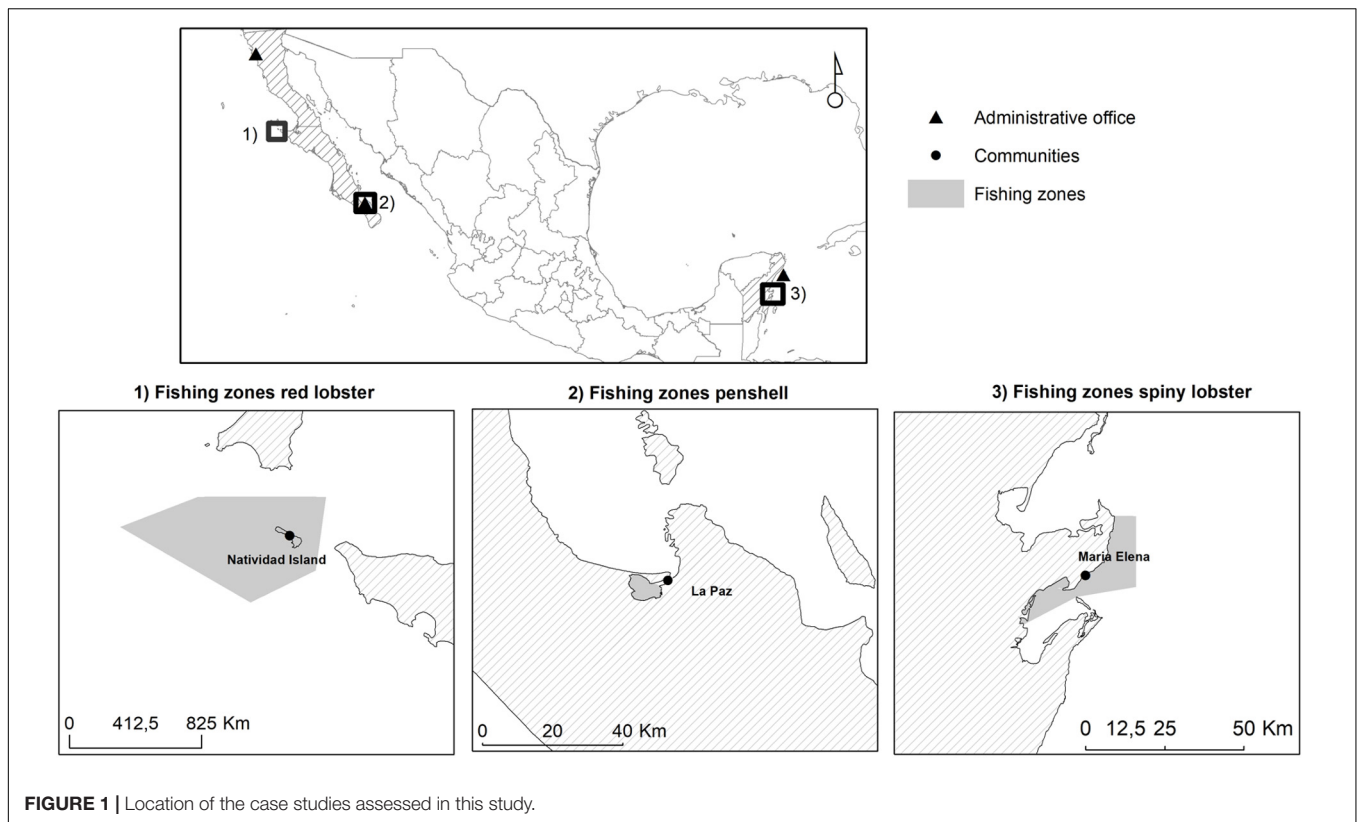
The study was conducted with two fishing cooperatives, *Buzos y Pescadores de la Baja California* and *Cozumel*, and the *Organización de Pescadores Rescatando la Ensenada* rural production society. The *Buzos y Pescadores de la Baja California* cooperative is based on Natividad Island (Northern Mexican Pacific) and principally extracts California spiny lobster (*Panulirus interruptus*) with wire traps in the northern Mexican Pacific. The *Cozumel* cooperative mainly extracts Caribbean spiny lobster (*Panulirus argus*) in the Mesoamerican Reef region of Cozumel Island and the *Maria Elena* fishing camp (Mexican Caribbean) via free diving and lobster “casitas” (artificial shelters). The *Organización de Pescadores Rescatando la Ensenada* rural production society encompasses several fishing cooperatives based in La Paz, Baja California Sur, that extract penshell (*Atrina maura*) in the Gulf of California (Figure 1).

It also comparatively analyzed fishing and fishery system data to understand how narrative can influence and bias participation in fisheries and thus contribute to the gender-data gap. We suggest that broadening the understanding of the fishery system throughout the value chain by incorporating elements of gender studies is the key to charting a course toward inclusive and socially equitable fisheries.

The objectives of this research were to (1) determine the identities of the participants of three high-value SSF in Mexico, focusing on a gender-division of labor along the value chain; (2) generate information on the contributions of men and women to fisheries; and (3) raise awareness among fishing communities about the importance of gender equality for marine conservation and sustainable fisheries management.

## MATERIALS AND METHODS

To generate a broader understanding of the fishing and social dynamics of coastal communities, a reconstruction of the value chains of three SSF in Mexico was conducted. A participatory methodology was designed and implemented, including qualitative and quantitative data collection. Participants aged over 18, from three fishing organizations (*Buzos y Pescadores de la Baja California* cooperative, *Cozumel* cooperative, and the *Organización de Pescadores Rescatando la Ensenada* rural production society) provided written informed consent to engage in this study.



**FIGURE 1** | Location of the case studies assessed in this study.

## Co-creation of the Fishery Value Chain

Two sets of participatory workshops were held for each fishery. The first was a 2-day workshop to co-create the fishery value chain at the community level and quantify with fishers and community members how many people, accessed leadership positions, cooperative membership, temporary employment, and participated in activities complementary to production (community patrolling and monitoring, family support). Data was disaggregated by gender. As fishing cooperative members are mainly men, inclusive community participation was essential to ensure that the co-creation process included all voices from both direct and indirect jobs related to the fishery. A maximum of 35 participants were invited to each workshop, including women and men of different ages, diverse occupations, and different social positions in the community (**Table 1**). Participants did not need to be members of the fishing cooperatives, but they were required to have knowledge of the selected fishery.

None of the studied fisheries had built their value chain with a gender perspective. To achieve this, the first workshop used participatory facilitation dynamics to foster co-creation of knowledge and defy gender-based roles in fisheries. Groups of five to seven men and women identified the steps of the fishery value chain including categorization of complementary to production activities, identified paid and unpaid jobs, and described how members access decision-making in their cooperatives. The results and reflections were shared in a plenary session. As a result of shared reflections, a fisherman said,

**TABLE 1** | Individuals involved in the participatory assessment.

Fishery	W	Women	M	Men	Total by fishery
California spiny lobster	9	Housewives, divers, employees of the processing plant and administrative staff.	5	Fishermen and aquaculture technician.	14
Penshell	7	Members of the cooperative, product processing and in charge of monitoring the fishing area.	1	Fishermen.	8
Caribbean spiny lobster	11	Housewives, daughters of members, members of cooperative, employees, administrative assistants and student.	24	Board of directors, members of cooperative, extras, warehouse and administrative employees.	35
Total	27		30		57

Women (W) and men (M).

