



## The blue economy paradigm: livelihood viability of fisherfolk through coastal tourism

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### Abstract

Coastal tourism is increasingly recognized as a vital component of the global 'blue economy', offering a critical pathway for traditional fishing communities to diversify their livelihoods amid mounting economic and environmental pressures. To understand this dynamic, this study investigates the occupational transition of 120 coastal fisherfolk into the tourism sector across two states in India. Analyzing socio-economic profiles and transition patterns, the research highlights a significant occupational shift, with 85.8% of respondents now identifying tourism as their primary income source. Demographically, the participants are predominantly middle-aged males with low educational attainment and modest living conditions. Fisherfolk strongly favor tourism over traditional fishing, citing lower physical strain, reduced risk, and more stable earnings. Consequently, this transition has led to a marked reduction in fishing labor hours and a significant income boost, with median annual tourism earnings reaching ₹252,000 (~USD 2610). Furthermore, data models reveal that a willingness to step away from traditional fishing is the strongest predictor of transition readiness. Despite these positive economic outcomes, the occupational shift is hindered by several major constraints. Disruptions from the COVID-19 pandemic, high initial investments, strong competition from established operators, poor infrastructure, and adverse weather conditions remain significant challenges. Ultimately, while tourism is increasingly central to diversifying coastal livelihoods and reducing heavy physical labor, ensuring its sustainability requires targeted interventions. Stronger institutional support, comprehensive skill development, and accessible financial mechanisms are essential to secure equitable, long-term benefits for these coastal communities.

**Keywords:** blue economy; coastal tourism; fisherfolk; livelihood diversification; occupational transition

## 1 | INTRODUCTION

The conceptual journey of the blue economy begins with a crucial distinction from its predecessor, the "ocean economy." The ocean economy is a straightforward economic metric, focused on quantifying the output and value of ocean-based industries without an inherent sustainability mandate (McBain *et al.* 2024). In contrast, the blue economy, as defined by institutions like the World Bank, is the "sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of ocean ecosystems (World Bank Group 2017). It recognizes that the world's oceans, with an estimated annual economic value of US\$2.5 trillion, are equivalent to the world's seventh-largest economy, but are facing a triple crisis of climate change, pollution, and biodiversity loss that jeopardizes current and future generations (UNEP 2024). The OECD 2024 broadens this perspective to include multi-level governance and freshwater ecosystems, while the sustainable blue economy finance initiative focuses strictly on risk management and guiding capital toward ocean-friendly investments (United Nations 2025). In stark contrast, small island developing states (SIDS) view the blue economy through a lens of survival and stewardship, prioritizing social equity, cultural appropriateness, and the preservation of traditional sectors over pure economic expansion (WWF 2015).

The consumptive and non-consumptive recreational uses of the marine environment usually include fishing, shell collection, bird watching, sunbathing, windsurfing, scuba diving, and boating (Mitra *et al.* 2021). The priority sectors within blue economy differ from country to country based on the resource endowments. The contribution of fisheries and marine tourism towards the national income of large countries like the United States, China and India could be relatively low compared to small island developing states (SIDS) (WWF 2015). It is hence always important to efficiently formulate a proper spatial and socio-economic planning for these priority sectors, for yielding desired results of the blue economy in the form of job creation, export growth and upliftment of native coastal communities, particularly women (Blue Economy Forum 2020).

It is estimated that coastal and marine tourism accounts for at least 50% of all global tourism (Ocean Panel 2020). The broader ocean economy, of which tourism is a principal component, was valued at \$1.5 trillion in 2010 and is projected to double to \$3.0 trillion by 2030, with employment in ocean-related sectors reaching 40 million people (IFC 2022). This immense and growing economic contribution is the primary reason why coastal tourism is consistently identified as an established and prioritized sector within blue economy strategies and development

plans worldwide (World Bank and United Nations 2017).

According to the Economic Impact Research by the World Travel & Tourism Council (WTTC 2024), travel and tourism sector's contribution to India's GDP reached over ₹19.13Trillion (~USD 200.67 billion) in 2023, which is almost 10% ahead of 2019 levels. Recognizing the immense potential of coastal tourism, India has initiated a significant strategic pivot towards its vast coastline, transitioning from a fragmented approach to a more deliberate and integrated vision. This renewed focus is spearheaded by ambitious national programs like the Swadesh Darshan scheme, which develops thematic "Coastal Circuits" to create seamless and holistic travel experiences by linking multiple destinations (Sake 2025). Complementing this is the Sagarmala Programme, which, beyond its maritime logistics focus, dedicates resources to coastal community development, funding projects from cruise tourism infrastructure to the development of fishing harbors and lighthouses as tourist attractions (Ministry of Ports, Shipping and Waterways 2025).

The Government of Karnataka has signalled a decisive pivot towards leveraging its coastal assets with the launch of the Karnataka Tourism Policy 2024–29 (DoT 2024). This policy is not a nascent effort but an evolution, explicitly building on the "successes, failures, and learnings" from its predecessors, the 2015–20 and 2020–26 policies (DoT 2024). The government has earmarked an operational budget of ₹1,350 crore (~USD 141 million) for the policy's implementation and aims to attract between ₹7,800 crore (~USD 817 million) and ₹8,000 crore (~USD 838 million) in direct private investment over the next five years (Triveni 2025). To facilitate this, a tourism development fund has been established under Karnataka Tourism Infrastructure Ltd (KTIL) to manage land banks and infrastructure planning. Central to Karnataka's strategy is the cultivation of a "New Goa" narrative, a theme prominently featured in both media discourse and policy actions (Kulkarni 2025). In accordance, the government plans the establishment of a dedicated coastal tourism development board tasked with creating a comprehensive master plan to guide sustainable investment. This strategy envisions the creation of integrated tourism zones and the development of at least ten mega-tourism projects along the coast within five years (Naina 2025).

Tamil Nadu's approach to coastal development is framed within a vision that is markedly broader than tourism alone. The Tamil Nadu Tourism Policy 2023 sets forth an ambitious goal to evolve the state into the "most attractive experiential destination in Asia" (Tamil Nadu Tourism Policy 2023). This was given motion by declaring "industry status" to tourism projects. This approach is a key component of the state's larger goal of achieving a \$1

trillion economy (Govardan 2025). The centrepiece of this framework is the Tamil Nadu Coastal Restoration Mission, a comprehensive, five-year project launched with a budget of ₹1,675 crore and in partnership with the World Bank (Chaitanya 2024). The state is actively promoting cruise tourism, with identified routes such as Chennai–Rameswaram–Kanniyakumari and Chennai–Port Blair, supported by plans to develop the necessary jetty infrastructure to facilitate these services (Tamil Nadu Tourism Policy 2023).

