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Livelihood assessment of women seafood vendors during pandemic restrictions in Andaman and Nicobar Archipelago, India

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Abstract

The study aimed to evaluate the effects of COVID-19 related lockdowns on the livelihoods of women seafood vendors in South Andaman and Car Nicobar Islands of the Andaman and Nicobar Islands, India. Women fish vendors represent a marginalised community within the marine fisheries sector, facing unique challenges exacerbated by the pandemic. We conducted personal interviews using a semi-structured questionnaire with the women seafood vendors (n=184) representing the urban (77.1%), rural (21.1%) and tribal (1.6%) populations across seafood markets. Paired 't' test analysis revealed a significant reduction ($p<0.001$) in the average weekly income of the vendors during COVID-19 lockdowns. Responses from a five-point Likert scale survey demonstrated varying perceptions and recommendations concerning the pandemic among participants. Key challenges faced by the vendors during the pandemic restrictions included movement restrictions, limited access to inputs, reduced demand and lack of storage facilities. The study outlines necessary preparedness steps and coping strategies to revamp the marketing practices for sustainable development and participatory outcomes. We highlight the socio-economic vulnerabilities of women fish vendors and inform policy interventions to support their recovery and resilience in the post-pandemic landscape.

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Introduction

The role of women in fishing-related activities remain underrepresented (Torre *et al.,* 2019; Harper *et al.,* 2020; Szymkowiak and Rhodes-Reese, 2020) and overlooked in the case of the economy (Harper *et al.,* 2017), management and policy (Harper *et al.,* 2013; Santos, 2015). Women represent 47% of the global fisheries workforce in the pre and post-production process (Solano *et al.,* 2021). The roles of men and women are complementary in the fishing sector as women control shore-based activities such as processing and marketing, whereas men engage in fishing in the sea (Marine Fisheries Census, 2010). In India, women workforce plays a crucial role in the fisheries sector, particularly in the post-harvest practices (Shyam *et al.,* 2011; 2017; Shyam, and Geetha, 2013) mainly in fish marketing (Shyam *et al.,* 2011; Kumari, 2016). Despite the extensive presence and proactive contributions in the seafood supply chain nationwide, their significance remains largely underappreciated in policy planning and developmental programs (Shyam *et al.,* 2011).

In Andaman and Nicobar (ANI), a tropical archipelago in the Bay of Bengal, marine fishery provides livelihood and employment for thousands of dependent stakeholders (KirubaSankar *et al.,* 2021). The pandemic-related restrictions have affected the livelihood of the fish farmers and fisherfolk population in the ANI (Kiruba-Sankar *et al.,* 2022; 2023a). The impact of pandemic

restrictions on marginalised communities such as women fish vendors were unknown from the archipelago although such studies are reported from other parts of India (Jeeva *et al.,* 2023; Jament and Osella, 2024) and globally (Bennett *et al.,* 2020; Mudege *et al.,* 2022; Macusi *et al.,* 2024). In ANI, fisherwomen are engaged in activities such as fish seed collection, marketing, net repairing, curing, processing, peeling and other labour-oriented activities (Marine Fisheries Census, 2010; CMFRI-FSI-DOF, 2020). Seafood marketing is a vital economic activity for women in the Islands, who rely heavily on this sector for their livelihoods and household responsibilities. While men also participate in the sale of fish, women mainly depend on fish marketing as their primary occupation. Our study seeks to investigate the challenges faced by women fish vendors during the COVID-19 lockdown and aims to propose practical solutions to mitigate these impacts. By addressing these constraints, our study aims to enhance the resilience and sustainability of women's business operations in the seafood market.

Materials and methods

The study focused on the markets of South Andaman, primarily Port Blair, the capital of the Andaman and Nicobar Islands and surrounding rural markets. The markets surveyed are based on the district and taluk classification adopted in Marine Fisheries Census 2010 (Table 1) and the location of the districts and taluks is shown in Fig. 1. Survey methodologies employed non-probability sampling during the pandemic-related restrictions, chosen for their accessibility. Car Nicobar, is a remote island in the Nicobar District inhabited by Nicobarese tribes (Kiruba-Sankar *et al.,* 2023b). However, travel restrictions precluded the survey of markets in North and Middle Andaman and the Southern Nicobar Islands. Semi-structured questionnaires were developed to facilitate personal interviews, enabling a flexible yet focused approach to data collection. Respondents were asked to categorise their answers using a five-point Likert scale, where scores ranged from 1 (strongly disagree), 2 (disagree), 3 (no opinion), 4 (agree) and 5 (strongly agree). A score above 3.0 signified a general agreement with the presented statements (Patankar, 2019). A total of 184 respondents were interviewed from South Andaman and Car Nicobar Island. The interviews were conducted during the period from November 2020 to mid-January 2021. The fish vendors were thoroughly briefed on the interview's objectives, ensuring clarity and relevant engagement. The interviews concentrated on gathering demographic information, identifying constraints encountered in the market, understanding the impact on their livelihoods, evaluating the extent of income loss and exploring potential strategies for future resilience. This approach facilitated a comprehensive understanding of the challenges faced by the