*“Equality is not a race to see who earns more or less, is participation of both (men and women) in fisheries so that we can provide a better life to our families.”*

**TABLE 2** | Description of the gender division of labor according to Aguilar and Castañeda (2001).

Gender division of labor	Description
Reproductive work	Related to biological reproduction and the maintenance of the family and household. They are usually carried out in the domestic or private space.
Productive work	Generate income, goods, services, or benefits for their own consumption or for their commercialization in the market. They are usually carried out in the public space.
Community work	Carried out in the community to ensure family reproduction, defense and improvement of living conditions, and community organization. They can be done in the domestic or public space.

The second 1-day workshop explored the conditions in which women have historically become involved in fisheries. A historical monography comparing historic and recent photographs was collectively assembled and used as a visual tool to discuss the history of the fisheries and communities. Attention was drawn to the division of labor based on gender and to environmental and fisheries conditions. A diagram of the value chain that was co-created during the first workshop, was validated with the participants.

## Fishery Value Chain Framework

The design of the value chain of each fishery was based on the model of the FAO (2014) that includes four core elements: production, aggregation, processing, and distribution (wholesale and retail). We integrated the gender division of labor (Aguilar and Castañeda, 2001) into the FAO (2014) model to highlight traditionally Invisible, Ignored, and Unrecognized (IIU) fishing activities (Table 2).

Together with the participants, we rebuilt the value chains according to the particularities of the three case studies, adjusting the original design. Different activities were identified and categorized as either direct or indirect work and as either paid or unpaid labor (Figure 2).

Direct work refers to the functions located at the core of the value chain that are contractually, permanently, or periodically accounted for in the cooperative. Indirect work refers to activities that do not have a direct impact on the sector but that are necessary for the operation of the fishery, in addition to other activities that are complementary to harvest that were identified due to the incorporation of the gender division of labor from Aguilar and Castañeda (2001). Indirect work may be either paid or unpaid.

Productive activities were classified into four stages: pre-production, production, post-production, and complementary to production (Figure 2). As production is generally considered to encompass extractive activities (FAO, 2014), we included the pre-production and complementary to production stages to incorporate activities that have not been previously considered in the traditional value chain and that are mostly unpaid. These were identified by the participants of the fisheries. Activities were also classified considering productive, community and reproductive

work. Participants were quantified collectively with the fishers and attention was brought when people were found to perform more than one task.

Considering all the above, 18 activities were identified across the four stages of the value chain: pre-production (supplies, bait fishing), production (shipment, harvest), post-production (landing, aggregation and storage, processing, transport, wholesale and retail, administration), and complementary to production (maintenance, services, social commission, surveillance, monitoring, beach gleaning, transport and family support) (Figure 2). Ten activities were identified as productive work, seven activities were identified as community level work, and one activity was identified as reproductive work.

## Historical Monography

We constructed a historical monography based on visual anthropology tools. To deepen the understanding of social dynamics in fisheries, a focus was set on the participation of women in fishing community livelihoods. According to Sanchez (1989), visual anthropology is a branch of anthropology that is focused on the collection of images of cultures and people through time and space. Visual anthropology considers that culture manifests itself through visible symbols, gestures, ceremonies, rituals, and the rebuilding of natural environments. Therefore, photography is a commonly used tool within qualitative research (Vicente et al., 2017) since it allows for a descriptive and cultural form of communication from the participants (Hernández-Espejo, 1998). Describing the participation of women in fisheries through visual anthropology (Nadel-Klein and Davis, 1988) allows for a better understanding of fishing communities and a worldview that is derived from a systemic approach.

The monography was constructed through a participatory process, in which the experiences and memories of the members of the three fishing communities were shared among the participants. Old family photographs were presented by participants to foster a dialogue about the changing roles that women have held throughout the history of the fisheries. To facilitate this dialogue, we proposed triggering questions: (1) How was the fishery established? (2) What activities were historically related with either women or men? (3) Have their roles changed? (4) If so, how did this change occur and what is the current fishing dynamic? This historical monography was used to understand and complement the quantitative data in this research to shed a light on the conditions that enabled the inclusion of women in SSF. All the information was compared with available literature (Cochrane and Chakalall, 2002; Basurto et al., 2012; DOF, 2018a) and validated with the participants.

## RESULTS

A total of 57 people participated in the workshops (some people attended both workshops but were counted only once), which is equivalent to 17% of the total number of people registered in the three cooperatives ( $n = 347$ ). Overall, 47% of the workshop attendees were women and 53% were men.

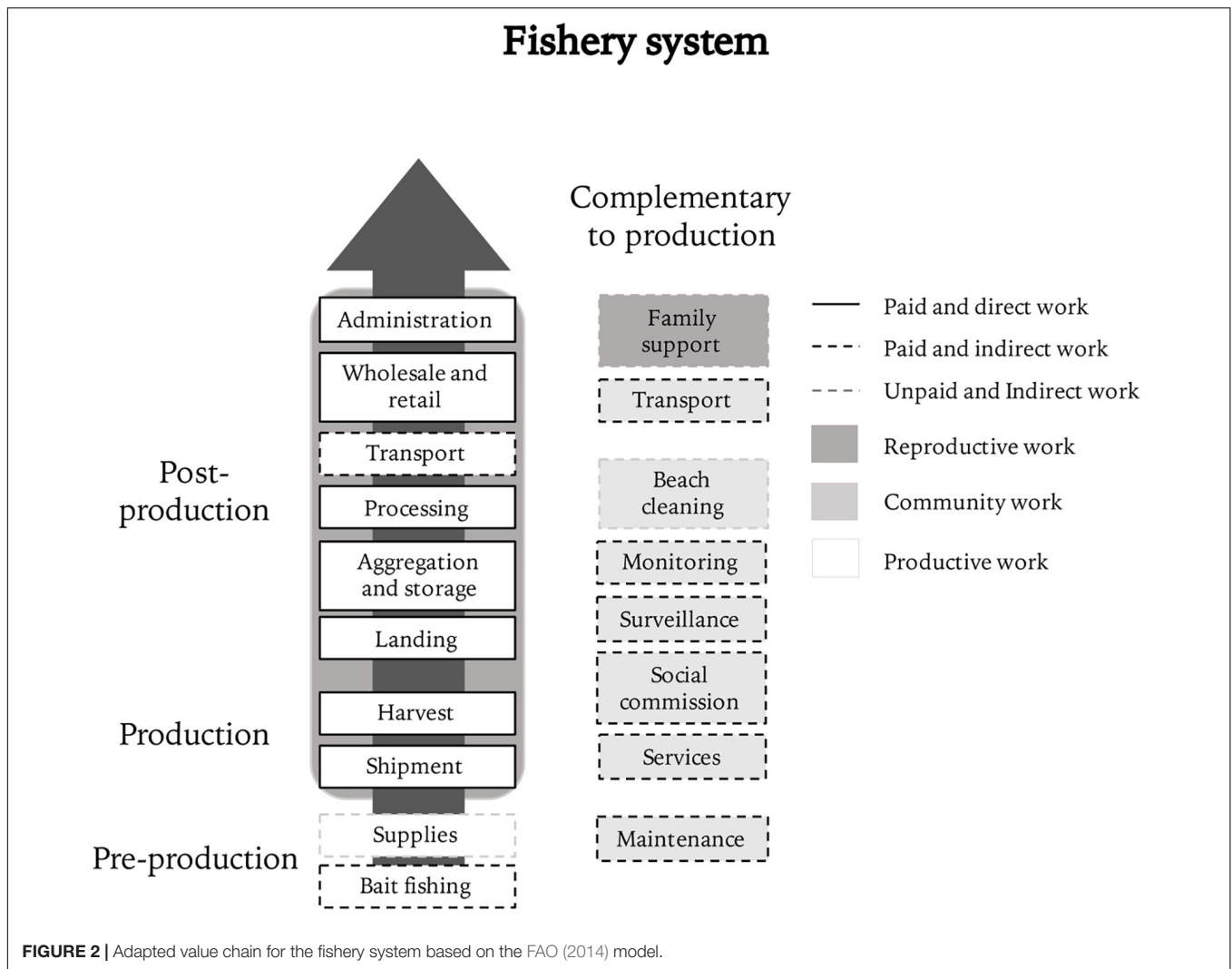


FIGURE 2 | Adapted value chain for the fishery system based on the FAO (2014) model.