A study by Pascoe *et al.* (2023) examined how tourism would change in the absence of fishing, and how this would affect benefits to tourists and the local economy. Knowing the complex relationship between the existence of a fishing industry and tourism, the results suggested that fisheries may make a substantial contribution to regional economies through their impact on tourism, as well as providing non-market benefits to visitors themselves. In some particular regions of Europe, fishery operators engage directly in tourism-related activities. Referred to as “pescaturism”, tourists are invited on board fishing boats where they experience the life of a fisher for a day (Piasecki *et al.* 2016). Similarly, “yujiale” has developed as a form of tourism in China, where tourists live with fishing families, participate in the fishing activity and attend cultural events in the fishing communities (Su *et al.* 2016, 2017). These types of tourism activities allow visitors to learn about fishers’ traditions while interacting with them. Culturally, fisheries-related tourism appeals to tourists seeking authentic experiences, thereby driving a sustainable form of tourism that reinvests its advantages back into the local community (Madau *et al.* 2009; Mourde 2014). Balamurugan *et al.* (2022) asserted that the promotion of mudflat tourism in India presents a viable strategy for enhancing local community livelihoods and creating employment opportunities. Individuals, including fishermen relying on natural resource extraction for their livelihood, face high income variability driven by a mix of environmental, biological, management, and economic factors (Anderson *et al.* 2017). In response to significant income decline due to climate impacts, small-scale fishers in Galicia, Spain, had to diversify their livelihoods (Salgueiro-Otero *et al.* 2022). A study stated that moving from a single fishery strategy to a 50-25-25 split in revenues reduces the expected coefficient of variation of gross revenues (Kasperski and Holland 2013). Community participation in tourism development processes can support and uphold local culture, tradition, knowledge, and skill, as well as create pride in community heritage (Nagaraja and Siddiq 2024a, 2024b). A study revealed that angling tourism promotes sustainable rural development by enhancing social values, conserving biodiversity, and improving the economic and social well-being of fishermen and local communities (Sangma *et al.* 2025).

Tourism mainly has two kinds of stakeholders, one is

those who provide the services and the other who receive those services. Research in this arena has usually been conducted concentrating on the receiving end, i.e., the tourists, usually leading towards evaluating the area of a particular activity. Very little research is conducted on economic aspects, constraints faced and the perspective of the providers’ end. Considering that, these service providers belong to inclusive communities, backgrounds and ethnicities, like fisherfolk. Filling this research gap is essential for informing evidence-based policy and management decisions. Keeping this kind of gap in mind, this study was conducted concentrating on the coastal fisherfolk community and their role towards coastal tourism. This exploratory research documents the socio-economic profile of tourism-dependent coastal fisherfolk, incorporates perspective study, along with recognizing time effort and income patterns of fisherfolk after transitioning into tourism.

## 2 | METHODOLOGY

### 2.1 Study area

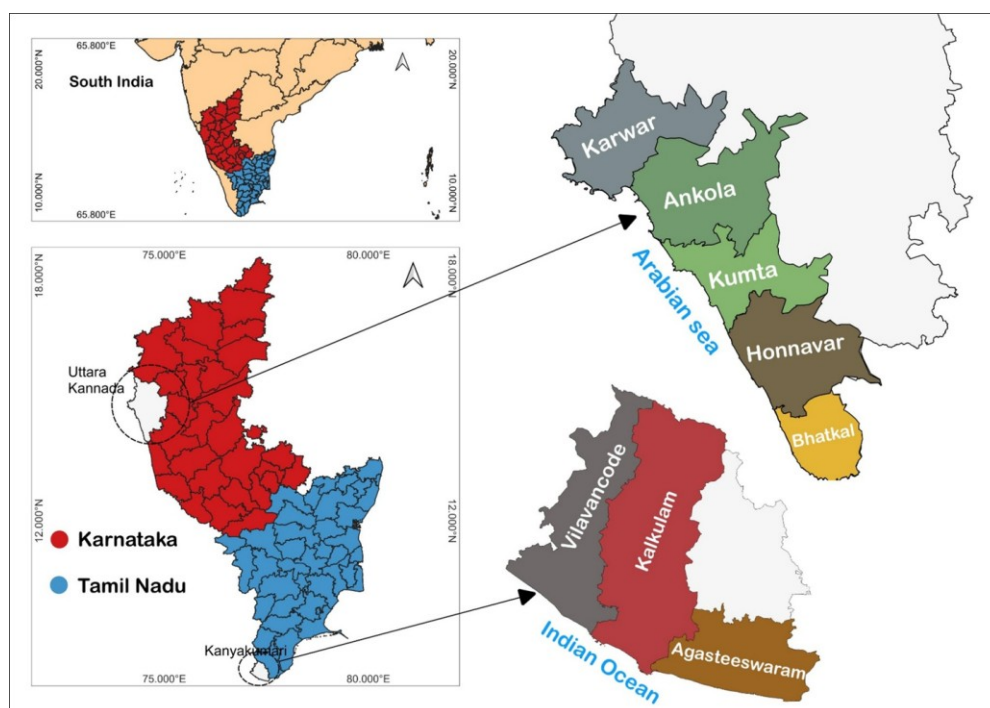
To gain an understanding of socio-economic attributes, transition ability, and income-effort patterns among coastal fisherfolk who are involved in tourism and tourism-related activities, the sampling framework was laid out. Kanyakumari district, among fourteen coastal districts in Tamil Nadu, and Uttara Kannada district, among three coastal districts in Karnataka, were selected as the study areas (Figure 1). The strategic selection of Karnataka and Tamil Nadu as study areas was primarily driven by their exceptionally heavy inflow of tourists compared to other Indian coastal states (Ministry of Tourism 2024), alongside their active policy alignment with the broader global blue economy narrative. Also, selecting two major coastal tourism hotspots from two different states was believed to provide a broader perspective on the resulting patterns in this exploratory research. And also, there are cultural differences among the respondents and operational differences in tourism activities between these two regions. This helps unveil two different viewpoints on the same issue.

### 2.2 Sampling protocols

A total of 120 fisherfolk were selected through purposive sampling. From each district, the sample size was fixed at 60 to provide equal representation to both states. The tourism activities like boat/cruise tourism, mangrove tourism, fish eateries, scuba diving/dolphin tourism, adventure sports, homestays, ornamental shell tourism, and turtle eco-tourism (Figures 2–3) were identified during primary data collection, both through the internet and informants (mostly locals and travel enthusiasts). Primary data were collected using a semi-structured interview schedule. Since it was purposive sampling, emphasis was not given to the activities themselves, but to tourism as a

whole through identifying hotspots of all these activities. From each hotspot area, key informants were selected randomly. The percentage of respondents involved in each activity is shown in Figure 4. The reliance on purposive sampling to identify individuals actively engaged in

coastal tourism introduces inherent selection bias. By exclusively surveying fisherfolk who have successfully transitioned into the tourism sector, the study inadvertently omits the perspectives of those who may have attempted to transition but failed.



