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## **Factors Contributing for Vulnerability on Livelihood of Fishers of Ratnagiri, Maharashtra State, India**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. Authors BMY, SMW and SSM designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author SVP managed the analyses of the study. Authors MMS and KJC managed the literature searches. All authors read and approved the final manuscript.*

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### **ABSTRACT**

**Aims:** The present study was carried out to investigate the impact of vulnerability on livelihood of fishers of Ratnagiri, Maharashtra state of India.

**Study Design:** For this study interview schedule was used to collect the fisher information.

**Place and Duration of Study:** In present study, the data were collected from the fishers of the three fishing villages of Ratnagiri district of Maharashtra during the year 2019-2020.

**Methodology:** The data were randomly collected from 64 fisher by using questionnaire in the Google form and interview schedule. The vulnerability variables considered in this study are categorised as natural shocks like cyclones, heavy rain, environmental changes; personal factors like illness, sea accidents, sudden death, social conflicts and seasonality includes decline in fish catches, unpredictable price fall and non-availability of markets. The opinions of respondents with respect to vulnerability factors were recorded on the basis of three categories i.e. high impact, medium impact and low impact. The descriptive statistics i.e. percentage and frequency analysis was used to represent the results.

**Results:** The overall results of vulnerability indicated that the natural shocks factors like cyclones,

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heavy rain, environmental changes and personal factors like illness, sea accidents, sudden death, social conflicts have high impact on more than 90% respondents; while seasonality factors like decline in fish catches, unpredictable price fall and non-availability of markets have high impact on livelihood of about 70% fishers respondents.

**Conclusion:** The respondents reported that the various factors of vulnerability have direct impact on livelihood of fishers and ultimately socioeconomic conditions of the fishers.

**Keywords:** Vulnerability; fishers; livelihood; fishing.

## 1. INTRODUCTION

In India, 65% of the population is dependent on agriculture for their livelihood and employment source, amongst them one of the occupations is fisheries which is contributing for supply of protein rich food to the large population of the country [1]. The role of fisheries sector is of great importance, in ensuring adequate protein intake and as a source of economic and social growth for the rural coastal communities [2]. The fisheries sector plays an important role in the boosting the Indian economy by contributing to the national income, employment generation, and foreign exchange earnings [3]. Fishing is a high-risk livelihood activity “due to the fugitive nature of the resource, the hostile environment of the seas, and perishability of the product” [4,5].

It should be noteworthy that fishing is one of the most vulnerable sectors to be affected by the unpredictable climate change [6]. Many of the people dependent on small-scale fisheries live in developing countries and face climatic shocks and stresses such as cyclones, floods, droughts, sea-level rise, land erosion, and temperature and rainfall [7,8]. These impacts increase the vulnerability of fishery-based livelihood [9]. The emergence of the term ‘vulnerability’ which refers to the relationship between poverty, risk, and efforts to manage risk [10]. Vulnerability has emerged as a central concept for understanding the impacts of climate change and natural hazards, in order to develop adequate risk management strategies [11]. The asset base human, physical, natural, financial, and social capital forms the building block of livelihoods and helps reduce vulnerability [12]. One direct impact of climatic shocks, such as cyclones and floods, is loss of life. Climatic shocks have killed several hundred thousand people in coastal Bangladesh; many of them are fishermen or their household members, friends, or relatives [7]. Other impacts include physical injuries [13] and health effects [14]. Cyclones and floods also damage boats, nets, fishing gear, and fish landing centres, as well as educational, health, housing, and other

community infrastructure [15]. The fishing is a high-risk livelihood activity due to limited resources, the unpredictable environment of the seas, and perishability of the fishes which have directly affects the livelihood of the fishers. In this context, the present study was undertaken in three fishing villages of Ratnagiri district of Maharashtra to assess the impact of vulnerability on livelihood of fishers.

## 2. MATERIALS AND METHODS

### 2.1 Study Area

The data for the present study was collected from the three fishing villages of Ratnagiri block namely Kasarveli, Kalbadevi and Varvade. These villages have the status of minor fish landing centres of Ratnagiri district of Maharashtra state.

