



Engendering Blue Swimming Crab Fishery Management: A Case Study in Lampung, Indonesia

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Abstract

Despite growing recognition of fisherwomen's roles in the fisheries sector, their limited participation in fisheries management and governance remains a concern. A gender analysis of activities in the blue swimming crab (BSC) fishery illustrated how women are involved in all stages of the BSC value chain except at the capture stage. This study explored the different roles and needs, the relationship among actors in terms of gender, economics and power dynamics, as well as gendered roles and relations among stakeholders, and the opportunities and challenges faced by the actors. The fishing families are dependent on patrons for loans for fishing, daily needs and emergencies has created an imbalanced relationship, but it also provides emergency support. The gender analysis was followed by efforts to mainstream gender into the fishery management committee, aiming to improve the fishery management. This paper discusses how women participation in fishery management was encouraged using a transformative approach by organizations and NGOs that facilitated the process by addressing women's needs as well as increasing the awareness-among men, the wider community, and the government-of women's contributions to the BSC fishery.

Keywords: Crab, fishery management, gender mainstreaming, patron, governance

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Introduction

Indonesia is a major global producer of blue swimming crab (BSC), ranked as the second largest producer in 2014 (MMAF, 2019). In the first half of 2022, crab contributed to one-fourth of Indonesia's export value in fishery, and 9.65% of the total fish export value. The export volume in 2021 marked the highest in the past eight years, at 32,183 tonnes; while the export value of crab reached USD 613.25 million, the highest in the previous 10 years (MMAF, 2022). Approximately 10-15% of Indonesia's production comes from Lampung Province (Governor of Lampung, 2018) and is the most important in BSC production in Indonesia. The export volume from Lampung rose from 1,342.82 tonnes in 2019 to 1,573.26 tonnes in 2021 (BKIPM, 2022).

Lampung province had five BSC processing companies employing more than 1,000 workers and 22 mini plants that hired around 780 people (Setiawan, 2018). In addition, three plants in other provinces regularly sourced BSC from Lampung (Setiawan, 2018). Overall, around 4,000 fishers were involved in BSC fishing in Lampung (Damayanti & Fitriana, 2021). This substantial workforce engaged across the industry indicates the economic importance of BSC to Lampung.

Despite growing production and export value, signs of overfishing have been observed in Lampung, Eastern Coast of Sumatera, which was a key location for the production of BSC (Seafood watch, 2018; EDF, 2020; Ernawati, Budiarti, & Yuniarta, 2021). In response to rising concerns about the decline in BSC stock, several governmental and non-governmental organizations have been working to improve the sustainability of BSC fishery.

The FAO technical guideline outlines fisheries management as "the integrated process of informa-

tion gathering, analysis, planning, consultation, decision-making, allocation of resources and formulation and implementation, with enforcement as necessary, of regulations or rules which govern fisheries activities in order to ensure the continued productivity of the resources and the accomplishment of other fisheries objectives" (FAO, 1997). This definition highlights the sustainable productivity of the stocks involves a wide-ranging set of tasks and genuine participation in the management process. Fisheries governance becomes increasingly complicated when balancing the sustainability of fish resources with the welfare of both direct and indirect users, as well as determining who should be involved in the management process. The FAO Technical Guidelines (FAO, 1997) suggest that fisheries management institutions have two major actors: the fisheries management authority, and stakeholders, primarily made up of by fishers and fishing companies. However, in addition to this, fisheries involve pre-fishing, trade, processing and marketing that engage multiple stakeholders.

There is a growing recognition of the gender-based division of labour between women and men in the fisheries sector. However, the work carried out by women is often undervalued, resulting in their exclusion from decision-making processes in the fisheries sector (Lorena et al., 2015; Alonso-Población & Siar, 2018; Mangubhai & Lawless, 2021). Although there has been considerable discussion around gender analysis, and gender analysis studies on various fisheries, little has been published on how to integrate the results of gender analysis into the fisheries value chain. This paper presents the experiences and challenges of gender mainstreaming in the management of the Blue Swimming Crab (BSC) fishery in Lampung, with the aim of enhancing women's participation in fishery management and decision-making processes.

