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*Perceptions and Reality of Overfishing: Evaluating Shifts in Fish Species Composition and Livelihood Impacts on Pemba Island, Zanzibar*

# Perceptions and Reality of Overfishing: Evaluating Shifts in Fish Species Composition and Livelihood Impacts on Pemba Island, Zanzibar

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**Abstract**
This study was conducted at Pemba Island, Zanzibar. It evaluated the perceived effects of overfishing on shifts in the species composition of fish. 368 people who engage in fishing-related activities participated in a cross-sectional survey and gave different perspectives on ecological change and their local experiences. The results showed that 55.2% of those surveyed said that the species of fish has reduced significantly in the last several years. A substantial contributing factor that was linked to a 25.2% rise in the probability of documented species changes was overfishing. Residence, marital status, gender, years of fishing experience, and frequency of fishing were additional significant factors. The likelihood of these changes being perceived was lower among infrequent fishermen, but higher among older male fishers, urban dwellers, and those with greater fishing experience. Pemba Island's marine resources to remain ecologically and economically sustainable, the study emphasises the urgent need for inclusive and sustainable fisheries management systems that incorporate local knowledge and address the social aspects of overfishing.

## Introduction
Concern over overfishing is growing worldwide, especially in island and coastal areas, where marine resources are the primary source of food and income (Yanti et al., 2024; Bariyah et al., 2025) . Significant ecological disruptions, such as diminishing fish stocks, changes in species composition, and wider effects on marine biodiversity, result from overfishing that exceeds the pace of natural replenishment. People who depend on fishing for both commercial and subsistence needs are directly threatened by overfishing, which changes marine food webs and has a detrimental impact on fisheries sustainability in many coastal communities (Mwanyoka et al., 2025 Makame et al., 2021).

Fishing is a major source of income for thousands of households in Zanzibar, especially on Pemba Island. Artisanal and small-scale fishing is the primary source of income and nutrition for many local people (Mwanyoka et al., 2025; Makame et al., 2021). However, because of expanding market demand, illicit fishing, and increased fishing pressure, there has been a growing concern in recent years over the sustainability of fish stocks in the region (Lödel, 2025 Rehren et al., 2022). The problem has been made worse by unregulated fishing practices, including dynamite fishing and the use of fine-mesh nets, which have changed marine ecosystems and caused a sharp drop in some fish species (Khamis Jape et al., 2024).

Changes in fish species brought on by overfishing may have significant ecological repercussions. The entire marine ecosystem may become unbalanced as a result of the selective eradication of some fish

species, which upsets the natural predator-prey dynamics (Rehren et al., 2022). Apex predator overexploitation, for example, can lead to an overabundance of smaller fish and invertebrates, which impacts primary producer supply and disturbs ecological stability (Pedersen, 2024). These changes could also lead to less commercially desirable fish becoming more prevalent, which would lower the overall productivity and profitability of the fishery. This puts Pemba Island's fisheries' economic sustainability in jeopardy, in addition to endangering biodiversity (Lödel, 2025).

The economic effects of overfishing are especially worrisome for the fishing populations of Pemba Island. Decreased catches for many fishermen are resulting in reduced earnings and more competition for limited resources (Pedersen, 2024). The loss of high-value species exacerbates financial difficulties for fishermen and related enterprises, impacting both export earnings and local markets. Additionally, fishermen may be compelled to move farther offshore as traditional fishing areas lose their productivity, which would raise operating expenses and safety hazards (Mwanyoka et al., 2025). Since a large percentage of the local diet consists of fish, the fall in fish populations also has an impact on food security (*Ibid*.).

Research on the effects of overfishing on the species composition of fish on Pemba Island is scarce, despite fisheries playing a vital role in Zanzibar's economy and food security. Although regional fisheries management challenges have been the subject of studies, little is known about how species composition is evolving and the main factors influencing these changes (Makame et al., 2021). Developing sustainable fisheries strategies that strike a balance between ecological conservation and the financial demands of local populations requires addressing this knowledge gap (Khamis Jape et al., 2024).

The purpose of this study was to assess the ecological impacts and perceptions of overfishing on Pemba Island, with an emphasis on its effects on various fish species and the socioeconomic status of the local fishing community. Specific objectives include; assessing the perceptions of local fishermen about overfishing and how it affects Pemba Island's fish species and availability; examining how the makeup of fish species has changed over time in connection to fishing pressure and methods; determining which major factors such as market demand, illicit fishing; and unregulated practices are causing overfishing and changes in marine biodiversity; and also to investigate the socioeconomic effects of overfishing on coastal communities' fishing habits, revenue, livelihoods, and food security.