### Leadership Positions, Cooperative Membership, and Temporary Employees

This research identified 347 people that were directly involved in the three fishing cooperatives: cooperative members (196, 10.2% women, 89.8% men) and temporary employees (130, 15.4% women, 84.6% men; **Table 3**). When looking at the compositions of the boards of directors (21), the average representation of women was much smaller (9.5%) compared to that of men (90.5%). In the three analyzed fisheries, the percentage of female members varied from 4 to 20%, with substantially higher participation of women in the penshell fishery, where 14 women are members, as opposed to only two women in the spiny lobster fishery, and four women in the red lobster fishery.

The California spiny lobster fishery generated the largest number of temporary jobs for women (21%) compared to that of the two other fisheries. Whereas 10% of temporary jobs in the Caribbean spiny lobster fishery were occupied by women, the penshell fishery did not employ women in any temporary job. In contrast, the penshell fishery was the only fishery with

TABLE 3 | Participation of women (W) and men (M) as cooperative members, temporary employees, and members of the board of directors in the fishing communities.

Fishery	Cooperative members		Temporary employees		Board of directors		Participants per fishery
	W	M	W	M	W	M	
California spiny lobster	4	75	15	55	0	6	155
Penshell	14	54	0	10	2	8	88
Caribbean spiny lobster	2	47	5	45	0	5	104
Total	20	176	20	110	2	19	347
Percentage	10.2	89.8	15.4	84.6	9.5	90.5	

a board of directors with 20% representation by women. This suggests that the penshell fishery is more inclusive compared to the other two fisheries, employing all its members with a minimal temporary workforce.

## Direct and Indirect Jobs

The three fisheries contribute to social wellbeing by generating direct and indirect employment for 607 people (180 women, 427 men). Direct jobs employed 6.7 men per woman (35 women, 237 men). When evaluating indirect jobs, participation was more equitable compared to that of direct jobs, with one woman for every 1.3 men (145 women and 190 men).

The penshell fishery employed 100 people (43 women and 57 men). In this fishery, similar participation by women was observed in direct (35%) and indirect jobs (50%). The Caribbean spiny lobster fishery provided jobs for 232 people (83 women and 164 men). This fishery showed the lowest participation of women in direct jobs (6.5%), whereas 68% of women held indirect jobs. On the other hand, the red lobster fishery had the highest number of workers (260, 21% women, 79% men), with one in ten direct employees being a woman. Women held 26% of the indirect jobs in this workforce.

## Participation of Women in the Different Stages of the Value Chain

Women and men in the three fisheries participated in 18 activities identified across the value chain: pre-harvest (two), harvest (two), post-harvest (six), and complementary to harvest (eight) (**Figure 2**). Ten activities were identified as productive work, seven activities were identified as community level work, and one activity was identified as reproductive work. Some people performed more than one task. Overall, we found that these fisheries provided 724 jobs (250 and 474 jobs occupied by women and men, respectively) (**Table 4**).

Women showed the highest participation in activities that were complementary to production (145 jobs), while men participated to a greater extent in production activities (169 jobs). For the three combined study cases, 39%, 2%, 29%, and 56% of women participated in pre-harvest, harvest, post-harvest, and complementary to harvest activities, respectively (**Figure 3**). The overlapping percentages indicate that women participated in more than one activity.

In the penshell fishery, we found 12 activities within the value chain, with only one pre-harvest activity (supplying) and two complementary to harvest activities (surveillance and family support). Women who worked in this fishery system did not participate in other pre-harvest or production activities. However, women did show a high degree of participation in post-harvest (processing) and complementary to harvest activities (biological monitoring, surveillance, and family support). The historical monograph revealed that men and women had carried out penshell fishing together since the fishery was founded, although no one remembered the date. This was facilitated by the fact that the penshell fishery operated within an urban context in the city of La Paz, which promoted a work-life balance.

In the California spiny lobster fishery, 17 activities were identified as part of the value chain, with beach cleaning as the only non-related activity. Women showed the greatest participation in the value chain as suppliers and providers of family support. The monographic study revealed that Natividad Island used to be a fishing camp with limited infrastructure.

While men traveled to the island during the fishing season, the women and children remained in their homes in the coastal towns of Ensenada, Baja California, or La Paz, Baja California Sur, due to the lack of facilities for families on the island. Specifically, the island did not have its own water supply, electricity, schools, or access to medical care. After establishing the fishing cooperative in 1942, the community has invested and attracted public investment to build a desalting plant, school, medical facilities, and a processing plant that provides employment to the men and women of the island. Starting in 1957, some fishermen brought their wives to help them prepare food on the island. Occasionally, these women also sold food to other fishermen who had to travel to the island alone. This was the foundation of the Natividad Island community.

The dynamics of the penshell fishery were simple at its inception, with the men fishing from boats to harvest penshell and women processing the catch. During the low tide, women also harvested penshell along the shore. Penshell production was a family occupation with everyone contributing equally. After years of uncontrolled overfishing, the fishery collapsed, which deeply affected the wellbeing of the community as the penshell was the only resource that supported the local economy. Hence, the penshell fishers were forced to develop collective strategies to reduce the fishing effort. One of those strategies was to remove women from this activity to ensure that the small incomes generated from penshell fishing were only directed to men. In addition, the organization unanimously decided to only allow one member of each family to access the fishery to allow it to recover, and membership within the organization was only open to men. However, with the passage of time and with the support of the non-governmental organization *Noroeste Sustentable (NOS)*, the penshell fishers developed different strategies, such as seeding, penshell fattening, and the terrestrial and marine surveillance and protection of their fishing areas, in which women actively participated. The history of the fishery, which was based on the perception of fishing as a family activity, has allowed for women and men in the community to participate more equally when compared to that of the other fishing communities.

In the Caribbean spiny lobster value chain, we categorized 16 activities. Bait was not needed for this fishery, and product transportation was not carried out by the fishing organization. Women in this fishery system showed high participation in pre-production (supplies) and complementary to production activities (family support and, to some extent, monitoring). Compared with the other case studies, this is the only fishery in which women participate in harvesting (three active fisherwomen). The fishery began in 1960, when the cooperative was founded, and the dynamics of its development are similar to those of Natividad Island. Men traveled from Cozumel Island to the *Maria Elena* fishing camp (located in the Sian Ka'an Biosphere Reserve) for the season and occasionally brought their families for short periods of time. Some women have become more involved in the fishery over the past 5 years, working as fishing technicians, underwater monitors, and cooperative administrators.