Material and Methods

This paper is based on an exploratory study conducted in 2021 to understand gendered roles and relations among stakeholders, as well as the opportunities and challenges faced by the actors (Barclay et al, 2017). In addition, using a qualitative approach allowed for a deeper understanding and documentation of the mechanisms and processes that influence the operations and functions of the social network along the BSC value chain (Pedroza-Gutiérrez & Hernández, 2020). All actors across the

value chain were mapped based on their gender, roles, interests and needs. As this study aimed to understand and improve the governance and policy of BSC fishery management, a qualitative approach was used to explore strategies for engaging all stakeholders, particularly women, in the management process, and assessment of potential impacts of management decisions and policies on these stakeholders.

Data was collected using a semi-structured interview format, with questions designed to map out the value chain and actors, and roles of women and men along the value chain from the input stage to production, trading and processing; including different level of access to assets and resources; with special attention to the relationship between actors, competition among them and power dynamics. The collected data was compiled and summarized with causal relationship assessed and synthesized to explore the pattern of interactions at the study site (Newing, Eagle, Puri, & Watson, 2011).

Data was collected from five villages along the eastern coast of Lampung Province, i.e. Muara Gading Mas and Margasari in Lampung Timur District; and Kuala Seputih River, Sungai Burung, and Kuala Teladas, in Tulang Bawang District. A total of 99 respondents were interviewed, comprising 37 men and 62 women, representing various actors along the BSC fishery value chain in Lampung.

This study also employed observations of a wide range of community activities, enabling the identification of social and economic practices, patterns of resource use, and the actual roles and behaviours of individuals within their specific contexts (Gillham, 2000).

Results and Discussion

The observations indicated that the Blue Swimming Crabs (BSC) in Lampung are primarily caught using set bottom gillnets and collapsible traps. Once harvested, the crabs are sold to traders, processed in small-scale mini plants and larger processing companies, and then exported as canned, cooked crab meat, typically boiled and pasteurized.

The BSC fishery clearly shows how women are involved in nearly every stage of the value chain, except for the actual harvesting at sea. The key stages in the BSC value chain include input supply,

production, trading, and processing. Men were the primary actors in the fishing or harvesting stage. In contrast, women play leading roles in gear preparation, removing crabs from nets, collecting catches at landing sites, trading, and processing, especially in crab meat picking.

Both men and women are involved in trading activities and in owning or managing mini processing plants. There are strong linkages among actors across different stages of the value chain, both upstream and downstream. In addition, complex relationships often exist within a single stage, particularly in trading, where multiple layers of interactions shape the functioning of the value chain.

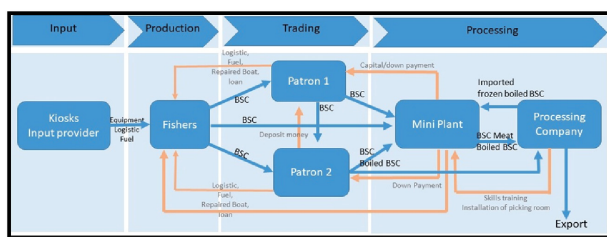


Fig. 1. The BSC value chain and actors

Several actors were involved along the value chain (Fig. 1), including (i) input providers, who sold materials for lines, nets, small buoy, fuel and logistic; (ii) fishers, at the production stage; (iii) patrons, who are actually traders that provide fishing supplies and, in some cases, daily necessities to fishers, and then sell the BSC to other actors; and (iv) processors, including mini plant and processing factory owners, who were also exporters. In Lampung, there were two layers of patrons: Patron 1 and Patron 2. Patron 2 operated on a larger scale in terms of the number of fishers and volume of BSC traded, compared to Patron 1. At the processing stage, mini plants processed BSC by boiling and manually separating the meat from the shells. These mini plants also served as a patron to fishers and to traders, and then sent the processed product to larger processing company.

Table 1 presents the number of actors involved along the BSC value chain. The survey revealed that a total of 4,833 people were involved in the value chain from pre-production, production, trade and processing stages in the targeted villages. Of this, 2,516 were women, representing 52% of the workforce along the chain. Individuals involved in mending nets were also engaged in releasing crabs and

bycatch from the nets, and were therefore counted only once. This reflects women's significant contribution to the BSC industry.

The observations from the study generated valuable insights into gender dynamics, revealing the distinct roles, responsibilities, and levels of participation of women and men along the BSC value chain, as well as their livelihood strategies and the potential opportunities for more inclusive and equitable fishery management and future development. Additionally, the findings from the gender analysis also provided the implementing organization with guidance on how to effectively apply gender mainstreaming within their programs, which also contributed to the discussion presented in this paper.