Policymakers, conservationists, and local fishing communities can all benefit from the research's insightful analysis of the connection between fishing pressure and fish population trends. Implementing efficient fisheries management plans, encouraging sustainable fishing methods, and guaranteeing the long-term sustainability of Pemba Island's marine resources all depend on an understanding of these dynamics (Pedersen, 2024; Lödel, 2025).

## Methodology

### *Study design*

A mixed-methods explanatory sequential design was employed to examine how overfishing affects the species composition of fish and the resulting socioeconomic implications on Pemba Island, Zanzibar. There are two primary stages of the research. In the quantitative phase, records of fish species composition, fisheries catch data, and structured questionnaires administered to local fishermen were collected and analysed. This aimed to measure fish population shifts, identify patterns in fishing pressure, and assess the degree of ecological disturbance. In the qualitative phase, an in-depth understanding of the perspectives, experiences, and coping mechanisms of fishing communities was achieved. Three focus groups were used to collect qualitative data.

Through the integration of results from both quantitative and qualitative phases, a thorough understanding of the ecological and human aspects of overfishing was achieved, enabling the creation of sustainable and well-informed fisheries management plans that incorporate both local knowledge and scientific data.

***Study Population***

This study engaged individuals from Pemba Island, Zanzibar, whose major economic activity is fishing. Among the individuals involved were experienced fishermen, young adults starting their livelihoods, and women who played vital roles in fish trading. Pemba Island hosts about 12,000 fishermen (Zanzibar National Plan of Action, 2023). Most individuals were men, reflecting the traditional gender roles of small-scale fishing, whereby men dominated fishing activities, and women contributed to fishing, trading and processing. The participants came from four districts: Chakechake, Mkoani, Micheweni, and Wete.

***Study Area***

Pemba Island is found at the geographical location between the latitudes of $5^0$ S and $5^0$ 30' S and the longitudes of $39^0$ E and $40^0$ E. The island is famous for its hilly landscape, coral reefs and dense mangrove forests. The island is divided into two administrative regions: the Northern Region and the Southern Region. The Southern Region comprises two administrative districts, Mkoani and Chakechake, while the Northern Region has two administrative districts, Wete and Micheweni. Fishing and farming are the major economic activities on which the people of Pemba (National Bureau of Statistics, 2024)depend. Figure 1 shows the map of the study area.