### 2.2 Sampling Procedure

The major population in the study area represents the fisher communities i.e. *Kharvi*, and *Bhandari* involved in fisheries and allied activities as income sources for their livelihood. The respondents were selected randomly among the fisher communities. The information was collected from the 64 fishers comprising fishing crew members, fish sellers and fishing vessel owner. The data with respect to demographic characteristics, fisheries resources and livelihood capitals were collected by using questionnaire administered through Google form and the data related to impact of vulnerability on livelihood was collected face to face with the help of interview schedule. The vulnerability variables considered in this study were categorised as *natural shocks* like cyclones, heavy rain, environmental changes; *personal factors* like illness, sea accidents, sudden death, social conflicts and *seasonality* includes decline in fish catches, unpredictable price fall and non-availability of markets. The opinions of respondents with respect to vulnerability were recorded on the basis of three categories i.e. high impact, medium impact and low impact.

## 2.3 Statistical Analysis

The descriptive statistics i.e. percentage and frequency analysis was used to represent the results of the study following [16]. Method name will be added.

## 3. RESULTS AND DISCUSSION

### 3.1 Demographic Characteristics of Respondents

The demographic characteristics of respondents were studied with respect to age, gender, educational level, religion, occupation, etc. Among the total respondents of the present study, 82.8% male and 17.2% were female and the age was found in the range of 28 to 75 years. Half of the respondents were studied up to secondary level followed by 31.3% up to primary level, 6.3% up to graduate and 3.1 do the ITI while 4.7% respondents were illiterate. All the respondents were from Hindu religion and had different occupational status. Half of the respondents were fishing vessel owners, while 35.9% were fishing vessel crew members, 12.5% were fresh-dry fish seller/fish dryers and 1.6% was in fisheries entrepreneurs. In this study, the monthly income from fisheries occupation of fisher family was up to Rs. 20,000/- only.

### 3.2 Vulnerability on Livelihood of Fishers

#### 3.2.1 Natural shocks

##### 3.2.1.1 Cyclones

A total of 95.3% respondents have reported the high impact, 3.1% have reported medium impact and 1.6% respondents have reported the low impact of cyclone on their livelihood. The regular cyclones occur on the west coast of Maharashtra put the fishing operations on halt for number of days. Eventually, other activities related to fisheries also get affected during the cyclone period. This phenomenon has usually serious impact on the livelihood of fishers and allied activities. On the other hand, if fishers try to continue fishing during cyclonic situation, then there may be possibility of damage to fishing assets or even life of fishers operating the fishing vessel. Similar results were reported by [17,18] stating that major sector of fisheries face high impact of cyclone causing body injuries or loss of life as a result of the boat submergence and loosing of fishing equipment's.

##### 3.2.1.2 Heavy rain

The heavy rain also affects fishing operations due to rough weather conditions causing very high tides which create barriers in smooth fishing operations. In this study, about 95.1% respondents reported high impact of the heavy rain on their livelihood while 3.3% have medium impact and 1.6% respondents have the low impact of heavy rain on their livelihood. The [17] reported that the fishing operations usually affects due to high rainfall resulting into loss of life due to submergence of vessels, loss of fishing gears in rough sea and also body injuries due to vessel swept because of high tides.

##### 3.2.1.3 Environmental changes

The impact of the environmental changes on the livelihood was reported high (95.3%) during this study. The environmental changes are unpredictable phenomenon provoke adverse weather conditions which leads to break in fishing operations, decline in fish catches, losing the fishing accessories or sometimes leading to loss of life of fishers. The [19] reported that effects on seawater temperature as well as its influence on storm conditions climate change can affect the performance of fishing vessels or gears, as well as vessel safety and stability at sea. The [19] reported that wind speed had significant effects on catch rates, and specifically catches were reduced during the strongest winds.

#### 3.2.2 Personal factors

##### 3.2.2.1 Illness

The results of the present study indicated that 91.9% of respondents faced high impact of illness on their livelihood and very few respondents reported medium (4.8%) and low (3.2%) impact of illness. The illness of the person involved in fishing operations or occupation cause saviour impact on livelihood as the persons detached themselves from their regular activities. As the activities needs to be performed on day to day basis, single day absence is also has impact on livelihoods. However, the few individuals which may have substituting person to carry out these activities may have medium or low impacts of such illness. The [20] reported that 52% of the household heads left their normal activities due to an illness.