The number of input providers corresponds to the number of supply kiosks and patrons operating in the three villages. Women, particularly the spouses of fishers, often took part in mending nets, and during the peak crab fishing season, additional women were hired specifically for this task. The number of women involved in mending fishing nets was not directly recorded, but was estimated based on the number of crab fishers. However, the actual number may be higher, as observations revealed that many households had at least two adult women engaged in this activity. In trap fishing, fishers either brought traps from their home areas or purchased them from suppliers in Java, typically using 1,000 to 1,500 traps per fishing group. Both women and men were involved in preparing bait for the traps and received payment for their work.

The number of actors at the production stage varied seasonally, with the number of fishers significantly higher during the peak BSC season, when patrons roped in additional fishers from West Java, Central Java, Lampung and South Sumatera to work in this area. During the lean season, other type of fishers (e.g., shrimp fishers) also came to the area; who were again brought to the location by patrons. No women were formally identified as fishers in the study area. In a discussion held in Margasari Village, Lampung Timur District, some fishers noted that although a woman occasionally accompanied her husband to sea, such instances were rare. Women were primarily involved at the landing site, where they played a crucial role in quickly removing crabs from the nets to preserve the quality of the catch. They also helped clean the nets by removing bycatch such as shells, rocks, and fish. This cleaning needed to be

Table 1. Number of women and men actors involved in BSC fishery

Factors	Total	Muara Gading Mas Village	Marga Sari	Kuala Teladas	Sungai Burung	Kuala Seputih
kiosk selling fishing gear	64	> 10	1	17	20	16
# of fishers	3094	800	1124	500	470	200
# of BSC Fishers	2170	400 (sub village 5)	480	620	470	200
# of women involved in mending nets	1970	400 (sub village 5)	320	620	470	160
# of women picking crabs from nets	1970	400 (sub village 5)	320	620	470	160
# of patrons	118	45	20	17	20	16
# of women patrons	49	35	10	1	2	1
# of mini plants	18	9	4	4	0	1
# of mini plants owned by women	4	3	0	1	0	0
# of women picking crab meat	493	293	80	60	0	80

done promptly, especially during the peak season, as the nets were often reused later the same day. Both women and men were active at the trading stage of the Blue Swimming Crab (BSC) value chain. Traders, locally known as *pembina* (patrons), typically had their own networks of client fishers. The number of patron traders tended to increase during the peak crab fishing season, often matching the rise in the number of fishers. Traders from Central Java and Lampung frequently brought their own fishers to the area during this period.

Several mini processing plants operated in these villages, and some were owned by women. All crab pickers in the mini plants were women, with the exception of one male picker identified in Margasari Village. Many women pickers came from neighbouring villages, as women in fishing households were often occupied with gear preparation and landing activities. In contrast, women from farming households, who had more available time during the fishing season, were employed as meat pickers. Boiling and loading tasks, which require heavy labour, were typically handled by male workers in the mini plants.

Despite the presence of several fishing groups in the area, none included women members. This exclusion is likely because the capture stage of crab fishing in Lampung is male-dominated, with women primarily involved in post-harvest activities at the landing site.

At the processing level, there existed a formal association of BSC processors and traders known as PPRa (Perkumpulan Pengusaha Rajungan), with

membership comprising mini plant owners and large-scale traders in each district. In Lampung Timur District, the association was led by a woman, demonstrating some level of female leadership. However, in Tulang Bawang District, no women were involved in the organization, and some women traders reported being unaware of such an organization.

Gender composition along the value chain

At the input stage, kiosks provided daily fishing supplies. In MGM Village, all kiosks were owned by men. Margasari Village had only one kiosk offering fishing supplies. In Kuala Teladas, Sungai Burung, and Kuala Seputih, kiosks were mostly owned by patrons. If a patron did not own a kiosk, they would typically refer fishers to another patron who owned one, often someone with a higher economic standing.

Women played a key role in preparing fishing nets and were particularly active during the high season, often spending entire days and nights mending nets. During this busy period, even meals were purchased from food vendors, indicating the intensity of their workload.

At the production stage, men dominated the fishing activities at sea. Women were primarily involved at the landing sites, where both women and men helped remove crabs from nets and clean the nets of bycatch such as shells, rocks, and fish. Handling live crabs and maintaining their quality was a priority, requiring nets to be cleaned and repaired quickly for reuse, often within the same afternoon.