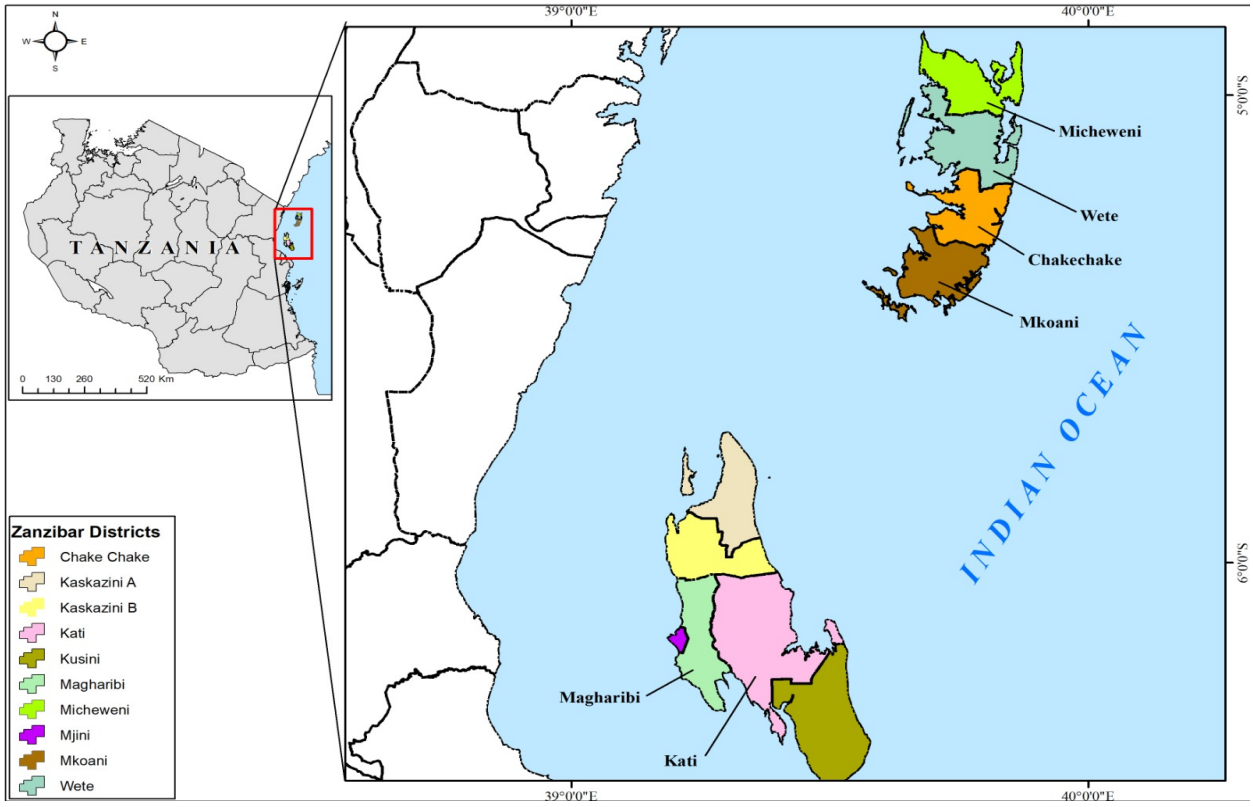


*Figure 1: Location of the Study Areas*

*Source: UDSM, Department of Geography (2025)*

***Sample size and Sampling***

The sample size was determined using the formula proposed by Israel (1992) for cross-sectional surveys. This formula is widely used in social and environmental research to calculate sample sizes for finite populations.

The Formula includes the following terms:

*Population Size (N):*

Pemba Island has an estimated 12,000 individuals engaged in fishing-related activities (Zanzibar National Plan of Action, 2023).

*Margin of Error (e):*

A 5% margin of error (e = 0.05) was selected, a standard threshold in social science research to maintain a balance between accuracy and feasibility (Bartlett et al., 2001).

*Confidence Level (Z):*

A 95% confidence level (Z = 1.96) was applied, ensuring that the results reflect the actual population parameters with high reliability.

*Estimated Proportion (p):*

Since prior studies on overfishing perceptions in Zanzibar were limited, a proportion (p) of 0.5 (maximum variability) was assumed to ensure a conservative sample estimate (Israel, 1992; Israel, 2012).

***Sample Size Calculation***

The formula for a finite population is:

$$n = \frac{N.\,p(1-p)}{(N-1).\left(\frac{e}{2}\right)^2 + p.\,(1-p)}$$

$$n = \frac{12{,}000\,.\,0.5\,.\,0.5}{(12{,}000-1).\left(\frac{0.05}{1.96}\right)^2 + 0.5\,.\,0.5}$$

$n \approx 368$

A sample of **368** ensures that key subgroups are represented.

***Data collection***

To investigate the ecological effects of overfishing and the corresponding socioeconomic repercussions for fishing communities on Pemba Island, this study combines quantitative and qualitative data. The quantitative component focused on fish species composition, as determined by species diversity, abundance, and frequency, using catch sampling and fishery records. Fishing efforts were measured by the number of fishermen, the frequency of fishing, and the types of gear used, while fish capture volume was measured in kilograms per trip or per day. Based on survey data and observational reports, the study also examined the prevalence of damaging fishing methods, including the use of fine-mesh nets and explosives. Fishing revenue (reported monthly earnings), the distance to fishing grounds (measured in km), and the level of food security (assessed by household fish intake frequency and dietary diversity scores) are additional quantitative variables.

The study's qualitative component examined how fishermen and community members perceive overfishing and how species composition changes over time. This includes the scarcity of once-common species and changes in species availability that are observed by the community. The study also examined the effects on livelihoods, including adjustments in income, increased competitiveness, and flexible coping mechanisms. It also recorded the opinions of the community regarding the governance of fisheries, including their views on current management tactics, issues with enforcement, and their level of involvement in decision-making. Structured household surveys and three focus group discussions were used to gather data. By combining these factors, a comprehensive analysis was conducted to assess the quantifiable and perceived impacts of overfishing.

The Information on socio-demographic characteristics (age, sex, education, marital status), household characteristics (wealth index measured in terms of house ownership and log income, place of residence, number of children) and fishing characteristics (primary fishing activity, fishing frequency, high-catches season, years of fishing and overfishing index) was collected.

***Data analysis***

The study employed a modified Poisson regression model with a robust error variance to assess the impact of overfishing and other contributing factors on changes in fish species composition. Because changes in fish composition within the study population were relatively common (>10%), this method was selected over the conventional logistic regression model. In such situations, logistic regression may overstate odds ratios and inflate standard errors, potentially leading to skewed estimates and wider confidence intervals. In contrast, the modified Poisson model yields risk ratios that are more precise and comprehensible in certain circumstances.