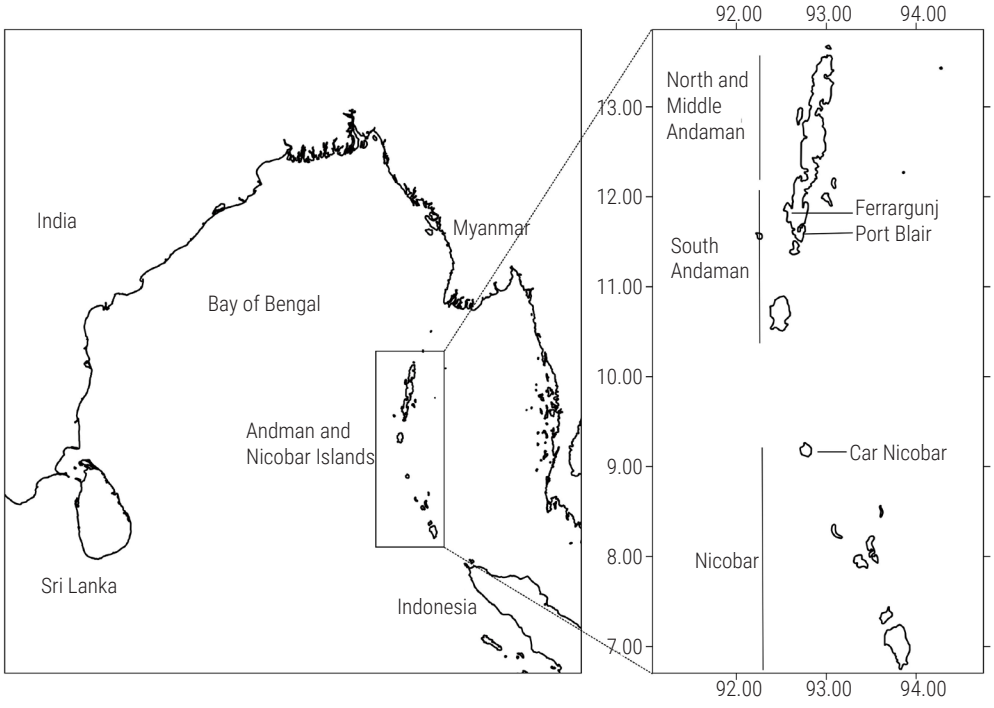

Fig. 1. Map showing the location of the study areas in the archipelago

Table 1. Details of the fish markets surveyed in the archipelago

District	Taluk	Locations surveyed
South Andaman	Port Blair	Aberdeen Bazaar, Dairy farm, Dignabad, Haddo, Junglighat, Mohanpura, Prem Nagar, Prothrapur, Brookshabad, Nayagaon, Chakkargaon, Burmanallah, Dollygunj, Chatham
	Ferrargunj	Bambooflat, Panighat, Sippighat, Wimberlygunj
Nicobar	Car Nicobar	Big Lapathy, Teetop

vendors and provided valuable insights for future interventions.

In the survey involving 184 respondents from South Andaman, Port Blair and Ferrargunj taluks accounted for the vast majority at 98.4%. At the same time, Nicobarese women vendors from Car Nicobar comprised just 1.6% of the respondents. Port Blair, the capital city of the Andaman and Nicobar Islands, was extensively surveyed, resulting in a predominance of urban market representation (77.1%). In contrast, rural and tribal vendors contributed 21.1 and 1.6%, respectively. Notably, Telugu-speaking fisherwomen represented the most significant demographic within the survey at 90.8%, followed by Tamil, Bengali and Nicobarese communities.