**FIGURE 1** Map of southern India showing the study areas.



**FIGURE 2** Mangroove boating services in Mavinkurve.



**FIGURE 3** Shell tourism in Kanyakumari.

### 2.3 Data analysis

Data were analyzed using various statistical methods, including frequency and percentage distribution, arithmetic means and standard deviation for socio-economic profiling of the fisherfolk and perceived transition scores into tourism. Respondents' perceptions regarding fifteen push-and-pull statements were recorded on a 5-point Likert scale. The continuous arithmetic mean of these fifteen items was calculated for each respondent to gen-

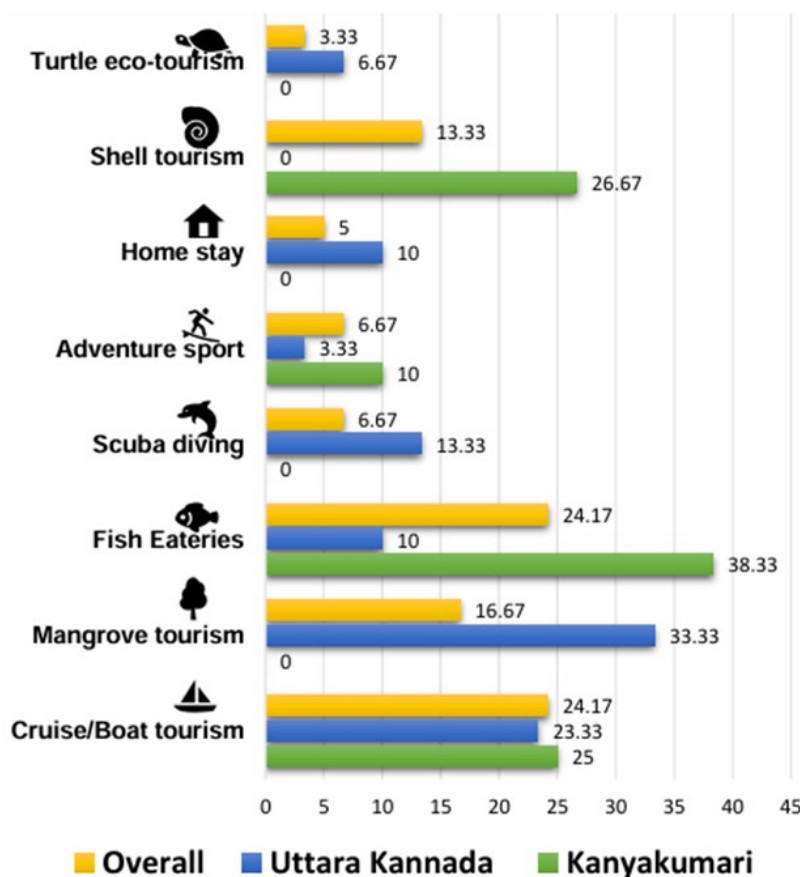
erate a composite "Transition Score". A Pearson's chi-square ( $\chi^2$ ) test of independence was employed to determine if there were statistically significant differences in perceptions regarding fish availability between the Kanyakumari and Uttara Kannada districts. The Kruskal-Wallis test was used to compare the transition scores across the eight different activity groups. The Wilcoxon Signed-Rank test was used to determine if there was a change in time effort before and after individuals entered

the tourism sector. Also, it helped to determine if the income of individuals after entering the tourism sector was significantly different from a benchmark. Ordinal logistic regression was administered to quantify the extent of influence of independent variables like fishing income, tourism income, family size, experience in tourism, fish availability, age, effort before entering into tourism, effort after entering into tourism, and major source of income, on livelihood transition value, the dependent variable. The livelihood transition value was derived from an independent, single-item measure assessing overarching occupational sentiment (“Overall, I strongly feel to have transitioned into tourism”). While originally measured on a standard 5-point Likert scale, the complete absence of ‘Strongly Disagree’ responses naturally formed a four-level discrete ordinal variable utilized in the model (2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree). Constraint analysis was carried out through Garrett Ranking Technique (Garrett and Woodworth 1969). Respondents were asked to rank constraints in order of perceived

importance, with these ranks subsequently converted to Garrett scores using the following formula:

Percent position =  $100 \times [(R_{ij} - 0.5) / N_j]$ . Where  $R_{ij}$  represents the rank assigned to the  $i$ th factor by the  $j$ th respondent, and  $N_j$  denotes the total number of constraints ranked by the  $j$ th respondent.

Percent positions were then converted to Garrett scores using standardized Garrett tables (Garrett and Woodworth 1969). Mean Garrett scores for each constraint were calculated across all respondents, with higher scores indicating greater perceived severity. Constraints were subsequently ranked in descending order of mean Garrett scores, providing a priority hierarchy for policy intervention targeting. To statistically validate the differences in severity rankings across the constraints, a non-parametric Friedman test was conducted. The tools used to analyze and visualize the data were R statistical software (version 4.4.2) through R Studio (version 2025.5.1.513) and Microsoft Excel.



**FIGURE 4** Percentage of respondents involved in each activity.

### 3 | RESULTS AND DISCUSSIONS

#### 3.1 Demographic profile

Among all the respondents from two districts, the mean age was found to be 42.7 years, ranging between 19 and 65 years (Table 1). The data reveals a workforce predominantly in its prime productive years, with a substantial

majority (71.67%) falling within the 31–50 age bracket. This finding is consistent with other socio-economic studies of Indian fishing communities, which frequently report a middle-aged demographic as the core of the workforce (Immanuel 2004; Charles *et al.* 2009; Joshua 2009; Salim *et al.* 2013). Demographic compositions varied significant-

ly by region. While the Uttara Kannada cohort was exclusively Hindu and predominantly male, Kanyakumari exhibited higher female participation (43.33%) and a Christian majority (63.33%). These regional religious variations mirror the localized demographic shifts noted in broader literature (Billah *et al.* 2018; Yadav *et al.* 2020). Education levels in the study area trail behind national averages. With 68.33% of respondents being illiterate, the community falls notably short of the National Marine Fisheries Census (2016), which recorded a 66% literacy rate (primary or higher) among eligible marine fishermen. Regarding household structure, most fisherfolk live in nuclear families (averaging 4 members), a finding consistent with

Sharma *et al.* (2000), Anon (2005), and Nirmale *et al.* (2007), though contradicting Shankar (2010), who found joint families to be more prevalent. Housing conditions underscore persistent socio-economic challenges, with the majority (54.17%) residing in temporary Kuccha houses. This resonates with literature describing the enduring poverty within Indian fishing communities (Vichare 2010; Kalita *et al.* 2015). However, asset ownership indicates some upward economic mobility; 75% of respondents own a two-wheeler (the remainder own bicycles), demonstrating capital accumulation essential for transportation and work stability. Notably, none of the respondents owned a four-wheeler.