**TABLE 4** | Participation at the different steps of the value chains.

Stage	Activities	California spiny lobster		Penshell		Caribbean spiny lobster		Participation by stage (Number of positions)			
		W	M	W	M	W	M	W	%	M	%
Pre-production	Harvest (bait fishing)	0	5	N/A	N/A	N/A	N/A	70	39	111	61
	Supplies	40*	89*	0	15*	30*	2				
Production	Shipment	0	40*	0	15*	3*	114*	3	2	169	98
	Harvest	0	40*	0	15*	3*	114*				
Post-production	Landing	0	5	0	15*	0	3*	32	29	78	71
	Storage	0	9	0	4	2*	3				
	Processing	3*	5	14*	8	0	5				
	Transport	0	9	0	1	0	3				
	Wholesale and retail	3	0	0	1	0	1				
	Administration	6	2	3	2	3*	2				
	Monitoring	5*	22	4*	29*	2*	12*	145	56	116	44
	Surveillance	0	6	14*	6*	0	4*				
Complementary to production	Transport	0	2	N/A	N/A	N/A	N/A				
	Service (Ice, water, light)	0	5	N/A	N/A	0	3				
	Maintenance	0	10	N/A	N/A	0	8				
	Beach cleaning	N/A	N/A	N/A	N/A	3*	20*				
	Social commission	0	2	N/A	N/A	0	3				
	Family support	40*	0	12	0	71*	2				
	Number of people by fishery	85	171	15	64	80	192				
Total participants in the three fisheries								180	30	427	70
Total job positions in the three fisheries								250	35	474	65

N/A: Activity does not occur in that fishery. \* one or more people participate in different activities.

## Double Shift and Economic Remuneration

Both women and men were involved in two or more activities within their fisheries. This phenomenon occurred most in the Caribbean spiny lobster fishery, where the lobster fishery occurs in a temporary fishing camp (in Sian Ka'an Biosphere Reserve) which is separated from the cooperative's main office (Cozumel Island), where families remain. At least one woman participated in more than one of the eight activities carried out by women, tripling the workday. In the penshell fishery, this occurred with men participating in six of 11 activities (with at least one man in each activity). In the California spiny lobster fishery, fewer activities involved the same man (three out of 15), hence more people (mostly men) participate in it and there is less cases of double shifts (Table 4). Men perform more than one activity when looking at the production stage, and when they participate in sustainability activities (monitoring and surveillance), though these activities are mostly paid-for. Women were found to perform more than one activity in every stage of the value chain, except for administration in the red lobster and penshell fisheries.

Revenue for women was provided in 13% of the job positions (52 out of 398 paid jobs), whereas 87% of the work done by men was paid (346 out of 398). Unpaid jobs were performed by women and men in 62% (198 out of 326 unpaid jobs) and 39% (128

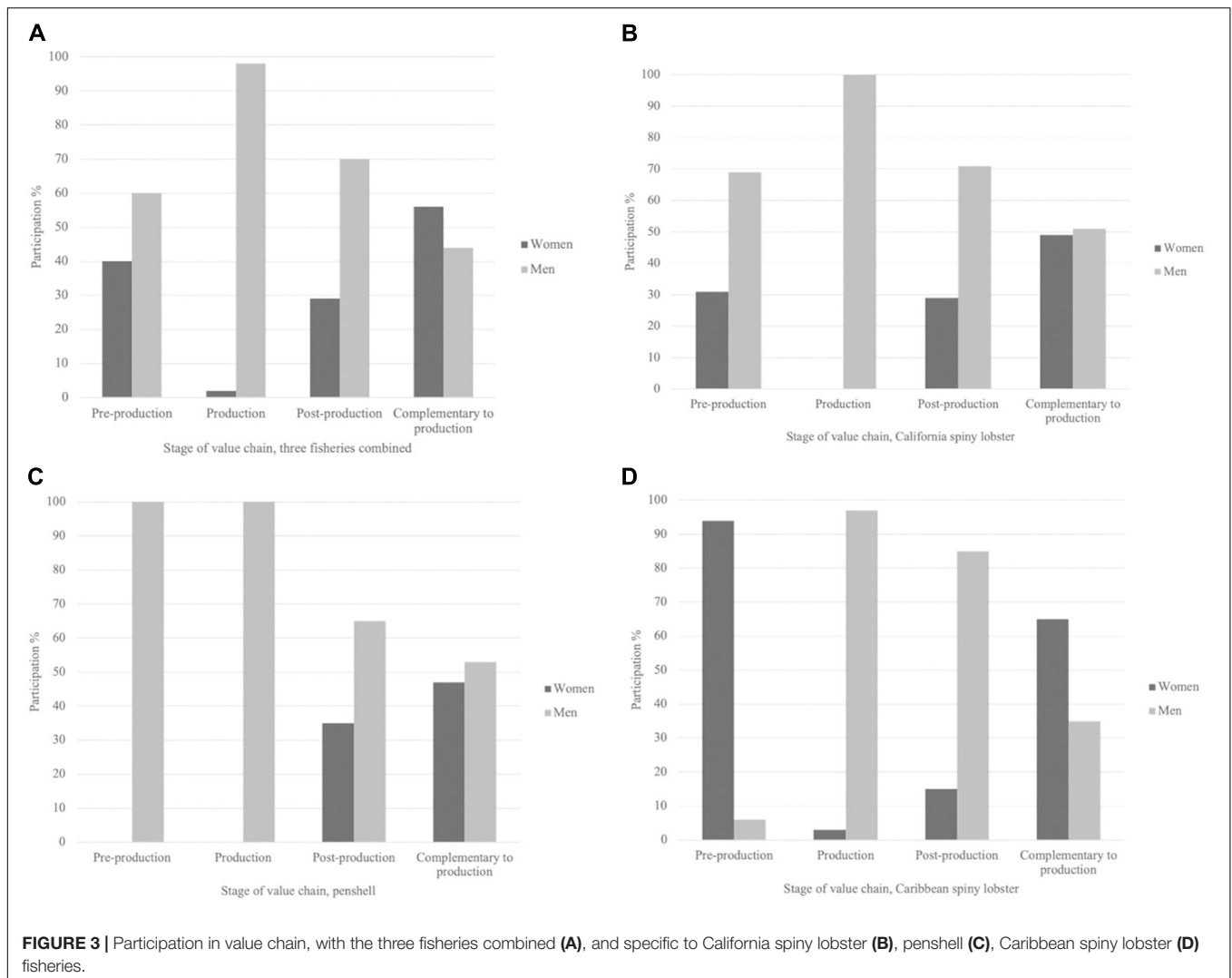
out of 326) of the cases, respectively (Table 5). Thus, men had better conditions to access economic stability than women due to paid employment.

The Caribbean spiny lobster fishery accounted for the lowest paid jobs (eight) and the largest amount of unpaid jobs for women (106). This fishery employs men in most working areas (162 jobs). The penshell fishery offers the best economic and job conditions for women when compared to that of the other two fisheries. Women held 27 of the paid job positions and only 12 unpaid jobs. The California spiny lobster fishery showed the most equitable proportion of unpaid jobs occupied by women and men (1:1 ratio), although the paid jobs were unequally distributed with only 17 of 134 positions held by women (Table 5).