Table 2. Activities segregated by gender along the BSC value chain

Value chain	Men	Women
Input provider	Kiosks sold fishing gear. Fuel supply	Making and mending nets. Sun-drying bait fish Packing bait into plastic bags
Production	Preparing equipment and logistic. Operating boats. Setting the net in the sea. Releasing crabs from nets. Cleaning nets. Receiving money	Releasing crabs from nets. Cleaning nets Receiving money
Patron 1	Owners of the boats did not go to the sea. Invest in fishing cost. Facilitate the coming of fishers from other places (travel cost, fishing cost, down payment). Provide supplies Receiving money	Owners of the boats did not go to the sea. Invest in fishing cost. Facilitate the coming of fishers from other places (travel cost, fishing cost, down payment). Provide supplies Receiving money
Patron 2	Owners of the boats did not go to the sea. Invest in fishing cost. Facilitate the coming of fishers from other places (travel cost, fishing cost, down payment) Grading. Weigh the catch Recording Sometimes boiling the crabs Receiving money	Owners of the boats did not go to the sea. Invest in fishing cost. Facilitate the movement of fishers from other places (travel cost, fishing cost, and down payment).
Mini plant	<i>Owners:</i> Buyer negotiation. Documentation. Paying those who brought the crabs <i>Workers:</i> Boiling Transporting crabs to the mini plants Storing the crabs	<i>Owners:</i> Buyer negotiation. Recording. Paying those who brought the crabs <i>Pickers:</i> Picking and sorting the meat Unloading and packing

In the case of trap fishing, women in Kuala Teladas, Sungai Burung, and Kuala Seputih also participated in drying bait fish and packing the dried bait into plastic bags for future use.

At the trading stage, there was no significant difference between the roles of male and female patrons. Both were responsible for recruiting fishers, often from outside the area, investing in fishing operations, and receiving payments from buyers after the catch was sold. Trading activities typically included grading the landed crabs, weighing them, and maintaining transaction records. Crabs were

either sold live to traders or mini plants or boiled before being sold.

At the processing stage, male and female mini plant owners performed similar roles. However, the processing workforce, particularly pickers and sorters, was predominantly female (Table 2). These women were provided with tools and benches for picking crab meat. Strict hygiene standards were enforced, with workers required to maintain cleanliness, refrain from using body lotions, avoid wearing jewellery or having long nails, and wash their hands and feet with chlorine before entering the processing area.

Several occupational health and environmental issues were identified along the Blue Swimming Crab (BSC) value chain. Environmental concerns included the accumulation of crab shell waste, discarded fishing nets, and bycatch, which contributed to silting in local waterways, as well as the growing issue of microplastic pollution.

Occupational health risks were most evident among women working as crab meat pickers. The most serious issues reported included thinning of the skin on their fingertips and bleeding caused by prolonged exposure to crab shells. In one mini plant in Tulang Bawang, several women were observed with bleeding hands while continuing to work. Despite experiencing pain, irritation, and itchy palms, they persisted due to economic necessity and the need to support their daily livelihoods.

Relationship among actors

The relationships among actors in the BSC fishery in Lampung were notably complex and hierarchical. Most fishers were tied to a patron, with only a few operating independently. Patrons, also known as traders, had permanent client fishers and made huge investments in boats, gear, and logistics. They often brought in fishers from other provinces, covering all associated costs, including travel expenses and advance payments to their families back home.

Fishers incurred two types of debt: larger debts (e.g., for boat purchases or repairs), which acted as long-term guarantees of loyalty and were not deducted from daily catches, and smaller operational debts, which were repaid through daily BSC harvests. Notably, debts were product-specific, debts for BSC fishing were only repaid with BSC earnings, not from other catches like shrimp or fish, which was found to be very unique.

This patron-client model was viewed by fishers as beneficial, as it offered financial stability and a guaranteed buyer during peak seasons. Independent fishers often struggled to sell their catch, even when non-patrons offered better prices, further reinforcing their dependence on patrons.

Larger patrons and mini plant owners had their own networks of smaller patron clients, often connected through business and family ties. These higher-tier patrons invested in lower-tier ones and prioritized crab supply from their own networks, reinforcing the layered patronage system. Fishers remained

loyal due to consistent payments, the ease of borrowing, and personal rapport. Patrons also served as a social safety net during times of crisis, and not just as financiers.