Ethical standards in personal interviews were taken up following Patankar *et al.* (2015) and Patankar (2019). Garrett ranking was carried out to rank the constraints faced by following Kumaran *et al.* (2021). Statistical analyses, such as ANOVA, frequency analysis, Garret Ranking and Paired t-test were performed using the SPSS software (Release16 SPSS, Chicago, IL, USA).

Results and discussion

The insights derived from a comprehensive analysis of the responses collected from 184 women fish vendors hailing from South Andaman and Car Nicobar Islands are critical for understanding the demographic characteristics of this group. A detailed demographic profile of the respondents is presented in Table 2, providing essential context for our findings.

Table 3 presents a Garrett ranking analysis highlighting the challenges encountered by seafood vendors during the COVID-19 restrictions. The analysis identifies movement restrictions, insufficient access to essential inputs such as ice and fish, inadequate market demand and limitations in fish storage facilities as the primary constraints faced by vendors. Notably, movement restrictions emerged as a significant hurdle, disproportionately impacting poor and marginalised women vendors who rely on public transportation and lack access to private transport facilities for their market activities.

Women seafood vendors unanimously agreed that there was a reduction in income ($p<0.001$) and inflow of customers due to the COVID-19 pandemic. During the early phases of the COVID-19 pandemic and the related lockdown, there was a general perception among the public that seafood could act as a possible carrier of COVID-19 infection. The perception was disagreed by the tribal and rural market vendors whereas the urban vendors did not have any opinion on this regard. The tribal women vendors were also not aware of online marketing and did not have any opinion regarding the competition from online marketing. However, the rural vendors agreed ($p<0.001$) on the competition and urban vendors did not have any opinion. Rural women vendors also strongly disagreed ($p<0.001$) that the sales were picking up with ease in restriction, whereas urban and tribal market vendors did not have any opinion. Regarding the suggestions to revamp the marketing activities, respondents from urban and tribal markets agreed that there is an imminent need for awareness and sensitisation on the aspects of the hygienic handling practices and sustainable utilisation of fish wastes generated in the market, whereas the respondents from rural markets did not have any opinion on the need of awareness programs ($p<0.001$). The women vendors also strongly agreed on the need for administrative assistance and subsidies as they strongly believed that such administrative assistance and subsidies could compensate for the income losses and increased financial burden incurred during the COVID-19 lockdown period. The women vendors unanimously agreed that there is a need for the relaxation of lockdown restrictions, which they strongly believed could increase the customer inflow and income generation. During the interviews, we questioned the possibility of additional income generation through value addition to the existing fresh forms of seafood sold. The urban and tribal market vendors disagreed that there is a higher demand for processed seafood than fresh forms whereas, those from the rural area did not have any opinions ($p<0.001$). The respondents from rural, urban, and tribal areas did not have any opinion on the statement that the value addition of fish can increase income and employment opportunities (Table 4).

Table 2. Profile of the women seafood vendors surveyed (N =184)

Category	Details	Frequency	%
District	South Andaman	181	98.40
	Car Nicobar	3	1.60
Market type	Urban	142	77.17
	Rural	39	21.19
	Tribal	3	1.63
Ethnicity	Bengali	6	3.30
	Nicobari	3	1.60
	Tamil	8	4.30
	Telugu	167	90.80
Age groups (in years)	<30	8	4.30
	30-60	164	89.10
	>60	12	6.50
Education level	Illiterate	135	73.40
	Primary	16	8.70
	Upto 10th	29	15.80
	Upto 12th	3	1.60
	Graduate	1	0.50
Experience (years)	0-10	68	37.00
	11-20	71	38.60
	21-30	31	16.80
	31-40	12	6.50
	>41	2	1.10
Type of marketing followed	Door to door	60	32.60
	Fish market	59	32.10
	Street vendor	56	30.40
	Both door-to-door and fish market	9	4.90
Frequency of sale	Daily	122	66.30
	Random	62	33.70
Source of raw material	Direct purchase	161	87.50
	Middlemen	23	12.50

Table 3. Constraints ranked by the women seafood during the pandemic

Constraints	Garrett mean values	Rank
Reduction in demand	48.4	3
Movement restrictions	72.8	1
Limitations in storage	29.5	4
Lack of inputs (ice)	49.2	2

Table. 4. Stakeholder perception, and suggestions on the impact of the pandemic (N=184)