## Fishing vs. Fishery System

Fishing (only harvesting activities) involved 172 people (three women and 169 men) across the three fisheries. When only fishing was evaluated, women accounted for less than 2% of all people in this study. However, when expanding our evaluation to the fishery system, the total number of participants in the three fisheries increased from 172 to 607, with the participation of women reaching 30%. Nonetheless, women continued to have a lower presence overall than men given that the participation





of men also increased. This increase in the participation of women when considering the fishery system was consistent in all the studied fisheries. For example, in the Caribbean spiny lobster fishery, the participation of women increased from three individuals (1%) involved in harvesting to 80 individuals (29%) involved in the fishery system, whereas the participation of men increased from 114 to 192 (71%). In the California spiny lobster and penshell fisheries, the participation of women in harvesting activities was not reported. Therefore, when considering the entire value chain, the participation of women increased from 0 to 85 individuals (33%) and from 0 to 15 individuals (19%), respectively. The participation of men in the California spiny lobster fishery increased from 40 to 171 people, corresponding to 67% of the total number of participants. In the penshell fishery, the participation of men increased from 15 to 64 (81%) individuals. Thus, evaluating the fishery system is a more inclusive and equitable approach to evaluate the participation of both men and women and is essential for highlighting the roles of women as community members and decision makers.

## DISCUSSION

Gender analysis in SSF is not new, although increasing interest has been shown over the last 15 years in a variety of reports and studies. These studies have highlighted the importance of understanding gender issues from different perspectives, taking into account the economy and norms and values of a society; productive, community, and reproductive roles; and paid and unpaid work (Kleiber et al., 2014; de la Torre-Castro, 2019; Frangoudes et al., 2019; Harper et al., 2020). Most of the research has focused on gender studies of fisheries in Asia, Europe, and the United States (Chapman, 1987; Frangoudes et al., 2008; Kleiber et al., 2014), with regional gaps with regard to research in Latin America, Africa, and Oceania. Globally, the participation of women as members of organized groups or in decision-making bodies has been limited in fisheries (Harper et al., 2017) and this gender division of labor represents a means to control the incomes of women (Alsop et al., 2006), hindering their free agency. This trend can be observed in developing countries

**TABLE 5** | Paid and unpaid jobs disaggregated by gender in the three fisheries.

Fishery	Paid employment		Unpaid employment	
	W	M	W	M
California spiny lobster	17	117	80	89
Penshell	27	75	12	15
Caribbean spiny lobster	8	154	106	24
Total employment	52	346	198	128

in Latin America (de Oliveira Leis et al., 2019), although in the last two decades, it has begun to change due to national (Torre et al., 2019) and international efforts (such as the #MeToo movement in 2006 or the #HeForShe movement driven by the United Nations in 2014). This has led to increasing attention to women in fisheries and a timid opening from the fishing sector to integrate a gender perspective, encouraged by the creation of women cooperatives (Salas et al., 2006; Navarro-Smith, 2008; Perea-Blazquez and Flores-Palacios, 2016; Torre et al., 2019).

In Mexico, studies have focused on the description of value chains and the participation of women in the capture, processing, and sale of fishery products (Salas et al., 2006; Perea-Blazquez and Flores-Palacios, 2016; Pedroza-Gutiérrez, 2019; Coronado et al., 2020). This is the first study to use quantitative and qualitative sex-disaggregated data to document the participation and activities of men and women in fishing cooperatives, the types of employment opportunities that are currently available, and the contributions of women to the value chains of three fisheries in Mexico. The findings of this study demonstrate that women are present in all steps of the value chains of three Mexican SSF.

Although women in Mexico are already members of fishing cooperatives, they are very rarely able to access the decision-making realms of the fishing cooperatives, except in some indigenous cooperatives, such as Cucapa (Navarro-Smith, 2008), or in women-exclusive organizations. The Mexican federal government has recently set women inclusion as a qualifying element for subsidies (e.g., conservation and development subsidies from protected area programs), with higher scores awarded if women are included in the fishing organization. However, many of these women face paper representation, as they do not receive benefits, nor can they occupy leadership positions. Furthermore, their participation in the implementation of projects may be restricted.

Mexican cooperatives operate under a gender-unbalanced process for selecting members. In addition to the application itself, common membership requirements include making economic contributions (application fees) and/or working for a certain period of time as an apprentice until being elected a member. This period of time is usually 5 years but varies within a wide range, and only direct jobs are considered, which are mostly performed by men. Each cooperative has the right to establish in its internal regulations the requirements for becoming a member, and these requirements prevent women from having voice or vote, as only members can make decisions or become part of the board of directors (DOF, 1994). For example, one

of the analyzed fisheries in this study stipulated that in order to become a member of the organization, a potential member has to participate in fishing activities for a period of time, considering only production.

In this analysis, women participated to a lower extent than men as both members of cooperatives and as temporary employees given that the majority of temporary jobs were in harvesting (fisher apprentices). Other jobs, (e.g., processing or administrating), do not count toward the mandatory training time. This fact is ignored in many fishing cooperatives, which are influenced by social and cultural constructions of gender divisions in labor. Consistently, gender studies have indicated that gender imbalances in fishing communities are heightened by a limited access to paid employment, training, credits, subsidies, benefits, and access rights by women who are not members of a cooperative (Abwao and Awuor, 2019).

In general, in the three fisheries evaluated in this study, women showed low participation in direct jobs (production and post-production). When evaluating the participation of women in indirect jobs (pre-production and complementary activities), a very similar ratio was found between men and women. This increase in the participation of women in indirect vs. direct jobs is very similar to what has been reported in other fishing value chain studies in Africa, Asia, Oceania, and Latin America (EMEDO, 2017; Sornkliang et al., 2018; de Oliveira Leis et al., 2019), including in commercial and subsistence fishing reported in other regions of Mexico (Vázquez-García and Montes-Estrada, 2006; Navarro-Smith, 2008; Uc-Espadas et al., 2017). This suggests that a more inclusive approach to fisheries is needed to correctly estimate overall human pressure on the environment (Kleiber et al., 2014), as well as socio-economic impact.

In indirect jobs, women participate in activities related to the preparation of provisions and family support (Rajaratnam et al., 2016), which are unpaid in most fisheries. For example, in Natividad Island, according to the testimonies of the participants, wives of members and temporary employees have been involved in the pre-production activities of preparing food and processing and repairing fishing gear, traps, or buoys. According to what was reported when constructing the historical monography, this type of participation by women has occurred since the early stages of the fishery, constituting some of the first roles that women have traditionally held on the island.

In addition to productive work (e.g., processing, sales, or administration), women carry out a series of tasks that are necessary for the proper functioning of fishery systems, the conservation of natural resources, and the development and welfare of coastal communities (Westermann and Benbow, 2013; Gustavsson and Riley, 2018; Gopal et al., 2020). On the other hand, this study identified that women tended to participate in two or more activities at the same time, generally combining productive, reproductive, and community activities, both paid and unpaid. Although men were also found to participate in two or more activities, these activities belonged to their paid productive (e.g., boarding, fishing, and disembarking) and community work (e.g., monitoring and surveillance). Only one fishery identified men involved in reproductive tasks (Table 5). Therefore, when considering the efforts of women in productive

and community work, in addition to reproductive work, women often doubled or even tripled their workday, as described in other studies (Soares et al., 2011; Sabater, 2014; Perea-Blazquez and Flores-Palacios, 2016).

Jobs performed by women have generally been related to activities on land, except for monitoring, which entails working for days at sea and diving (Table 4). Overall, the participation of women in the value chain of the fisheries in this study was mainly linked to complementary to production activities, such as monitoring, which is an activity of increasing importance for women to get involved in the fishery and get paid for it (Torre et al., 2019). Women contribute to citizen science by generating biological, acoustic, and oceanographic data of their fishing resources in concessions and no-take fishing areas. This information is used in management and to improve decision making, but women are still prevented from having a voice in assemblies and meetings. Women are of paramount importance for ensuring the continuity of activities related to scientific monitoring and the development of key technical capacities that are usually allocated to men. This has also been reported for several other coastal communities in Mexico (Fulton et al., 2019b).