A mixed selection approach served as the basis for the variable selection in the final multivariable model. Known confounding effects, the importance of the variables in prior research, and pertinent outside information regarding ecological and socioeconomic factors affecting fish species composition were all taken into consideration. Only variables with significant connections were included in the study; those that did not were eliminated from consideration if they satisfied the statistical significance threshold of $p < 0.05$. This method facilitates strong and trustworthy deductions about the factors influencing shifts in fish composition when overfishing is present. The qualitative data were analysed using thematic analysis to identify common themes related to overfishing, changes in fish species composition and impacts on livelihoods.

***Ethical Considerations***

The study adhered to all ethical considerations to ensure that local and international research standards were met. Before conducting the field survey, the research permit was secured from the government office responsible for issuing it, followed by notification to the district and village leaders. This study respected local cultural norms and was conducted in the Swahili language to ensure accessibility.

**Results**

***Socio-demographic characteristics of the study participants***

The results from Table 1 indicate that, among all sample respondents (n = 368), 55.2% reported a change in fish composition over the past few years. Respondents residing in Chakechake districts are 52.7% (n=194), followed by Micheweni (34.2%, n=126), Mkoani (7.6%, n=28), and Wete (5.4%, n=20). Participants aged 24 years or below 24 were 30.4% (n=112) while those aged 25-34 and 35 years and above were 34.8% (n=128) each.

The majority of respondents were men who were fishermen, accounting for approximately 67.4% of all respondents. This follows the study's emphasis on small-scale and artisanal fishing since male fishermen's perspectives are especially pertinent for documenting direct observations of species decline and fishing pressure.

Regarding educational background, the majority of participants, 60.6% (n = 223), had completed either primary or secondary education, while 10.9% (n = 40) indicated no formal education. At this educational level, respondents appear to have a modest ability to comprehend and express changes in the environment and livelihood, which promotes the inclusion of local ecological knowledge in the qualitative study of perceptions. Geographically, 22.8% (n=84) of the respondents lived in cities, indicating that most participants came from rural or peri-urban coastal towns, where there is usually a greater reliance on marine resources. Additionally, 75.8% (n = 279) of those surveyed reported being fishers, which aligns with the study's primary target demographic. Insights on the patterns, difficulties, and coping strategies associated with overfishing and its ecological and economic ramifications are gained through their professional involvement.

Based on fishing activities, 37.8% (n=139) reported practising net fishing, while 24.5% (n=90) and 22.6% (n=83) reported practising trap and traditional fisheries, respectively. Likewise, 51.4% (n = 189) reported performing their respective fishing activities daily. Changes in fish stocks were reported by 49.5% (n=182) participants, while 46.7% (n=172) reported observing migration patterns of fish. Additionally, the reported index of overfishing was only 21.7% (n = 80).

The results, based on summary statistics of continuous variables, indicated that the years of fishing had a median of 5 years with an interquartile range (IQR) of 3 to 7 years. The median number of children in households was 2, with IQR (0,4), while the reported median income from fishery-related activities was 20,000 Tshs with IQR (10000, 50000). The standardised reported mean of log income was 8.87 with a standard deviation, sd of 1.01.

*Table 1: Characteristics of respondents*

| Variable | **Count** | **Percent** |
|---|---|---|
| Changes in fish composition | | |
| No | 165 | 44.8 |
| Yes | 203 | 55.2 |
| District | | |
| Chakechake | 194 | 52.7 |
| Mkoani | 28 | 7.6 |
| Micheweni | 126 | 34.2 |
| Wete | 20 | 5.4 |
| Gender | | |
| Female | 120 | 32.6 |
| Male | 248 | 67.4 |
| Age | | |
| 17-24 | 112 | 30.4 |
| 25-34 | 128 | 34.8 |
| 35-79 | 128 | 34.8 |
| | | |
| Education | | |
| Non-formal | 40 | 10.9 |
| Primary | 73 | 19.8 |
| Secondary | 150 | 40.8 |
| Higher education | 105 | 28.5 |
| Marital status | | |