Perceptions	Urban	Rural	Tribal
Decreased sales and income loss	4.85±0.03	4.95±0.04	5.00±0.00
Reduced customer inflow	4.13±0.03	4.23±0.07	4.00±0.00
Fear of seafood consumption	2.70±0.09	2.03±0.03	2.00±0.00
Competition from online marketing	3.27±0.05^{ab}	3.85±0.17^{b}	3.00±0.00^{a}
Sales picking up with ease in restrictions	2.99±0.06^{b}	1.28±0.12^{a}	3.00±0.00^{b}
Suggestions			
Awareness and training programs	4.02±0.04^{b}	2.64±0.16^{a}	4.00±0.00^{b}
Administrative assistance and subsidies	4.01±0.07^{a}	4.90±0.04^{b}	4.00±0.00^{a}
Relaxation in lockdown restrictions	3.75±0.01	4.00±0.00	4.00±0.00
Scope for alternative income			
Better demand for processed fish than fresh fish	2.33±0.05^{ab}	2.90±0.05^{b}	2.00±0.00^{a}
Value addition can increase income	3.15±0.04	3.03±0.03	3.00±0.00

Note: Analysed using one-way ANOVA followed by Duncan's multiple-range test. Values are expressed as mean ± standard error. Values in the same row with different superscripts differ significantly ($p<0.001$).

Weekly income data collected from the respondents (n=184) belonging to urban, rural and tribal women vendors revealed that all three categories of vendors faced significant reduction ($p<0.001$) in the weekly income during the pre-and post-COVID scenario (Table 5). with a maximum difference in the rural area (57.18%) followed by urban (51.54%) and tribal (28.4%) locations. The tribal women vendors of Car Nicobar Island, though limited in number, have preferred home delivery options over market-based sales, during the COVID-19 pandemic. In contrast, urban and rural vendors primarily rely on market-based sales, with a smaller subset participating in door-to-door sales. Analysis of weekly income data from fish vendors indicates that rural vendors generally earn more than their urban counterparts. This disparity may be attributed to the additional logistical and transportation costs incurred by urban vendors, who frequently navigate multiple markets. Furthermore, urban markets face stiff competition from digital seafood delivery services, which can further elevate operational costs compared to rural markets, contributing to the observed income differences.

Among the issues identified considering COVID-19, movement restrictions and transportation issues remained a serious bottleneck in the fisheries and aquaculture sector (Jamwal and Phulia, 2020; Sunny *et al.,* 2020). The observations from this study align closely with the responses of women vendors, who identified movement restrictions and inadequate transportation facilities as significant obstacles to marketing their fish. These barriers not only hinder their operational efficiency but also limit their access to broader markets, ultimately affecting their economic viability and growth potential in the fish trading sector. Restrictions in mobility affecting logistics and movement of fish to markets by women vendors were also identified as a livelihood issue in the studies of Jeeva *et al.* (2023) in Andhra Pradesh. The lockdown restrictions significantly hindered the availability of essential inputs, particularly ice (Jamwal and Phulia, 2020), which posed a considerable challenge for women vendors in the Islands. The limited access to inputs such as ice made it extremely difficult for these vendors to store fish effectively, given the perishable nature of marine products. Consequently, without adequate refrigeration and storage facilities, vendors experienced substantial quality degradation of their catch, resulting in spoilage and a corresponding decline in market value. Women fish vendors operating in the post-harvest sector faced serious challenges such as loss of income (Seafoodsource, 2020) which could be attributed to various reasons such as lack of proper guidance, limited inputs such as ice and cold storage as well as lack of innovative marketing approaches and bargaining capacity. These observations also matched with our study as women seafood vendors represented in our study faced income losses due to a lack of unorganised marketing practices, and proper guidance, and the disadvantageous situation due to fear of COVID-19. Some of the important coping strategies that could be adopted in the future are the need for training programs on storage systems that allow them to store fish for longer periods (World Fish Center, 2021; Sultana *et al.,* 2021), drying and processing (Campbell *et al.,* 2021), migration to door-to-door sales and delivering seafood directly to the consumers (Lau *et al.,* 2021; Ruiz-Salmon *et al.,* 2021; Stoll *et al.,* 2021) and online platform sale (Love *et al.,* 2021). During our surveys, the need for awareness programs on quality marketing and innovative approaches was also suggested by the women vendors during interviews. Skill development, training programs, subsidised equipment, and low-cost credit are proven to be helpful to women fish retailers to overcome their marketing issues (World Fish Centre, 2017). In our study, the tribal fish vendors of Car Nicobar adopted innovative coping strategies such as door-to-door delivery within a certain reach in their village to sell the fish catches.