**TABLE 1** Demographic characteristics of respondents from the southern India.

| Attributes                                                  | Kanyakumari (n=60) |       | Uttara Kannada (n=60) |       | Total (n=120) |       |
|-------------------------------------------------------------|--------------------|-------|-----------------------|-------|---------------|-------|
|                                                             | Frequency          | %     | Frequency             | %     | Frequency     | %     |
| <b>Age (years)</b>                                          |                    |       |                       |       |               |       |
| 18–30                                                       | 6                  | 10    | 2                     | 3.33  | 8             | 6.67  |
| 31–50                                                       | 40                 | 66.67 | 46                    | 76.67 | 86            | 71.67 |
| >50                                                         | 14                 | 23.33 | 12                    | 20    | 26            | 21.67 |
| Mean $\pm$ SD = 42.70 $\pm$ 9.60 years; Range = 19–65 years |                    |       |                       |       |               |       |
| <b>Gender</b>                                               |                    |       |                       |       |               |       |
| Male                                                        | 34                 | 56.67 | 58                    | 96.67 | 92            | 76.67 |
| Female                                                      | 26                 | 43.33 | 2                     | 3.33  | 28            | 23.33 |
| <b>Religion</b>                                             |                    |       |                       |       |               |       |
| Hindu                                                       | 17                 | 28.33 | 60                    | 100   | 77            | 64.17 |
| Christian                                                   | 38                 | 63.33 | 0                     | 0     | 38            | 31.67 |
| Muslim                                                      | 5                  | 8.33  | 0                     | 0     | 5             | 4.17  |
| <b>Category</b>                                             |                    |       |                       |       |               |       |
| SC                                                          | 13                 | 21.67 | 4                     | 6.67  | 17            | 14.17 |
| ST                                                          | 10                 | 16.67 | 0                     | 0     | 10            | 8.33  |
| OBC                                                         | 37                 | 61.67 | 56                    | 93.33 | 93            | 77.50 |
| <b>Education</b>                                            |                    |       |                       |       |               |       |
| Illiterate                                                  | 39                 | 65    | 43                    | 71.67 | 82            | 68.33 |
| Primary                                                     | 13                 | 21.67 | 13                    | 21.67 | 26            | 21.67 |
| High                                                        | 8                  | 13.33 | 4                     | 6.67  | 12            | 10    |
| Graduate                                                    | 0                  | 0     | 0                     | 0     | 0             | 0     |
| Professional                                                | 0                  | 0     | 0                     | 0     | 0             | 0     |
| <b>Marital status</b>                                       |                    |       |                       |       |               |       |
| Married                                                     | 59                 | 98.33 | 57                    | 95    | 116           | 96.67 |
| Single                                                      | 1                  | 1.67  | 3                     | 5     | 4             | 3.33  |
| <b>Family type</b>                                          |                    |       |                       |       |               |       |
| Nuclear                                                     | 35                 | 58.33 | 32                    | 53.33 | 67            | 55.83 |
| Extended                                                    | 9                  | 15    | 8                     | 13.33 | 17            | 14.17 |
| Joint                                                       | 16                 | 25.67 | 20                    | 33.33 | 36            | 30    |
| <b>Family size:</b> Mode = 4; Range = 2–7                   |                    |       |                       |       |               |       |

Due to the purposive sampling of individuals involved in coastal tourism, the primary source of income for the vast majority (85.83%) is tourism. This marks a distinct skew from traditional studies, which typically find fishing communities relying almost exclusively on fisheries for income (Ghosh *et al.* 2015; Ragavan *et al.* 2016;

Shyam *et al.* 2017). Despite tourism being the primary current income source, historical experience data confirms that fishing remains the foundational livelihood. Overall, respondents averaged 18 years of experience in fishing compared to 12 years in tourism (Table 2), echoing the findings of Venu *et al.* (2023). However, regional dis-

parities exist: Uttara Kannada respondents are highly experienced traditional fishers (mean: 25 years) who adopted tourism more recently (mean: 8.5 years), whereas Kanyakumari respondents show more established integration into the tourism sector (mean: 14.9 years) compared to their fishing experience (mean: 11.3 years, with

43.33% reporting no fishing experience at all). This 43.33% reporting no fishing experience at all might be interpreted due to considerable amount of these respondents being women, and practically less possible to be having any kind of fishing experience.

**TABLE 2** Livelihood characteristics of respondents from the southern India.

| Attributes                                     | Kanyakumari (n=60) |       | Uttara Kannada (n=60) |       | Total (n=120) |       |
|------------------------------------------------|--------------------|-------|-----------------------|-------|---------------|-------|
|                                                | Frequency          | %     | Frequency             | %     | Frequency     | %     |
| <b>Experience in tourism (years)</b>           |                    |       |                       |       |               |       |
| 1–3                                            | 9                  | 15    | 12                    | 20    | 21            | 17.50 |
| 4–6                                            | 8                  | 13.33 | 15                    | 25    | 23            | 19.17 |
| 7–10                                           | 11                 | 18.33 | 14                    | 23.33 | 25            | 20.83 |
| >10                                            | 32                 | 53.33 | 19                    | 31.67 | 51            | 42.50 |
| Mean±SD = 11.68±9.20 years; Range = 1–40 years |                    |       |                       |       |               |       |
| <b>Experience in fishing (years)</b>           |                    |       |                       |       |               |       |
| None                                           | 26                 | 43.33 | 4                     | 6.67  | 30            | 25    |
| 1-3                                            | 1                  | 1.67  | 0                     | 0     | 1             | 0.83  |
| 4-6                                            | 2                  | 3.33  | 0                     | 0     | 2             | 1.67  |
| 7-10                                           | 3                  | 5     | 1                     | 1.67  | 4             | 3.33  |
| >10                                            | 28                 | 46.67 | 55                    | 91.67 | 83            | 69.17 |
| Mean±SD = 18.07±13.10; Range = 0-48            |                    |       |                       |       |               |       |
| <b>Major source of income</b>                  |                    |       |                       |       |               |       |
| Fishing                                        | 11                 | 18.33 | 6                     | 10    | 17            | 14.17 |
| Tourism                                        | 49                 | 81.67 | 54                    | 90    | 103           | 85.83 |
| <b>House (asset)</b>                           |                    |       |                       |       |               |       |
| Kuccha                                         | 32                 | 53.33 | 33                    | 55    | 65            | 54.17 |
| Pucca                                          | 28                 | 46.67 | 27                    | 45    | 55            | 45.83 |
| <b>Vehicle (asset)</b>                         |                    |       |                       |       |               |       |
| 2-wheeler                                      | 47                 | 78.33 | 43                    | 71.67 | 90            | 75    |
| 4-wheeler                                      | 0                  | 0     | 0                     | 0     | 0             | 0     |
| Others                                         | 13                 | 21.67 | 17                    | 28.33 | 30            | 25    |

### 3.2 Fisherfolk's perception on their transition into tourism

In an exploratory study examining the transition of fisherfolk into tourism, understanding their perception is foundational. Perception acts as the primary lens through which potential opportunities and risks are evaluated, directly influencing their willingness to engage and adapt. A 5-point Likert scale (Likert 1932) was utilized to quantify these subjective attitudes regarding both "push" factors from fishing and "pull" factors toward tourism. This approach aligns with prior perception studies in fishing communities regarding angling tourism (Sangma *et al.* 2025) and climate change adaptation (Madhanagopal and Pattanaik 2019).