In most regions, women are less involved in offshore fishing (FAO, 2020), which is partially related to the difficulties associated with balancing extractive activities with household work (Perea-Blazquez and Flores-Palacios, 2016).

This explains the preference of the women in this study to work in pre- and post-harvest activities. The majority of the people who dedicated themselves to penshell processing were women. The same was also true of the people who surveilled and monitored the fishing and non-fishing areas (complementary to production activities). Both of these activities took place on the beach and could be accomplished within a few hours, can be carried out in the company of children, allow easy access to related facilities (e.g., schools and healthcare centers), and require relatively little and flexible time investments without the need for expensive fishing equipment, which is consistent with studies that indicate that women often work in aquaculture or in fishery activities adjacent to the coast since they are carried out near their homes (Tekanene, 2005; Arce-Ibarra and Charles, 2008; Siegert, 2017). This situation was brought about through the support of an NGO (NOS) who empowered and trained the women on the governance and management of fisheries resources, systemic thinking, collaborative dialogue, negotiation and conflict resolution, and the particularities of the fishery. Throughout the history of the community, penshell fishing was considered a family activity, in which men and women participated equally. Not surprisingly, the penshell fishery is the only fishery in this study to have included women in its board of directors. Compared to that of the other fishery systems, women in the penshell fishery system have had greater opportunities to participate and to establish the value of their contributions.

The paradigm that the fishing sector is synonymous with extractive activities entails that women in fishing communities are not considered to be part of that sector. Information on where and how women participate in fisheries is not sex-disaggregated

in fisheries statistics because data is collected by only considering extractive activities (FAO, 2016). This narrow understanding of the scope of fisheries characterizes the fishing sector as predominantly male (Weeratunge et al., 2010) and does not acknowledge the benefits of generating statistical information that is disaggregated by gender, with regard of the fishery system. In addition, women who participate in other activities in the value chain generally do not step forward to apply as cooperative members because they do not participate in extractive activities.

Although political and social barriers make it difficult for women to participate in fishing decision-making processes (Kleiber, 2014), their contributions to social capital have been widely documented, highlighting their high capacity for collaboration, solidarity, and conflict resolution (Velázquez, 1996; Westermann et al., 2005; Paz, 2015), leveraging valuable skills that influence the fishery system.

Our study indicates that both women and men amply participate in value chains, but data gaps and a limited view of what constitutes the fishery system contribute to keeping this fact invisible. According to Revollo-Fernández et al. (2015), women tend to have visions focused on sustainability, whereas men tend to have visions that are centered on fishing efficiency. Additionally, an approach that considers both genders brings attention and sensitivity to different fishing methods, the species caught, and the areas fished (Briceño-Lagos and Monfort, 2018). The analysis of the value chain showed that a notable difference was present between the results obtained when fishing was considered an extractive activity (direct jobs) versus when it was considered a fishery system (direct and indirect jobs). When only the extractive activities are considered, a series of community challenges are overlooked, leading to policy designs that lack a gender perspective (Harper et al., 2017). This, has often resulted in socioeconomic losses in terms of production, access to subsidies, family food security, and nutrition, particularly for vulnerable groups in developing countries (FAO, 2016).

The diversity of situations and lessons that women bring to fishing groups are very valuable, especially when those groups have been in existence for long periods of time (Alonso-Poblacion and Siar, 2018). This study helps shed a light on some of the conditions that have prevailed in the case studies, enabling actions toward gender equality, such as those in the penshell fishery. In this fishery system, the proximity of coastal sites to homes facilitated women to access domestic support or to perform fishing activities with children. Distance from the fishing area to home appeared to be one key element for the inclusion of women in the fishery system as either cooperative members or members of the board of directors. Also, complementary activities like monitoring, represent interesting turning points for the inclusion of women in mixed gender teams, allowing women to gain ground in areas that have been traditionally dominated by men. When resource management is carried out by mixed-gender working groups, improved group functioning and natural resource conditions have been observed (Agarwal, 2009; Bear and Woolley, 2011; Revollo-Fernández et al., 2015).

The participation of women in fishing systems remains largely unstudied due to the difficulties associated with gathering enough data on a national scale. Although the methodology has allowed

us to develop a closer view of the reality of the fishing sector, other similar studies to understand the challenges associated with the participation of women in coastal fishing in Mexico are needed. Gathering this set of experiences, learning, and knowledge from the women and men who contribute to the value chain, can provide interesting and new perspectives to address impacts in coastal fishing communities. Evaluating the fishery system instead of only extractive fishing activities provides a more realistic picture of the contributions of both women and men to the fishing sector. Similar studies that identify the participants of the SSF sector, and the conditions under which they participate, will contribute to generating the information that is needed to find strategies that reduce gender inequality and promote the inclusion of women in decision making processes. Women roles in SSF urgently need to be made visible, acknowledged, and correctly estimated, at scale, to ensure fair access to resource management and decision-making positions.

## DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

## ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Comunidad y Biodiversidad (COBI). The participants provided their written informed consent to participate in this study.

## REFERENCES

- Abwao, J., and Awuor, F. J. (2019). *State of Women in the Fisheries and Aquaculture Value Chain in Homabay County, Kenya. Towards Enhancing Sustainable Livelihoods and Economic Empowerment. Livestock Research for Rural Development*. Available online at: <http://www.lrrd.org/lrrd31/12/abwao31186.html> (accessed December 23, 2020).
- Afflerbach, J. C., Lester, S. E., Dougherty, D. T., and Poon, S. E. (2014). A global survey of TURF-reserves, territorial use rights for fisheries coupled with marine reserves. *Glob. Ecol. Conserv.* 2, 97–106. doi: 10.1016/j.gecco.2014.08.001
- Agarwal, B. (2009). Gender and forest conservation: the impact of women's participation in community forest governance. *Ecol. Econ.* 68, 2785–2799. doi: 10.1016/j.ecolecon.2009.04.025
- Aguilar, L., and Castañeda, I. (2001). *Sobre Marinos, Marinas, Mares y Mareas: Perspectiva de Género en Zonas marino-costeras*. Costa Rica: IUCN.
- Alonso-Poblacion, E., and Siar, S. V. (2018). *Women's Participation and Leadership in Fisherfolk Organizations and Collective Action in Fisheries: A Review of Evidence on Enablers, Drivers and Barriers (FAO Fisheries and Aquaculture Circular No. 1159)*. Rome: Food and Agriculture Organization of the United Nations.
- Alsop, R., Bertelsen, M. F., and Holland, J. (2006). *Empowerment in Practice: From Analysis to Implementation*. Washington, DC: World Bank Publications.
- Arce-Ibarra, M., and Charles, A. T. (2008). Inland fisheries of the Mayan Zone in Quintana Roo, Mexico: using a combined approach to fishery assessment for data-sparse fisheries. *Fish. Res.* 91, 151–159. doi: 10.1016/j.fishres.2007.11.015
- Basurto, X., Cinti, A., Bourlillon, L., Rojo, M., Torre, J., and Hudson Weaver, A. (2012). The emergence of access controls in small-scale fishing commons: a comparative analysis of individual licenses and common property-rights in

## AUTHOR CONTRIBUTIONS

JT and IL-E: conceptualization. NS and FF-RM: data curation and visualization. NS, IL-E, and FF-RM: formal analysis. JT: funding acquisition. NS and IL-E: investigation, methodology, and project administration. IL-E: supervision. FF-RM: validation. NS, IL-E, FF-RM, and JT: writing – original draft and writing – review and editing. All authors contributed to the article and approved the submitted version.