The COVID-19 lockdown and related restrictions inflicted a daily loss of ₹224 crores on the marine fishery sector in India (The Hindu Business Line, 2021). Approximately 60% of all fish sellers in India are fisherwomen, which highlights their importance and the necessity for fostering equitable economic recovery in the fisheries sector post-pandemic (Gopal *et al.,* 2020). On the other

Table 5. Impact of COVID-19 outbreak on the average weekly income of women vendors

Average weekly income (₹)	Urban	Rural	Tribal	Paired t test
Pre COVID-19 outbreak	1940.8±93.4	2425.6±100.1	1816.7±316.7	t= 21.773 ($p<0.001$)
Post COVID-19 outbreak	940.9±44.6	1038.5±64.9	1300.0±246.6	

hand, COVID-19 restrictions exacerbated the issues faced by Indian women fisherfolk as they are already facing gender-specific challenges in the fishery sector (The Hindu, 2021). (). In the present study, we have also witnessed income reduction along with logistical issues and limitations in inputs during the pandemic restrictions by all three types of vendors such as urban, rural, and tribal women seafood vendors. During the restriction period, the tribal women vendors of Car Nicobar, who are part of fishing families, adopted a door delivery system to maintain their fish sales and sustain their livelihoods. This approach not only allowed for the marketing of fresh fish but also leveraged their advantageous position of having direct access to local catches brought in by family members. The small geographic size of Car Nicobar further facilitated this delivery mechanism. Such innovations in marketing were also reported in other parts of India like Andhra Pradesh (Jeeva *et al.,* 2023). Conversely, in urban areas such as Port Blair, the situation differed significantly; the larger area and increased involvement of middlemen complicated access to fish catches, thereby hindering similar selling strategies.

Based on the insights gathered from the surveys, we recommend strategies that could enhance the sustainability and resilience of women fish vendors in the seafood marketing sector. Initiatives should focus on providing access to training programs, financial support and fair market opportunities. Additionally, fostering community support networks and facilitating collaborations among vendors can strengthen their market position and ensure long-term viability. These strategies could empower women fish vendors, enabling them to thrive in a competitive environment while promoting sustainable practices in the seafood industry. Developing social linkages in fish marketing can provide a key advantage in marketing to use the resources with easy access and timely distribution (Pedroza-Gutierrez and Hernandez, 2017). Social media is seen as a key factor for seafood marketing during the times of pandemic (Chesapeake Bay Program, 2020). Value addition is an ideal alternative way of livelihood for the fishermen community who had undergone a crisis during the COVID-19 wave. Frozen and shelf-stable products have had a good market during the COVID-19 pandemic (Love *et al.,* 2021). Underutilised catches during harvest present an opportunity for value addition through drying or curing processes. This approach not only minimises waste but also enhances the marketability of raw materials during difficult times such as pandemic lockdowns. This trend underscores the potential benefits of innovative processing methods in the face of market challenges. Women's involvement in the decision-making and policy planning process is crucial for the marine fishery sector (Shyam and Geetha, 2013) however, their contribution is less understood and is underrepresented in decision-making processes (Shyam and Geetha, 2013; Rohe *et al.,* 2018). Recognising the role of women in the fisheries sector has significant policy implications (Harper *et al.,* 2013; Solano *et al.,* 2021), potentially leading to improved outcomes (Santos, 2015). Policy decisions in the marine fishery sector can directly impact women's livelihoods and income generation. The need of the hour is to initiate work on collating the gender and fisheries disaggregated data (Bennett, 2005), as gender inclusion could promote coastal sustainability (Torre-Castro, 2019).

The findings of this study highlight the detrimental effects of COVID-19-related lockdowns on women seafood vendors in the islands. This research serves as a foundational resource underscoring the urgent need to support the livelihoods of these vendors, who have faced significant challenges during the pandemic's first wave. The vital role of women in the marine fisheries sector merits greater recognition, as they balance fishery-related activities with household responsibilities. Additionally, women vendors need to identify critical gaps in fish marketing and adapt their strategies to enhance resilience against future disruptions. We recommend that institutional and administrative policies prioritise the contributions of women in seafood marketing to promote gender equity and participatory governance, ultimately fostering sustainable outcomes in the marine fishery sector.

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