Table 3 outlines the fifteen transition factors assessed, alongside the corresponding mean scores and standard deviations for the overall population and the two respective districts. Strong agreement was observed regarding tourism's growth potential and promising future in coastal regions (mean ± SD = 4.92±0.26). This un-

derscores the need for coordinated efforts among government and industry stakeholders to enhance capacity-building, resource access, and equitable benefit-sharing (Nagaraja and Siddiq 2024a). Respondents perceived tourism as less physically strenuous (4.85±0.40), less risky than fishing (4.82±0.50), and involving fewer working hours (4.80±0.40), consistent with documented occupational hazards in fisheries (Fabinyi 2019; Hemagiri *et al.* 2024; Mariadason *et al.* 2025). High agreement was also recorded for increasing tourism demand (4.72±0.45), aligning with recent growth in visitation and infrastructure (The Hindu Bureau 2025). Economic drivers were prominent, including unreliable fishing income (4.30±0.90) and the perceived potential for higher earnings in tourism (4.78±0.42), supporting findings on livelihood diversification (González and Piñeiro 2020). Although the need for off-season income was rated lower (2.07±0.92), it still reflects tourism's role in stabilizing income, as noted in similar contexts (Aguinaldo and Gomez 2023). Moderate agreement was observed for skill

transferability ( $3.65 \pm 1.58$ ) and employment diversity ( $4.32 \pm 0.82$ ). In contrast, limited influence of training/support ( $2.59 \pm 1.20$ ), social networks ( $2.94 \pm 1.31$ ), and personal interest ( $3.64 \pm 1.09$ ) indicates gaps in institutional support (Nagaraja and Siddiq 2024b). To assess localized impacts, respondents were asked, "What is your perceived impact of tourism on fish availability?" to respond on a 5-point scale ranging from 1 (highly decreased) to 5 (highly increased). Perceptions varied significantly across regions ( $\chi^2 = 103.57$ ,  $df = 4$ ,  $p < 0.001$ ). In Kanyakumari ( $n = 60$ ), responses skewed neutral to positive: 50% reported no impact, 25% increased availability, 16.67% highly increased, and 8.33% decreased availability. In contrast, Uttara Kannada ( $n = 60$ ) showed overwhelmingly negative perceptions, with 61.67% reporting highly decreased and 38.33% decreased availability. While these findings highlight a stark regional divide in community experiences, it

is important to note the inherent limitations of perceptual data. Consequently, these perceptions represent the lived realities and attitudes of the respondents rather than objective, systematic ecological measurements of local fish stocks. Kanyakumari and Uttara Kannada exhibit similar drivers for livelihood transition into tourism, particularly strong agreement on tourism's growth potential, lower physical strain, reduced risk, and better income prospects. Economically, both regions recognized tourism as a viable alternative. However, Uttara Kannada exhibited stronger concern over fishing income instability (mean 4.60 vs. 4.00 in Kanyakumari) and slightly higher confidence in tourism earnings and skill transferability. Meanwhile, Kanyakumari showed comparatively lower agreement on income regularity and skill transferability, indicating a more cautious transition outlook.

**TABLE 3** Reasons to transition into tourism and tourism-related activities.

| Reason for transition                                                                                               | Respondents (mean $\pm$ SD) |                              |                        |
|---------------------------------------------------------------------------------------------------------------------|-----------------------------|------------------------------|------------------------|
|                                                                                                                     | Kanyakumari<br>( $n=60$ )   | Uttara Kannada<br>( $n=60$ ) | Overall<br>( $n=120$ ) |
| I transitioned due to a noticeable decrease in the quantity or availability of fish                                 | $2.40 \pm 0.62$             | $4.47 \pm 0.75$              | $3.43 \pm 1.24$        |
| The income from fishing became too inconsistent and unreliable                                                      | $4.0 \pm 1.04$              | $4.60 \pm 0.62$              | $4.30 \pm 0.90$        |
| I believed tourism offered the potential for greater overall earnings                                               | $4.72 \pm 0.45$             | $4.83 \pm 0.38$              | $4.78 \pm 0.42$        |
| Tourism seemed to provide a more regular and dependable source of income                                            | $3.72 \pm 1.09$             | $4.18 \pm 1.07$              | $3.95 \pm 1.10$        |
| Fishing provides income only during certain months, and I needed an income source for the off-season                | $2.28 \pm 1.08$             | $1.85 \pm 0.68$              | $2.07 \pm 0.92$        |
| I observed a growing demand for tourism-related activities and services in my coastal community                     | $4.67 \pm 0.48$             | $4.77 \pm 0.43$              | $4.72 \pm 0.45$        |
| My existing skills as a fisherman (e.g., operating a boat, knowing local waters) were useful for tourism activities | $3.10 \pm 1.63$             | $4.20 \pm 1.31$              | $3.65 \pm 1.58$        |
| Tourism activities seemed to be less physically strenuous or hazardous than fishing                                 | $4.95 \pm 0.22$             | $4.75 \pm 0.51$              | $4.85 \pm 0.40$        |
| I was interested in trying something new and expanding my professional horizons                                     | $3.73 \pm 1.07$             | $3.55 \pm 1.11$              | $3.64 \pm 1.09$        |
| My decision was influenced by family members or friends who may or may not already be involved in tourism           | $2.85 \pm 1.29$             | $3.03 \pm 1.34$              | $2.94 \pm 1.31$        |
| There were opportunities for training, financial support, or guidance available for starting tourism activities     | $2.57 \pm 1.20$             | $2.62 \pm 1.21$              | $2.59 \pm 1.20$        |
| I believe that tourism has a strong growth potential and a promising future in Coastal Karnataka/Coastal Tamil Nadu | $4.95 \pm 0.22$             | $4.90 \pm 0.30$              | $4.92 \pm 0.26$        |
| I believe tourism provides easy and diverse employment opportunities                                                | $4.47 \pm 0.72$             | $4.18 \pm 0.89$              | $4.32 \pm 0.82$        |
| Tourism activities are less risky than fishing                                                                      | $4.82 \pm 0.47$             | $4.82 \pm 0.54$              | $4.82 \pm 0.50$        |
| Tourism jobs demand fewer working hours/effort                                                                      | $4.87 \pm 0.34$             | $4.73 \pm 0.45$              | $4.80 \pm 0.40$        |

### 3.3 Transition score assessment

A composite "transition score" was computed as the mean of responses to all transition-related questions for each respondent. This enabled comparison across eight tourism-related activities, namely boat/cruise tourism,

mangrove tourism, fish eateries, scuba diving/dolphin tourism, adventure sports, homestays, ornamental shell tourism, and turtle eco-tourism, and as well as between Kanyakumari and Uttara Kannada. A similar scoring approach was adopted by Sangma *et al.* (2025), where social

value scores ranged from (+1) to (+5) and were aggregated across statements.