| | | |
|---|---|---|
| Single | 134 | 36.4 |
| Married | 182 | 49.5 |
| Divorced | 52 | 14.1 |
| Type of residence | | |
| Permanent | 214 | 58.2 |
| Temporary | 154 | 41.8 |
| Place of residence | | |
| Rural | 284 | 77.2 |
| Urban | 84 | 22.8 |
| Housing ownership | | |
| Own | 196 | 53.3 |
| Rent | 172 | 46.7 |
| Role in Fishing | | |
| Fish farmer | 10 | 2.7 |
| Fish trader | 75 | 20.4 |
| Fisher | 279 | 75.8 |
| Local authority | 4 | 1.1 |
| Primary fishing activity | | |
| None/others | 56 | 15.2 |
| Net fishing | 139 | 37.8 |
| Trap fishing | 90 | 24.5 |
| Traditional fishing | 83 | 22.6 |
| Fishing frequency | | |
| Daily | 189 | 51.4 |
| Occasionally or several times | 179 | 48.6 |
| High catch season | | |
| Wet/cold season | 193 | 52.4 |
| Dry/Wind/transitional season | 175 | 47.6 |
| Changes in fish stocks | | |
| No | 186 | 50.5 |
| Yes | 182 | 49.5 |
| Observed migration pattern | | |
| No | 196 | 53.3 |
| Yes | 172 | 46.7 |
| Overfishing index | | |
| 0 | 288 | 78.3 |
| 1 | 80 | 21.7 |

**Impact of overfishing on fish species composition**

The results from the multivariable modified Poisson regression model with robust estimator indicate that sex, place of residence (urban vs rural), marital status, frequency of fishing, years of fishing, age as well as overfishing index (primary exposure variable of interest) were the significant determinants of fish species composition at a 95% confidence level. According to the findings, the incidence of reported changes in fish species composition increased by 25.2% as a result of overfishing (95% Confidence Interval: 1.019–1.539, p = 0.033).

In addition, sociodemographic variables significantly influenced how people perceived and experienced changes in species. Due to their increased active fishing and direct exposure to changes in marine resources, male respondents were 42.7% more likely than female respondents to indicate changes in fish species composition (95% Confidence Interval: 1.121–1.815, p=0.004). Similarly, compared to rural people, urban residents reported a 29.4% higher prevalence of species composition

changes (95% CI: 1.048–1.598, p = 0.016), which may indicate that urbanised coastal areas are more exposed to or have heightened awareness of market-driven fishing pressures.

Married respondents reported a 22.1% and 39.6% lower prevalence, respectively, of perceived changes in fish species composition than single respondents (married: 95% Confidence Interval: 0.612–0.992, p=0.043; divorced: 95% Confidence Interval: 0.400–0.912, p=0.016), suggesting that marital status also appears to affect perceptions. This may indicate that household heads with family obligations have different priorities for their livelihoods or varying degrees of involvement in fishing activities.

The frequency of fishing-related activities strongly impacted the results. The idea that more frequent exposure increases awareness of environmental changes was further supported by the finding that respondents who reported occasional fishing were 30.7% less likely to report changes in fish species composition than those who reported daily fishing (95% Confidence Interval: 0.560–0.856, p = 0.001). Additionally, compared to respondents aged 17–24, individuals aged 35 and older were 44% more likely to report changes (95% Confidence Interval: 1.058–1.959, p = 0.020), possibly as a result of their greater experiential knowledge of the marine environment. This was also supported by the group of fisheries, who were asked if there had been a change in fish species compared to ten years ago. They responded by saying that there is a change in the need to travel very far to catch some species compared to ten years ago.

Lastly, the study found that the likelihood of reporting changes in fish species composition increased by 2% for every additional year of fishing experience (95% Confidence Interval: 1.008–1.032, p = 0.001), confirming the importance of accumulated ecological knowledge in forming a local understanding of the dynamics of marine biodiversity. Together, these results demonstrate the complexity of the effects of overfishing and the importance of incorporating indigenous perspectives into Pemba Island's sustainable fisheries management.

*Table 2: Impact of overfishing and other confounders on fish species composition*

| Variables | cPR (95% confidence interval) | p-Value | aPR (95% Confidence Interval) | p-Value |
|---|---|---|---|---|
| | | | | |
| **Sex** | | | | |
| **Female** | 1 | | 1 | |
| **Male** | 1.521 (1.2,1.927) | 0.001** | 1.427 (1.121,1.815) | 0.004** |
| | | | | |
| **Education** | | | | |
| **Non-formal** | 1 | | 1 | |
| **Primary** | 0.791 (0.584,1.073) | 0.132 | 0.765 (0.553,1.059) | 0.106 |
| **Secondary** | 0.830 (0.641,1.074) | 0.156 | 0.863 (0.643,1.158) | 0.327 |
| **Higher education** | 0.748 (0.561,0.996) | 0.047** | 0.816 (0.590,1.129) | 0.220 |
| | | | | |
| **Place of residence** | | | | |
| **Rural** | 1 | | 1 | |
| **Urban** | 1.288 (1.067,1.555) | 0.009** | 1.294 (1.048,1.598) | 0.016** |
| | | | | |
| **Housing ownership** | | | | |
| **Own** | 1 | | 1 | |
| **Rent** | 0.89 (0.738,1.073) | 0.221 | 0.899 (0.745,1.084) | 0.264 |
| | | | | |
| **Marital status** | | | | |
| **Single** | 1 | | 1 | |
| **Married** | 0.896 (0.744,1.079) | 0.247 | 0.779 (0.612,0.992) | 0.043** |
| **Divorced** | 0.590 (0.402,0.865) | 0.007** | 0.604 (0.400,0.912) | 0.016** |