Within fishing households, men held primary financial decision-making power, while women managed domestic affairs such as children's education and social matters. Although women controlled day-to-day household finances, major spending decisions were typically made by men. Women did attend public meetings, but usually remained silent and seated at the back.

Despite gendered roles at home and in public, there was no significant difference between men and women in their roles as mini plant owners or their participation in fishery-related discussions. Meanwhile, outside fishers also depended on traders, mirroring the local patronage system.

This study highlights the gendered roles along the Blue Swimming Crab (BSC) value chain in Lampung, Indonesia. While men predominantly handled harvesting at sea, women were active across input, production, trading, and processing stages. Women made up 52% of the workforce, including over 1,000 pickers employed in five processing companies, reinforcing findings by FAO, Duke University, and WorldFish (2023) on the vital roles of women in small-scale fisheries.

Fishing families were deeply reliant on the patron-trader system, which created a power imbalance. Patrons controlled pricing and sales to larger buyers, often leaving fishers with low earnings. Women contributed significantly to household income through processing, working in kiosks, or assisting patrons, and they also depended on the patron system for social and financial support, especially during crises (Anna, 2012; Zuhri, Wulandari, Purnomo, & Budiyo, 2019; O'Neill, Crona, Ferrer, & Pomeroy, 2019; UN Women, 2020; Iji, Ebong, Omang, & Ojong-Ejoh, 2021). For fishers, the patron relationship extended beyond economics to include trust and mutual obligation. Understanding these social networks is essential for addressing imbalances in value and risk distribution across the value chain (Pedroza-Gutiérrez & Hernández, 2020; O'Neill, Crona, Ferrer, Pomeroy, & Jiddawi, 2018).

Traders held considerable influence by setting prices, defining quality standards, and connecting fishers to processing companies. They also played

a key role in knowledge-sharing and promoting sustainability efforts (Alfian et al., 2020). Mini plant owners, some of whom were also traders, had lower financial risk and often shifted to trading during downturns, which left women pickers unemployed. Unlike fishers, pickers lacked patron support, making them the most vulnerable actors in the value chain.

The study also identified challenges to women's participation in public decision-making. While women were eager to attend meetings, they often lacked opportunities to speak or be heard. Despite their involvement in pre- and post-harvest activities and knowledge of crab quality and size, cultural norms and a lack of confidence limited their engagement.

The gender analysis triggered key shifts within implementing organizations. The Environmental Defense Fund (EDF), as the lead, promoted gender-sensitive approaches among partners and supported internal reflection on gender equity. For many, especially those from technical or male-dominated backgrounds, this required developing a new understanding of how to meaningfully involve women in management. The gender study encouraged the implementing organisations to acknowledge and support the roles of women across the value chain, which is essential for strengthening livelihoods, improving value chain efficiency, and ensuring more inclusive fishery management practices.

Targeted initiatives significantly increased women's knowledge and confidence. Programs such as Photo Voice, financial literacy training, and occupational health education, and crab waste reuse transformed women from workers and caregivers into active community contributors. Discussions started with practical needs—like reducing hand injuries and exploring new income sources—and gradually strengthened women's capacity in leadership and public speaking.

Women were more confident speaking in small or mixed groups. Community meetings and inclusive facilitation encouraged broader engagement, allowing women, men, fishers, traders, and plant owners to share their perspectives. Raising men's awareness of women's contributions was key to reducing resistance and fostering space for their involvement.

Local government engagement improved as EDF and partners regularly provided updates to district

and provincial officials about women's roles in the BSC value chain. This contributed to the formation of the Lampung BSC Management Committee (KPPRB), which comprises fishers, government, academics, industry, and NGOs. Women's groups were formally included in working groups, although their participation remained limited. Authorities often continued to view women primarily as food processors or caregivers rather than as active resource managers. However, some women confidently raised issues such as habitat damage and multi-stakeholder conflicts, and several had become respected traders and mini plant owners. Effective management must look beyond harvesting to encompass the full value chain, where all actors are interlinked. Changes in resources, markets, or interventions affect not only fishers but also processors, traders, and the wider community.

In conclusion, the gender analysis served as a catalyst for institutional change and practical action. It demonstrated the importance of integrating gender into fishery governance—not only to promote equity, but also to strengthen the resilience and sustainability of the BSC value chain.

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