The Kruskal–Wallis test indicated significant variation in transition scores across activities ( $\chi^2 = 88.444$ ,  $df = 7$ ,  $p < 0.001$ ), suggesting that livelihood transition is activity-specific. This aligns with Bires and Raj (2020), who reported differential impacts of tourism components on livelihood outcomes. Further, Dunn’s test (Bonferroni-adjusted,  $\alpha = 0.05$ ) identified significant pairwise differences. Fish eateries (activity 3) showed significantly higher transition scores than boat/cruise ( $p < 0.001$ ), mangrove ( $p < 0.001$ ), scuba/dolphin ( $p < 0.001$ ) and adventure sports ( $p < 0.001$ ). This may reflect challenges in fish procurement due to declining catches (Kumari *et al.* 2021). Ornamental shell tourism (activity 7) also exhibited higher scores than boat/cruise ( $p < 0.001$ ), mangrove ( $p = 0.001$ ), scuba/dolphin ( $p = 0.003$ ), and adventure sports ( $p < 0.001$ ), likely due to its export potential and role in rural development (Natarajan *et al.* 1988; Peh and Azra 2024). Adventure sports differed significantly from Homestays ( $p < 0.001$ ), indicating greater preference among younger individuals (Keane *et al.* 2020). Other comparisons were not significant, suggesting similar transition dynamics (Table 4).

Through Wilcoxon rank-sum test, it was observed that there is a significant difference in Transition scores between Tamil Nadu and Karnataka ( $W = 2551.5$ ,  $p < 0.001$ ). Karnataka recorded a higher median score (4.2) than Tamil Nadu (3.87), indicating more favourable perceptions toward tourism-based livelihoods. This may reflect regional factors such as declining fish catch in Uttara Kannada and the need for livelihood diversification. The findings reinforce the role of state-level context, consistent with Jayabraba (2025), who reported significant inter-district differences.

### 3.4 Time effort for fishing and tourism

Time effort was measured as total annual hours (months  $\times$  days  $\times$  hours) for fishing before entering into tourism, fishing after entering into tourism, and for tourism activities. This serves as a proxy for labour intensity and worker well-being (Wicaksono *et al.* 2024). Non-normality of differences (Shapiro–Wilk:  $W = 0.954$ ,  $p = 0.003$ ) justified the use of the Wilcoxon signed-rank test. A significant reduction in effort was observed after transitioning to tourism ( $V = 3703.5$ ,  $p = 2.674 \times 10^{-11}$ ), with median effort decreasing from 4415 to 3873 hours after entering tourism, it is visually represented in a paired line plot (Figure 5). This indicates reduced labour intensity post-transition, consistent with literature highlighting the physically demanding nature of fishing (Schilling 1966; Lee and Lee 2024; MacDonnell and Vandergeest 2024).

### 3.5 Income analysis

Although time effort declined post-transition, income

outcomes were examined to assess economic viability. Due to non-normality (Shapiro–Wilk:  $W = 0.96$ ,  $p = 0.005$ ), a one-sample Wilcoxon signed-rank test was conducted against a ₹200,000 benchmark. Results showed that post-tourism income was significantly higher ( $V = 6509$ ,  $p < 0.001$ ), with a one-sided test confirming median income  $>$  ₹200,000 ( $p < 0.001$ ). The observed median income was ₹252,000 (Figure 6). The benchmark was derived from prior studies reporting fisherfolk incomes typically below ₹120,000 annually or ₹50,000–100,000 monthly (Gunakar and Bhatta 2016; Viswambharan *et al.* 2022; Swathi and Vandana 2023; Harsha *et al.* 2024). These findings indicate that tourism participation enhances income and supports livelihood resilience (Aguinaldo and Gomez 2023; Boemiya *et al.* 2023; Suradja *et al.* 2024).

**TABLE 4** Comparison between different activities (1, boat/cruise tourism; 2, mangrove tourism; 3, fish eateries; 4, scuba diving; 5, adventure sports; 6, homestays; 7, ornamental shell tourism; 8, turtle eco-tourism).

| Comparisons | <i>p</i> -values | Significance |
|-------------|------------------|--------------|
| 1 vs. 2     | 1.00             | ns           |
| 1 vs. 3     | <0.001           | ***          |
| 2 vs. 3     | <0.001           | ***          |
| 1 vs. 4     | 1.00             | ns           |
| 2 vs. 4     | 1.00             | ns           |
| 3 vs. 4     | <0.001           | ***          |
| 1 vs. 5     | 0.463            | ns           |
| 2 vs. 5     | 0.695            | ns           |
| 3 vs. 5     | <0.001           | ***          |
| 4 vs. 5     | 1.00             | ns           |
| 1 vs. 6     | 0.010            | **           |
| 2 vs. 6     | 0.014            | *            |
| 3 vs. 6     | 1.00             | ns           |
| 4 vs. 6     | 0.012            | *            |
| 5 vs. 6     | <0.001           | ***          |
| 1 vs. 7     | <0.001           | ***          |
| 2 vs. 7     | 0.001            | **           |
| 3 vs. 7     | 1.00             | ns           |
| 4 vs. 7     | 0.003            | **           |
| 5 vs. 7     | <0.001           | ***          |
| 6 vs. 7     | 1.00             | ns           |
| 1 vs. 8     | 1.00             | ns           |
| 2 vs. 8     | 1.00             | ns           |
| 3 vs. 8     | 0.010            | *            |
| 4 vs. 8     | 1.00             | ns           |
| 5 vs. 8     | 1.00             | ns           |
| 6 vs. 8     | 0.066            | .            |
| 7 vs. 8     | 0.058            | .            |