| | | | | |
|---|---|---|---|---|
| **Primary fishing activity** | | | | |
| **None/others** | 1 | | 1 | |
| **Net fishing** | 0.773 (0.603,0.991) | 0.043** | 0.865 (0.682,1.097) | 0.233 |
| **Trap fishing** | 0.891 (0.69,1.151) | 0.377 | 0.938 (0.740,1.189) | 0.596 |
| **Traditional fishing** | 0.766 (0.577,1.017) | 0.066 | 0.882 (0.671,1.159) | 0.368 |
| | | | | |
| **Fishing frequency** | | | | |
| **Daily** | 1 | | 1 | |
| **Occasionally or several times** | 0.687 (0.566,0.834) | <0.001** | 0.693 (0.560,0.856) | 0.001** |
| | | | | |
| **High catches season** | | | | |
| **Wet/cold season** | 1 | | 1 | |
| **Dry/wind/transitional season** | 1.050 (0.873,1.262) | 0.605 | 1.171 (0.964,1.421) | 0.111 |
| | | | | |
| **Years of fishing** | 1.021 (1.014,1.027) | <0.001** | 1.020 (1.008,1.032) | 0.001** |
| | | | | |
| **Number of children** | 1.019 (0.99,1.049) | 0.192 | 0.951 (0.899,1.006) | 0.081 |
| | | | | |
| **Age** | | | | |
| **17-24** | 1 | | 1 | |
| **25-34** | 1.161 (0.899,1.499) | 0.252 | 1.232 (0.967,1.571) | 0.091 |
| **35-79** | 1.38 (1.088,1.75) | 0.008* | 1.440 (1.058,1.959) | 0.020** |
| | | | | |
| **Log-income** | 1.099 (0.992,1.218) | 0.071 | 1.017 (0.919,1.126) | 0.745 |
| | | | | |
| **overfishing index (1 vs 0)** | 1.176 (0.962,1.439) | 0.114 | 1.252 (1.019,1.539) | 0.033** |

**cPR →** crude prevalence ratio

**aPR →** adjusted prevalence ratio

Additionally, the qualitative information from three focus group discussions indicated a decline in high-value species, such as tuna and groupers, alongside an increase in smaller, less desirable fish, including rabbitfish, pony fish, and lizardfish. Older fishers observed that particular species, such as emperor fish, are now rarely found near the shore, requiring longer trips to deeper waters. These reduced catches have resulted in unstable income, forcing some fishers to switch to farming or small-scale trading. Female fish traders highlighted rising costs due to scarcity, which have impacted profit margins.

## Discussion

According to the study's findings, the fish species composition of Pemba Island is significantly impacted by overfishing. The findings indicated a change in the variety of fish species, with 55.2% of respondents reporting observable changes in their fish captures in the past few years. These changes were shown to be related to several socio-demographic and fishing-related parameters. According to the study, one of the leading causes of changes in the variety of fish species was overfishing. Compared to respondents with a low overfishing index, individuals with a high overfishing index were 25.2% more likely to report changes in fish composition. This result is consistent with other research (Rehren et al., 2018, Lugendo et al., 2007) showing that overfishing causes changes in fish composition, upsetting the natural equilibrium and altering the species diversity of marine

environments. These detrimental effects are exacerbated by elements including illicit fishing gear, strong market demand, and ignorance about fish supply depletion (Rehren et al., 2018).

Compared to female respondents, male respondents were 42.7% more likely to report changes in fish composition. This may be explained by the fact that male fish are more frequently, which increases their awareness of fish population fluctuations. Similarly, compared to rural inhabitants, urban dwellers were 29.4% more likely to report changes in fish composition. The overexploitation of particular species may result from increased fishing pressure in metropolitan areas, where there is a higher demand for seafood. This aligns with the study by (Galappaththi et al., 2025) who revealed that overfishing in coastal communities in turn results in a reduction of food availability for the community. Addressing overfishing in coastal communities (Marín, 2019) highlighted context-specific solutions, including but not limited to policies and promoting capacity building; however, their implementation must align with the traditional knowledge and practices of local communities to ensure sustainability.