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- two Mexican communities. *Hum. Ecol.* 40, 597–609. doi: 10.1007/s10745-012-9508-1
- Bear, J. B., and Woolley, W. A. (2011). The role of gender in team collaboration and performance. *Interdiscipl. Sci. Rev.* 36, 146–153. doi: 10.1179/030801811X13013181961473
- Briceño-Lagos, N., and Monfort, M. C. (2018). *Putting Gender Equality on the Seafood Industry's Agenda. Global Survey*. Paris: International Organization for Women in the Seafood Industry.
- Castañeda, I., Sabater, L., Owren, C., and Boyer, A. E. (2020). *Gender-Based Violence and Environment Linkages: The Violence of Inequality*. Gland: IUCN.
- Chapman, M. D. (1987). Women's fishing in Oceania. *Hum. Ecol.* 15, 267–288. doi: 10.1007/BF00888026
- COBI (2020). *Manual Para Implementar el Programa de Liderazgo Comunitario*. Guaymas: Comunidad y Biodiversidad A. C.
- Cochrane, K. L., and Chakalall, B. (2002). The spiny lobster fishery in the WECAFC region – an approach to responsible fisheries management. *Mar. Freshw. Res.* 52, 1623–1631. doi: 10.1071/mf01207
- CONAPESCA (2013). *Anuario Estadístico de Acuicultura y Pesca*. Mazatlán: Comisión Nacional de Acuicultura y Pesca.
- Coronado, E., Salas, S., Cepeda-Gonzalez, M. F., and Chuenpagdee, R. (2020). Who's who in the value chain for the Mexican octopus fishery: mapping the production chain. *Marine Policy* 118:104013. doi: 10.1016/j.marpol.2020.104013
- de la Torre-Castro, M. (2019). Inclusive management through gender consideration in small-scale fisheries: the why and the how. *Front. Mar. Sci.* 6:156. doi: 10.3389/fmars.2019.00156
- de Oliveira Leis, M., Barragán-Paladines, M. J., Saldaña, A., Bishop, D., Jin, J. H., Kerež, V., et al. (2019). "Overview of small-scale fisheries in Latin America

- and the Caribbean: challenges and prospects,” in *Viability and Sustainability of Small-Scale Fisheries in Latin America and The Caribbean*, eds S. Salas, M. J. Barragán-Paladines, and R. Chuenpagdee (Cham: Springer), 15–47. doi: 10.1007/978-3-319-76078-0\_2
- DOF (1994). *Ley General de Sociedades Cooperativas. Diario Oficial de la Federación de los Estados Unidos Mexicanos*. México: Diario Oficial de la Federación.
- DOF (2007). *Ley General de Pesca y Acuicultura Sustentables*. México: Diario Oficial de la Federación.
- DOF (2012). *ACUERDO Por el Que se da a Conocer la Actualización de la Carta Nacional Pesquera*. Mexico: Diario Oficial de la Federación.
- DOF (2018a). *ACUERDO por el Que se da a Conocer la Actualización de la Carta Nacional Pesquera*. Mexico: Diario Oficial de la Federación.
- DOF (2018b). *Ley General de Pesca y Acuicultura Sustentable*. México: Diario Oficial de la Federación.
- EMEDO (2017). *Women's Role, Struggles and Strategies Across the Fisheries Value Chain The Case of Lake Victoria-Tanzania*. India: International Collective in Support of Fishworkers
- Espinosa-Romero, M. J., Torre, J., Zepeda, J. A., Solana, F. J. V., and Fulton, S. (2017). “Civil society contributions to the implementation of the small-scale fisheries guidelines in Mexico,” in *The Small-Scale Fisheries Guidelines*, eds S. Jentoft, R. Chuenpagdee, M. J. Barragán-Paladines, and N. Franz (Cham: Springer), 423–449. doi: 10.1007/978-3-319-55074-9\_20
- FAO (2013). *Good Practice Policies to Eliminate Gender Inequalities in Fish Value Chains*. Rome: Food and Agriculture Organization of the United Nations.
- FAO (2014). *Developing Sustainable Food Value Chain. Guiding Principles*. Rome: Food and Agriculture Organization of the United Nations.
- FAO (2015). *Enfoque Ecosistémico Pesquero. Conceptos Fundamentales y su Aplicación en Pesquerías de Pequeña Escala de América Latina*. Rome: Food and Agriculture Organization of the United Nations.
- FAO (2016). *Promoting Gender Equality and Women's Empowerment in Fisheries and Aquaculture*. Rome: Food and Agriculture Organization of the United Nations.
- FAO (2020). *The State of World Fisheries and Aquaculture 2020. Sustainability in Action*. Rome: Food and Agriculture Organization of the United Nations.
- Frangoudes, K., Marugán-Pintos, B., and Pascual-Fernández, J. J. (2008). From open access to co-governance and conservation: the case of woman shellfish collectors in Galicia (Spain). *Marine Policy* 32, 223–232. doi: 10.1016/j.marpol.2007.09.007
- Frangoudes, K., Gerrard, S., and Kleiber, D. (2019). Situated transformations of women and gender relations in small-scale fisheries and communities in a globalized world. *Maritime Studies* 18, 241–248. doi: 10.1007/s40152-019-00159-w
- Fulton, S., Hernández-Velasco, A., Suarez-Castillo, A., Fernández-Rivera Melo, F. J., Rojo, M., Sáenz-Arroyo, A., et al. (2019a). “From fishing fish to fishing data: the role of artisanal fishers in conservation and resource management in Mexico,” in *Viability and Sustainability of Small-Scale Fisheries in Latin America and The Caribbean*, eds S. Salas, M. J. Barragán-Paladines, and R. Chuenpagdee (Cham: Springer), 151–175. doi: 10.1007/978-3-319-76078-0\_7
- Fulton, S., López-Sagástegui, C., Weaver, A. H., Fitzmaurice-Cahluni, F., Galindo, C., Fernández-Rivera Melo, F. J., et al. (2019b). Untapped potential of citizen science in Mexican small-scale fisheries. *Front. Mar. Sci.* 6:517. doi: 10.3389/fmars.2019.00517
- Gabriel-Morales, J., and Perez-Damian, J. L. (2006). Crecimiento poblacional e instrumentos para la regulación ambiental de los asentamientos humanos en los municipios costeros de México. *Gaceta Ecol.* 79, 53–77.
- Germain, N., Hartmann, H. J., Fernández-Rivera Melo, F. J., and Reyes-Bonilla, H. (2015). Ornamental reef fish fisheries: new indicators of sustainability and human development at a coastal community level. *Ocean Coast. Manag.* 104, 136–148. doi: 10.1016/j.ocecoaman.2014.12.007
- Gopal, N., Hapke, H., Kusakabe, K., Rajaratnam, S., and Williams, M. (2020). Expanding the horizons for women in fisheries and aquaculture. *Gender Technol. Dev.* 24, 1–9. doi: 10.1080/09718524.2020.1736353
- Gustavsson, M., and Riley, M. (2018). Women, capitals and fishing lives: exploring gendered dynamics in the Llŷn Peninsula small-scale fishery (Wales, UK). *Maritime Stud.* 17, 223–231. doi: 10.1007/s40152-018-0102-z
- Harper, S., Adshade, M., Lam, V. W. Y., Pauly, D., and Sumaila, U. R. (2020). Valuing invisible catches: estimating the global contribution by women to small-scale marine capture fisheries production. *PLoS One* 15:e0228912. doi: 10.1371/journal.pone.0228912
- Harper, S., Grubb, C., Stiles, M., and Sumaila, U. R. (2017). Contributions by women to fisheries economies: insights from five maritime countries. *Coast. Manag.* 45, 1–16. doi: 10.1080/08920753.2017.1278143
- Harper, S., Zeller, D., Hauzer, M., Pauly, D., and Sumaila, U. R. (2013). Women and fisheries: contribution to food security and local economies. *Mar. Policy* 39, 56–63. doi: 10.1016/j.marpol.2012.10.018
- Hernandez-Espejo, O. (1998). *La Fotografía Como Técnica de Registro Etnográfico*. México: Instituto Nacional de Antropología e historia, 31–51.
- Hernández-Félix, L., Molina-Rosales, D., and Agraz-Hernández, C. (2017). Servicios ecosistémicos y estrategias de conservación en el manglar de Isla Arena. *Agric. Soc. Desarrollo* 14, 427–449. doi: 10.22231/asyd.v14i3.644
- INEGI (2014). *Censo Económico*. Aguascalientes: INEGI.
- Kleiber, D. (2014). *Gender and Small-Scale Fisheries in the Central Philippines*. dissertation/PhD thesis. Vancouver: The University of British Columbia.
- Kleiber, D., Harris, L. M., and Vincent, A. C. J. (2014). Gender and small-scale fisheries: a case for counting women and beyond. *Fish Fish.* 16, 547–562. doi: 10.1111/faf.12075
- Monfort, M. C. (2015). *The Role of Women in the Seafood Industry. GLOBEFISH Research Programme*. Rome: Food and Agriculture Organization of the United Nations.
- Nadel-Klein, J., and Davis, D. (1988). *To Work and to Weep: Women in Fishing Economies*. Saint John's.
- Navarro-Smith, A. (2008). Cucapás, derechos indígenas y pesca. Dilemas del sistema productivo pesquero vis a vis las políticas de conservación de las especies en el Golfo de California. *Rev. Chilena Antropol. Vis.* 12, 171–196.
- Ostrom, E. (2009). A general framework for analyzing sustainability of social-ecological systems. *Science* 325, 419–422. doi: 10.1126/science.1172133
- Paz, L. (2015). *Ambientalismo, Género y Violencia. Campeñinas Ecologistas de la Sierra de Petatlán, Guerrero*. México: Centro de Estudios Sociales y de Opinión Pública.
- Pedroza-Gutiérrez, C. (2019). Managing Mercado del Mar: a case of women's entrepreneurship in the fishing industry. *Maritime Stud.* 18, 335–346. doi: 10.1007/s40152-019-00157-y
- Perea-Blazquez, A., and Flores-Palacios, F. (2016). Women's participation in fisheries: new gender roles, income and double shift. *Soc. Ambiente* 1, 121–141.
- Rajaratnam, S., Cole, S. M., Kruijssen, F., Sarapura, S. and Longley, C. (2016). Gender inequalities in access to and benefits derived from the natural fishery in the Barotse Floodplain, Zambia, Southern Africa. *Asian Fisheries Science Journal* 29, 49–71.
- Revollo-Fernández, D., Aguilar-Ibarra, A., Micheli, F., and Sáenz-Arroyo, A. (2015). Exploring the role of gender in common-pool resource extraction: evidence from laboratory and field experiments in fisheries. *Appl. Econ. Lett.* 23, 912–920. doi: 10.1080/13504851.2015.1119786
- Sabater, M. (2014). La interacción trabajo-familia. La mujer y la dificultad de la conciliación laboral. *Rev. Relaciones Lab.* 30, 163–198.
- Salas, S., Mexicano-Cintora, G., and Cabrera, M. A. (2006). *¿Hacia donde van las pesquerías en Yucatán?*. Merida: Centro de Investigación y Estudios Avanzados.
- Sanchez, F. J. (1989). *La Máquina Etnográfica. Reflexiones Sobre Fotografía y Antropología Visual*. Cabra del Santo Cristo: Contraluz.
- Siebert, H. (2017). *Women, Men and Fish: What Constitutes the Different Roles of Women in Small-Scale Fisheries in Puerto Libertad, Mexico*. Dissertation/ PhD thesis. Germany: Universität Heidelberg.
- Soares, D., Gutiérrez-Montes, A., Romero-Pérez, R., López-Mera, R., Rivas-Platero, G., and Pinto-Decelis, G. (2011). *Capitales de la Comunidad, Medios de Vida y Vulnerabilidad Social Ante Huracanes en la Costa Yucateca. Un Acercamiento a Través de la Experiencia de San Felipe, Yucatán*. Turrialba: Centro Agronómico Tropical de Investigación y Enseñanza.
- Sornkliang, J., Tiaye, R., Yenpoeng, T., Kaewtankam, V., and Pholcharoen, J. (2018). Recognizing gender roles in the fisheries value chain: local fishing communities of Thailand in focus. *Fish for the People* 16.