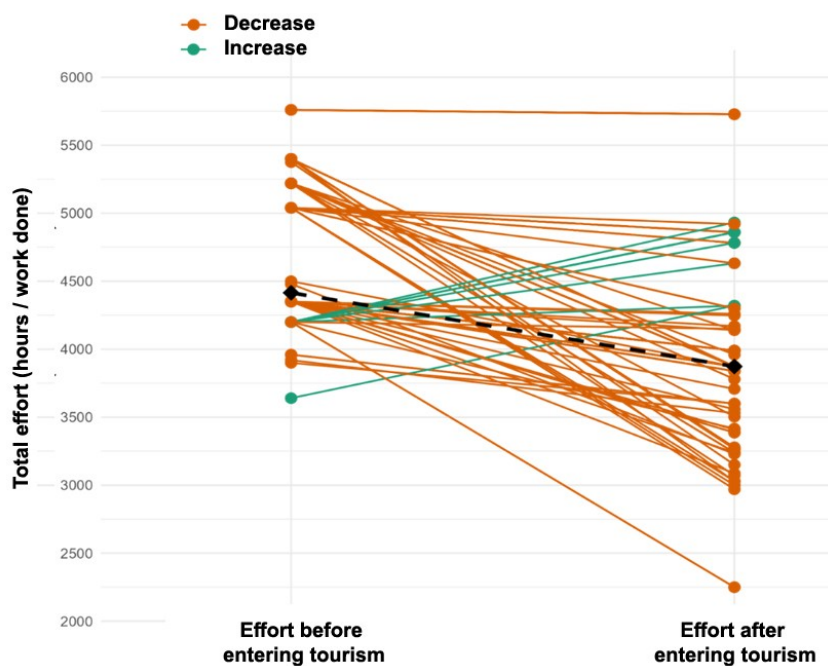
\*\*\*, highly significant; \*\* very significant; \* significant; ., marginal significance; ns, not significant

### 3.6 Determinants of livelihood transition values

An ordinal logistic regression model was estimated using the cumulative link model (CLM) to examine determi-

nants of livelihood transition value. The livelihood transition value measured on a four-point ordinal scale (Disagree, Neutral, Agree, and Strongly Agree) was taken as dependent variable and independent variables included tourism income, fishing income, marital status, family size, gender, age, tourism experience, fishing experience, effort before entering tourism, effort after entering tourism, and willingness to trade off fishing. Model convergence was achieved successfully. Prior to estimation, variance inflation factor (VIF) analysis was conducted to assess multicollinearity among predictors. The results indicated that while most predictors had acceptable VIF values ( $<5$ ), variables such as gender (21.54), age (9.35), fishing experience (14.64), and effort before entering tourism (15.79) exhibited very high multicollinearity. Also, fishing income (6.66) and tourism experience (5.24) variables exhibited borderline multicollinearity. Further, the pair-

wise correlation matrix among these variables showed that fishing income  $\sim$  effort after entering tourism (0.77), fishing experience  $\sim$  effort before entering tourism (0.79), and age  $\sim$  tourism experience (0.59) showed a very high correlation. Therefore, necessitating refinement of predictors by dropping age, gender, and fishing income. For model fitting, the marital status predictor was also dropped. The likelihood ratio (LR) test indicated a significantly better fit of the full model compared to the null (LR  $\chi^2 = 95.89$ ,  $df = 7$ ,  $p < 0.001$ ). Model fit statistics further supported adequacy, with a reduced AIC (148.10) and improved log-likelihood ( $-64.05$ ) compared to the null model. To further assess model calibration, a generalized Hosmer-Lemeshow goodness-of-fit test (Lipsitz test) was conducted. The test yielded a non-significant result ( $p = 0.17$ ), indicating an adequate fit between the predicted probabilities and the observed frequencies.



**FIGURE 5** Change in time effort before and after entering into tourism in southern India.

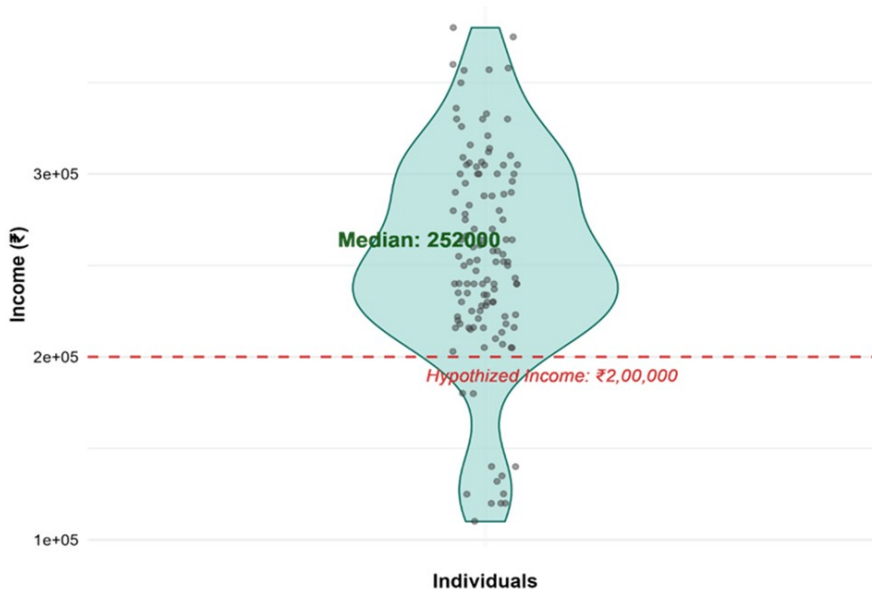
The model explained approximately 43% of the variance in the transition score (McFadden's  $R^2 = 0.43$ ), indicating good explanatory power. The proportional odds assumption was examined with parallel constraints, and no violation was observed for any covariates, validating the use of ordinal logistic regression.

The odds ratios (OR) with 95% confidence intervals revealed that effort after entering tourism (OR = 0.18, 95% CI: 0.06–0.45,  $p < 0.001$ ) and willingness to trade off fishing (OR = 86.98, 95% CI: 7.89–2761.66,  $p = 0.002$ ) were significant predictors of higher transition scores. Specifically, respondents with higher effort after entering tourism had lower odds of being in higher transition categories, while those willing to trade off fishing had markedly higher odds of being in higher transition categories. Other predictors were found to be not statistically signifi-

cant (Table 5). These findings highlight the central role of tourism in shaping livelihood transitions. Individuals with greater reliance on tourism demonstrate stronger acceptance of transition outcomes, reflecting economic incentives as a key driver of attitudinal change. Through previous findings, it is indicated that tourism dependence can foster positive attitudes toward transition outcomes, as people see tourism as a source of income and development (Croes *et al.* 2020; Praptiwi *et al.* 2021). In contrast, fishing dependence through longer experience and reduced effort tends to moderate or dampen positive perceptions, suggesting resistance rooted in traditional livelihoods. A study involving the coastal communities of Padstow (UK) and Paternoster (South Africa) noted that small-scale fishing, perceived as a way of life for fishers, is under threat in both areas, yet there is limited evidence

of concerted efforts to plan and manage the potential diversification processes into tourism (Kimbu *et al.* 2022), showing resistance due to generational dependencies on fishing. Socio-demographic factors such as marital status

and family size exerted limited influence, underscoring the dominance of economic and livelihood-related variables in shaping transition values.