Additionally, it emphasised that capacity building could effectively regulate overfishing. The perception of changes in fish species composition was also influenced by marital status. This concurs with the study by (Limuwa & Synnevåg, 2018) who asserted that there are significant differences in how male and female respondents perceive changes in fish catch and species composition. Compared to respondents who were single, married and divorced, respondents were far less likely to report changes in fish composition. This might be the result of disparities in fishing participation; single people might engage in fishing more frequently, which would make them more aware of shifts in fish populations. According to the study, individuals who fished daily were significantly more likely than those who fished infrequently to report changes in the species composition of fish. This demonstrates how views of fish population dynamics are influenced by the frequency of fishing.

Furthermore, compared to younger fishermen, older fishermen (those 35 and older) were 44% more likely to report changes in fish composition. This research supports the evidence of shifting species composition by indicating that fishing experience enables people to observe long-term patterns in fish populations. This agrees with the findings by Poissant et al. (2024) in their study on Fisher's ecological knowledge, which points to the fishing-induced changes. Additionally, the likelihood of reporting changes in fish species composition increased by 2% for every extra year of fishing experience. The significance of traditional ecological knowledge in comprehending long-term changes in marine ecosystems is emphasised by this. The study's results indicate that Pemba Island urgently requires sustainable fisheries management techniques. The variety of fish species is changing due to overfishing, socioeconomic issues, and environmental influences. This could have long-term implications for marine biodiversity and the livelihoods of local fishing communities. Stricter fishing laws should be implemented, sustainable fishing methods should be encouraged, and fishermen and stakeholders should be made more aware of the decline in fish stocks. All things considered, this study provides valuable insights into how overfishing impacts the diversity of fish species in Zanzibar. To address the problem and ensure the long-term viability of Pemba Island's fishing sector, a multifaceted strategy that combines community-based conservation initiatives and regulatory actions is necessary.

**Conclusion**

Ecological health and economic viability must be balanced through sustainable fisheries management. The results of this study demonstrate the significant impact of overfishing on the species composition of fish on Pemba Island in Zanzibar. Unsustainable fishing methods are changing the marine ecosystem, as evidenced by the 55.2% of respondents who reported changes in the species makeup of fish. According to the study, overfishing is a significant factor in these changes, as individuals with a high overfishing score are 25.2% more likely to experience changes in fish composition. Furthermore,

perceptions of changes in fish species composition are strongly influenced by demographic and fishing-related characteristics, including gender, place of residence, marital status, frequency of fishing, and years of fishing experience. Urban dwellers and male respondents were more likely to observe changes. Most likely as a result of increased fishing activity and pressures from the market in cities. The study also showed that individuals with extensive fishing experience and those who fished daily were more aware of changes in fish populations, highlighting the value of local ecological knowledge in determining long-term trends in marine biodiversity.

To prevent overfishing and maintain the biodiversity of the marine ecosystem on Pemba Island, our findings recommend the need for sustainable fisheries management. Creating awareness of decreasing fish populations, encouraging sustainable fishing methods, and implementing stronger fishing laws should be implemented. The long-term survival of fish populations and the protection of the livelihoods of those who depend on fisheries depend on cooperation between local fishing communities, conservationists, and policymakers. Additional ecological and environmental factors affecting fish species composition and the efficiency of current fisheries management practices in reducing overfishing should be investigated in future studies. By taking an integrated approach to marine conservation, Pemba Island can secure its abundant marine resources for future generations while striking a balance between ecological sustainability and economic viability.

## References

Bariyah, D. K., Mulyanie, E., & Hamid, N. (2025). *The impact of overfishing of bigeye tuna (Thunnus obesus) populations on the balance of the Indonesian marine ecosystem: a literature study in the Banda Sea*. *9140*, 65–75. https://doi.org/10.26740/ijgsme.v2n3.p66-75

Bartlett, J. E., Kotrlik, J. W., & Higgins, C. C. (2001). Organizational Research : Determining Appropriate Sample Size in Survey Research. *Information Technology, Learning and Performance Journal*, *19*(1), 43–50.

Galappaththi, E. K., Jayasekara, S. M., Perera, C. D., Ilangarathna, G. A., & Garbutt, H. (2025). Solvable constraints and unsolvable limits to global climate adaptation in coastal Indigenous food security. *Cambridge Prisms: Coastal Futures*, *May*. https://doi.org/10.1017/cft.2025.3

Israel, G. D. (1992). *Determining Sample Size*. Fact Sheet PEOD-6, Florida Cooperative Extension Services, Institute of Food and Agricultural Sciences, University of Florida, Gainesville.