### **3.2.2.2 Accident of fishing vessel**

The accident of fishing vessel cause major impact on livelihood of fisher respondents as it leads to direct damage to fishing vessel or loss of fishing vessel. It has direct impact on the persons involved in fishing operations, while it has indirect impact on the fishing related activities. The majority (96.2%) of respondents of the present study showed concern to this and reported high impact of accident of fishing vessel on livelihood. However, 1.9% of respondents reported medium impact and the low impact of accident of fishing vessel on their livelihood. These few respondents with medium and low impact may be the respondents involved in allied activities of fisheries.

### **3.2.2.3 Death**

All the respondents of the present study showed agreement with high impact of death on the livelihood of fishers. The results revealed in this study highlights that the death of working individual of family leads to direct impact on family livelihood. According to [21,20] death of the member is the most important health shock and the impact is high if he/she would be the main breadwinner for the family.

### **3.2.2.4 Social conflicts**

The results of the present study revealed no impact of the social conflicts on the livelihood of respondents. The results highlights that the conflicts among respondents was not for cut-throat competition and not devastating the livelihood of counterpart. The similar results with respect to social conflicts were reported by [22] and stated that no conflict/competition between the fishermen in respect of their employment or any other socio-cultural aspects.

## **3.2.3 Seasonality**

### **3.2.3.1 Fish catch**

The ups-downs in fish catches were usually found with changes in seasonality. In the present study, a total of 78.8% of respondents reported high impact of seasonality on the fish catches, whereas 18.2% and 3% respondents expressed medium and low impact, respectively. In the present conditions, the fish catches declining day by day due to number of reasons such as overexploitation, uncontrolled illegal fishing operations, destructive fishing operations,

change in climate, pollution, etc. The respondents which expressed high impact of seasonality with respect to fish catch may be attributed to decrease in fish catches and probably they may be small scale fishers, whereas, the medium and low impact of fish catches may be among the owners of mechanized fishing vessels. The similar results were reported by number of researchers. The [23] observed the indicators of seasonal variations were collected and categorised. These indicators are declining variety, changing temperature, non-availability of fish during post monsoon, declining catch during monsoon and declining catch during dry season. The [24] reported that seasonality index of fish catch in natural Egyptian fisheries come from variability of seasonality of marine, lakes and freshwater fisheries, which increasing in months (January, March, April, July, September, October, November), and decrease in other months. According to [25] reported that flooding occurs during the peak of the rainy season between the months of July and October. This results in decline of fish catches which tend to be higher during the dry season when the volume of water is low. The [26] confined that seasonal fluctuation negatively affect the quantity of fishes caught by the fishermen.

### **3.2.3.2 Price of fish**

The decrease in fish landing increases the demand for fish and ultimately increases in fish price. Conversely, high fish landing decreases the price of fishes due to excessive interventions by middlemen in fisheries sector. In this study, it was reported that 70% respondents have the high impact of price of fish, while 22.5% have medium impact of price of fish and 7.5% families have the low impact of price of fish. The [24] studied seasonal index of fish prices in natural Egyptian Fisheries with respect to variability of seasonality of marine, lakes and freshwater fisheries, which decrease in 4 months (June to September). The [27] reported that in some of the months of the year the price declined due to the more supply of fish.

### **3.2.3.3 Market**

The availability of market is one of the important aspects in fisheries. The nearness and availability of potential consumers in market significantly contributes for the fisheries sector. In the present study, a total of 65% respondents reported high impact of market on their

livelihood, while 25% and 10% respondents reported medium and low impact. As the fish is perishable commodity, the timely selling of fishes is pre-requisite. The respondents which have claimed high impact of market might be lacking the appropriate fish market in their localities.

#### 4. CONCLUSION

The present study conclude that, the natural shocks, personal factors and seasonality have highest impact on the livelihoods of fisher community residing in the fishing villages of Ratnagiri district of Maharashtra state. The environmental changes, cyclones, heavy rain, death of fisher, seasonality changes in fish catches, fish prices and unstable market had direct impact on the livelihood of fishers which reflects in the socio-economic conditions of the fishers under study area.

#### CONSENT

As per international standard informed and written participant consent has been collected and preserved by the authors.

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#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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