- Teh, L. C. L., and Sumaila, U. R. (2013). Contribution of marine fisheries to worldwide employment. *Fish Fish.* 14, 77–88. doi: 10.1111/j.1467-2979.2011.00450.x
- Tekanene, M. (2005). *The Women Fish Traders of Tarawa, Kiribati*. Dissertation. Penang: WorldFish Center.
- Torre, J., Hernandez-Velasco, A., Fernández-Rivera Melo, F. J., Lopez, J., and Espinosa-Romero, M. J. (2019). Women's empowerment, collective actions, and sustainable fisheries: lessons from Mexico. *Maritime Stud.* 18, 373–384. doi: 10.1007/s40152-019-00153-2
- Uc-Espadas, P., Molina-Rosales, D., Vázquez-García, V., Pérez-Jimenez, C., and Gurri-García, F. (2017). Permisos de pesca y relaciones de género en Isla Arena, Campeche. *AsyD.* 14, 383–404. doi: 10.22231/asyd.v14i3.642
- Vázquez-García, V., and Montes-Estrada, M. (2006). Gender, subsistence fishing and economic change: a comparative study in Southern Veracruz, Mexico. *International Journal of Sociology of Agriculture and Food* 14, 1–22.
- Velázquez, M. (1996). *Género y Ambiente en Latinoamérica*. Cuernavaca: UNAM.
- Vicente, T., García, M., and Vizcaino, T. (2017). *Antropologías En Transformacion: Sentidos, Compromisos y Utopías*. Spain: Universidad de Valencia.
- Weeratunge, N., Snyder, K., and Sze, P. (2010). Gleaner, fisher, trader, processor: understanding gendered employment in fisheries and aquaculture. *Fish Fish.* 11, 405–420. doi: 10.1111/j.1467-2979.2010.00368.x
- Westermann, K., and Benbow, S. (2013). The role of women in community-based small-scale fisheries management: the case of the south west madagascar octopus fishery. *West. Indian Ocean J. Mar.* 12, 119–132.
- Westermann, O., Ashby, J., and Pretty, J. (2005). Gender and social capital: the importance of gender differences for the maturity and effectiveness of natural resource management groups. *World Dev.* 33, 1783–1799. doi: 10.1016/j.worlddev.2005.04.018
- World Bank (2012). *Hidden Harvest: The Global Contribution of Capture Fisheries*. Washington DC: The World Bank.
- WSI (2020). *Let's Acknowledge Invisible, Ignored and Unrecognised (IIU) Women in the Seafood Industry*. Jacksonville, FL: FIS.
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