Israel, G. D. (2012). Determining Sample Size 1. University of Florida IFAS Extension. Available at. *Http://Edis.Ifas.Ufl.Edu.*, 1–5. https://www.psycholosphere.com/Determining sample size by Glen Israel.

Khamis Jape, K., Aslam Najar, M., & Author, C. (2024). Empowering Local Stewardship of Coastal Ecosystems in Zanzibar: Participatory Models for Habitat Rehabilitation and Resilience. *Int. j. Adv. Multidisc. Res. Stud*, *4*(2), 185–194.

Limuwa, M. M., & Synnevåg, G. (2018). A gendered perspective on the fish value chain, livelihood patterns and coping strategies under climate change - insights from Malawi's small-scale fisheries. *African Journal of Food, Agriculture, Nutrition and Development*, *18*(2), 13521–13540. https://doi.org/10.18697/ajfand.82.17580

Lödel, M. (2025). *Interactions between tourism and small-scale fisheries in Zanzibar: An integrated social-ecological analysis* [Master's thesis, Swedish University of Agricultural Sciences]. Department of Aquatic Resources, Uppsala, Sweden.

Lugendo, B. R.(2007). Utilisation by fishes of shallow-water habitats including mangroves and seagrass beds along the Tanzanian Coast. PhD Thesis, Faculty of Science, Radboud University Nijmegen, The Netherlands. https://doi.org/10.1007/s10750-006-0398-3

Makame, M., Salum, L., & Ali, L. (2021). Vulnerability of Fishing and Fisheries Sector to Climate Change and Non-climate Risks as Perceived by Fishermen in Zanzibar Coastal Villages. *Carnets*

*de Recherches de l'océan Indien*, *7*, 165–183.

Marín, A. (2019). *Adaptive Capacity to Coastal Disasters: Challenges and Lessons from Small-Scale Fishing Communities in Central-Southern Chile BT - Viability and Sustainability of Small-Scale Fisheries in Latin America and The Caribbean* (S. Salas, M. J. Barragán-Paladines, & R. Chuenpagdee (eds.); pp. 51–78). Springer International Publishing. https://doi.org/10.1007/978-3-319-76078-0_3

Mwanyoka, I., Said, M., Higini, K., & Kaswamila, A. (2025). Artisanal fishers and seaweed farmers' engagement in Blue Economy in Zanzibar. *Marine Policy*, *174*. https://doi.org/10.1016/j.marpol.2025.106587

National Bureau of Statistics. (2024). Kusini Pemba Region, Basic Demographic and Socio-Economic Profile. *URT*, 11(1). http://scioteca.caf.com/bitstream/handle/123456789/1091/RED2017-Eng8ene.pdf?sequence=12&isAllowed=y%0Ahttp://dx.doi.org/10.1016/j.regsciurbeco.2008.06.005%0Ahttps://www.researchgate.net/publication/305320484_SISTEM_PEMBETUNGAN_TERPUSAT_STRATEGI_MELESTARI

Pedersen, A. L. (2024). *Exploring Social-Ecological Resilience in Small-Scale Fisheries: Fish Abundance and Diversity, Local Management and Tourism Dynamics in Jambiani, Zanzibar*. Norwegian University of Life Sciences.

Poissant, D., Coomes, O. T., Robinson, B. E., & Vargas Dávila, G. (2024). Fishers' ecological knowledge points to fishing-induced changes in the Peruvian Amazon. *Ecological Applications*, *34*(5), 1–20. https://doi.org/10.1002/eap.2964

Rehren, J., Samoilys, M., Reuter, H., Jiddawi, N., & Wolff, M. (2022). Integrating Resource Perception, Ecological Surveys, and Fisheries Statistics: A Review of the Fisheries in Zanzibar. *Reviews in Fisheries Science and Aquaculture*, *30*(1), 1–18. https://doi.org/10.1080/23308249.2020.1802404

Rehren, J., Wolff, M., & Jiddawi, N. (2018). Holistic assessment of Chwaka Bay's multi-gear fishery – Using a trophic modelling approach. *Journal of Marine Systems*, *180*, 265–278. https://doi.org/https://doi.org/10.1016/j.jmarsys.2018.01.002

Yanti Setianti, Muh Aldhy Hatmar, Waode Santa monica, Umul Aiman, H. A. (2024). Overfishing and Marine Ecosystem Collapse : A Global Perspective. *Journal of Social Science*, *1*(5), 273–289. https://doi.org/10.59613/fswc2m24

Zanzibar National Plan of Action. (2023). *The Ministry of Blue Economy and Fisheries the Revolutionary Government of Zanzibar. Zanzibar National Plan of Action (ZNPoA) Towards implementation of FAO Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries* (Issue 06).