**FIGURE 6** Income changes for the respondents after transitioning into tourism in southern India.

**TABLE 5** Ordinal logistic regression results for livelihood transition values.

| Predictor                        | Odds Ratio (OR) | 95% CI         | p-value   | Interpretation              |
|----------------------------------|-----------------|----------------|-----------|-----------------------------|
| Tourism income                   | 1.36            | 0.62 – 2.90    | 0.410     | Not significant             |
| Family size                      | 0.71            | 0.44 – 1.14    | 0.152     | Not significant             |
| Tourism experience               | 0.87            | 0.39 – 2.07    | 0.743     | Not significant             |
| Fishing experience               | 0.72            | 0.34 – 1.51    | 0.366     | Not significant             |
| Effort before entering tourism   | 0.47            | 0.10 – 1.56    | 0.263     | Not significant             |
| Effort after entering tourism    | 0.18            | 0.06 – 0.45    | <0.001 ** | Significant negative effect |
| Willingness to trade off fishing | 86.98           | 7.89 – 2761.66 | 0.003 **  | Significant positive effect |

OR >1 indicates an increased likelihood of higher transition values

### 3.7 Constraint analysis

Fisherfolk who have transitioned into tourism and tourism-related activities face several notable constraints, each quantified by Garrett scores that highlight their severity (Table 6). The most critical barrier is the pandemic (Garrett score:  $64.38 \pm 12.08$ ), which disrupted tourism flow and caused income instability, ranking highest among all constraints. In many countries, tourism workers, those in informal or part-time positions, faced high rates of unemployment and wage reductions due to the COVID-19 pandemic (Maiti 2022; Sun *et al.* 2022; Chebby *et al.* 2025). High initial investment (Garrett score:  $62.13 \pm 13.88$ ) was another major challenge, as substantial capital is required for business setup, limiting participation for many fisherfolk. Hossain *et al.* (2023) observed that due to a lack of collateral and credit history, individuals cannot meet traditional lenders' requirements. Competition (Garrett score:  $59.31 \pm 18.17$ ) from established

operators and internal rivalry further diminished the prospects of new entrants seeking to thrive in the tourism sector. Sharma and Singh (2025) observed that competition is primarily price-driven, leading to downward pressure on margins and service quality, which can further disadvantage new entrants lacking scale. Issues related to maintenance (Garrett score:  $53.59 \pm 15.86$ ) reflect ongoing difficulties in managing infrastructure and resources to meet tourist expectations. Rough weather (Garrett score:  $52.62 \pm 11.83$ ) and locale constraints (Garrett score:  $40.08 \pm 14.06$ ) created operational unpredictability and accessibility problems, hindering consistent tourist visits. Additionally, government policies (Garrett score:  $35.89 \pm 11.75$ ) can complicate regulatory compliance and add procedural hurdles that make the transition to tourism more difficult. Finally, persistent communication gaps (Garrett score:  $33.01 \pm 14.2$ ) impede effective coordination between stakeholders and restrict fisherfolk's inte-

gration into the wider tourism value chain. Overall, these rankings highlight significant, non-random differences in

severity across the identified barriers (Friedman  $\chi^2 = 346.35$ ,  $df = 7$ ,  $p < 0.001$ ).

**TABLE 6** Garret ranks for constraints of tourism in the study areas.

| Constraints         | Overall       |      | Kanyakumari   |      | Uttara Kannada |      |
|---------------------|---------------|------|---------------|------|----------------|------|
|                     | Score         | Rank | Score         | Rank | Score          | Rank |
| Communication       | 33.01 ± 14.20 | VIII | 31.97 ± 12.95 | VIII | 34.05 ± 15.39  | VII  |
| Maintenance         | 53.59 ± 15.86 | IV   | 48.72 ± 15.94 | V    | 58.47 ± 14.32  | III  |
| Competition         | 59.31 ± 18.17 | III  | 60.22 ± 21.97 | III  | 58.40 ± 13.48  | IV   |
| Locale constraints  | 40.08 ± 14.06 | VI   | 41.10 ± 15.53 | VI   | 39.05 ± 12.46  | VI   |
| Pandemic            | 64.38 ± 12.08 | I    | 64.20 ± 9.83  | I    | 64.58 ± 14.06  | I    |
| Government policies | 35.89 ± 11.75 | VII  | 39.57 ± 13.09 | VII  | 32.22 ± 8.93   | VIII |
| Initial investment  | 62.13 ± 13.88 | II   | 60.52 ± 12.99 | II   | 63.75 ± 14.66  | II   |
| Rough weather       | 52.62 ± 11.83 | V    | 54.75 ± 11.14 | IV   | 50.48 ± 12.20  | V    |

#### 4 | CONCLUSIONS

The transition from traditional fishing to coastal tourism represents far more than a simple shift in economic sectors for the coastal communities of Uttara Kannada and Kanyakumari. It is a profound reimagining of their way of life, driven by a pragmatic pursuit of stability and well-being. With 85.8% of respondents now identifying tourism as their primary source of income, the data underscores a clear reality that fisherfolk are actively seeking relief from the physically strenuous work, occupational hazards, and unpredictable yields of traditional marine capture. This occupational pivot is yielding tangible, positive impacts on the welfare of this community. By transitioning into tourism, these individuals, predominantly middle-aged and operating with limited formal education, are significantly reducing their gruelling labor hours while simultaneously elevating their financial standing, successfully achieving a median annual income of ₹252,000. Furthermore, the predictive models reveal that the strongest catalyst for this shift is fundamentally psychological, a willingness to step away from the generational, traditional identity of fishing in exchange for the economic incentives of the blue economy.

However, these communities are navigating a fragile new landscape where the promise of a better livelihood is consistently challenged by external shocks and structural barriers. The enduring scars of pandemic disruptions, the steep financial barriers of high initial investments, and fierce market competition threaten to marginalize local, small-scale operators. Coupled with infrastructural deficits and the unpredictable realities of coastal weather, these constraints highlight the vulnerability of fisherfolk attempting to establish themselves in this highly competitive industry.

Ultimately, while the coastal tourism sector offers a vital lifeline and a pathway to socio-economic resilience, these coastal communities cannot navigate this tide alone. To ensure this transition is both equitable and sustainable, it requires a deliberate, human-centric policy response. For instance, the significant constraint of high

initial investment can be mitigated through targeted micro-credit programs, while women in these areas can be encouraged to form localized cooperatives to foster mutual support. Empowering these inclusive communities with the right tools and support is no longer just an economic option; it is an imperative to secure a truly sustainable and localized future for India's coastal blue economy.

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#### ETHICAL APPROVAL

All applicable international, national and/or institutional guidelines for the care and use of animals were followed in this study.

#### CONFLICT OF INTEREST

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

#### AUTHORS' CONTRIBUTION

Ishani S Gowda – Conception, Acquisition of data, Data analysis & interpretation and Drafting the manuscript; V. Senthilkumar – Conception, Data interpretation, Critical revision and Final approval of the manuscript; Thavasiyandi Umamaheswari and Thangaraji Ravikumar – Conception, Critical revision and Final approval of the manuscript; Nikhil A N and Dawood Ibrahim S – Acquisition of data and Suggestions on manuscript.

#### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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