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RESPONDENT ANALYSIS OF THREATS TO BRACKISH WATER FISHERIES IN ODISHA

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Abstract

The present study is a first order analysis on the threats exerted on the fishery sector in the state of Odisha through the survey mode of public opinion. The major threats considered in the present research program are erosion, natural disasters, over exploitation of natural resources, pollution, siltation and sea level rise. The magnitude of each of these threats was evaluated by five categories of stakeholders (Policy makers, Researchers, Agriculturist, Fisherman and Local inhabitants). It is observed that the highest value of threat is assigned to natural disaster (848.4) followed by pollution (648.1), over exploitation of natural resources (536.8), siltation (209.6), erosion (67.2) and sea level rise (19.2).

***Ke words**: Fishery, Threats, stakeholder, combined threat scale (CTS), Odisha coast*

I. INTRODUCTION

The present population of India is around 135,93,59,334 [1]. Food security is major issue to support this huge population mass of the country. Marine and brackish water fisheries are one of the most important sectors that can solve this problem with bold foot steps. With a total fisherman population of 14.5 million and rich marine and inland resources, fisheries and aquaculture constitute the backbone of employment, livelihood and food security. However this domain is presently under threats due to habitat destruction, pollution, overexploitation of natural resources, climate change related impacts like increase of temperature, extreme weather events, acidification, salinity alteration etc. Considering these threats as the background matrix, a questionnaire was developed and served to five major stakeholders in the maritime state of Odisha (Policy makers, Researchers, Agriculturist, Fisherman and Local inhabitants) in a group discussion and also through individual approach. The answers provided by these stakeholders were translated into Composite Threat Scale (CTS) through threat ranking. This paper thus reflects the awareness amongst the people of all ranks of the society in the state of Odisha in context to the impact of various threats on the fisheries sector of the state.

II. MATERIALS AND METHODS

The entire network of the present study consist of three stages **i)** identification of respondents (policy maker, researcher, fisherman, agriculturist and local inhabitants) **ii)** identification of major threats (6 in number) and **iii)** evaluation of the respondent's response to construct the threats scale through ranking and voting. Although threats can be of various types, our list captures the major threats operating on the coastal zone of Odisha. Threats were ranked in terms of their importance by building a Threat Assessment Matrix (TAM). However, as there is high probability of variation of this ranking with the category of respondents, therefore the views of the respondents were also considered (by inclusion of the % of voting along with their respective ranking factor) and finally Combined Threat Scale (CTS) was constructed on the basis of Threat Scale (TS) computed as per the expression:

$$CTS = TS1 + TS2 + TS3 + TS4 + TS5$$

Where, TS = Threat Rank (TR) × % of Vote

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III. RESULTS

The opinion given by various stakeholders (in terms of % vote) as well as the rank assigned for each and every threat is presented in Table 1 along with the threat scale for each type of threat (Fig. 1-5). Finally, the Combined Threat Scale for each type of threat is highlighted in Fig.6.

Table 1. Threat type with scaling in Odisha coastal zone

Respondent Type 1	**Policy Maker**		
	TR	**% of Vote**	**TS1**
Erosion	**1**	**10.8**	**10.8**
Natural Disaster	**6**	**26.1**	**156.6**
Over-exploitation of Natural Resources	**5**	**21.1**	**105.5**
Pollution	**5**	**22.9**	**114.5**
Siltation	**2**	**17.7**	**35.4**
Sea Level Rise	**2**	**1.4**	**2.8**
Respondent Type 2	**Researcher**		
	TR	**% of Vote**	**TS2**
Erosion	**2**	**6.7**	**13.4**
Natural Disaster	**6**	**29.6**	**177.6**
Over-exploitation of Natural Resources	**6**	**19.8**	**118.8**
Pollution	**6**	**22.1**	**132.6**
Siltation	**5**	**12.0**	**60.0**
Sea Level Rise	**1**	**9.8**	**9.8**
Respondent Type 3	**Fisherman**		
	TR	**% of Vote**	**TS3**
Erosion	**2**	**8.3**	**16.6**
Natural Disaster	**6**	**29.9**	**179.4**
Over-exploitation of Natural Resources	**5**	**18.5**	**92.5**
Pollution	**5**	**26.9**	**134.5**
Siltation	**4**	**15.7**	**62.8**
Sea Level Rise	**2**	**0.7**	**1.4**
Respondent Type 4	**Agriculturist**		
	TR	**% of Vote**	**TS4**
Erosion	**1**	**13.8**	**13.8**
Natural Disaster	**6**	**27.6**	**165.6**
Over-exploitation of Natural Resources	**5**	**20.3**	**101.5**
Pollution	**5**	**26.8**	**134.0**
Siltation	**3**	**8.2**	**24.6**
Sea Level Rise	**1**	**3.3**	**3.3**
Respondent Type 5	**Local inhabitant**		
	TR	**% of Vote**	**TS5**
Erosion	**2**	**6.3**	**12.6**

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Natural Disaster	**6**	**28.2**	**169.2**
Over-exploitation of Natural Resources	**5**	**23.7**	**118.5**
Pollution	**5**	**26.5**	**132.5**
Siltation	**2**	**13.4**	**26.8**
Sea Level Rise	**1**	**1.9**	**1.9**

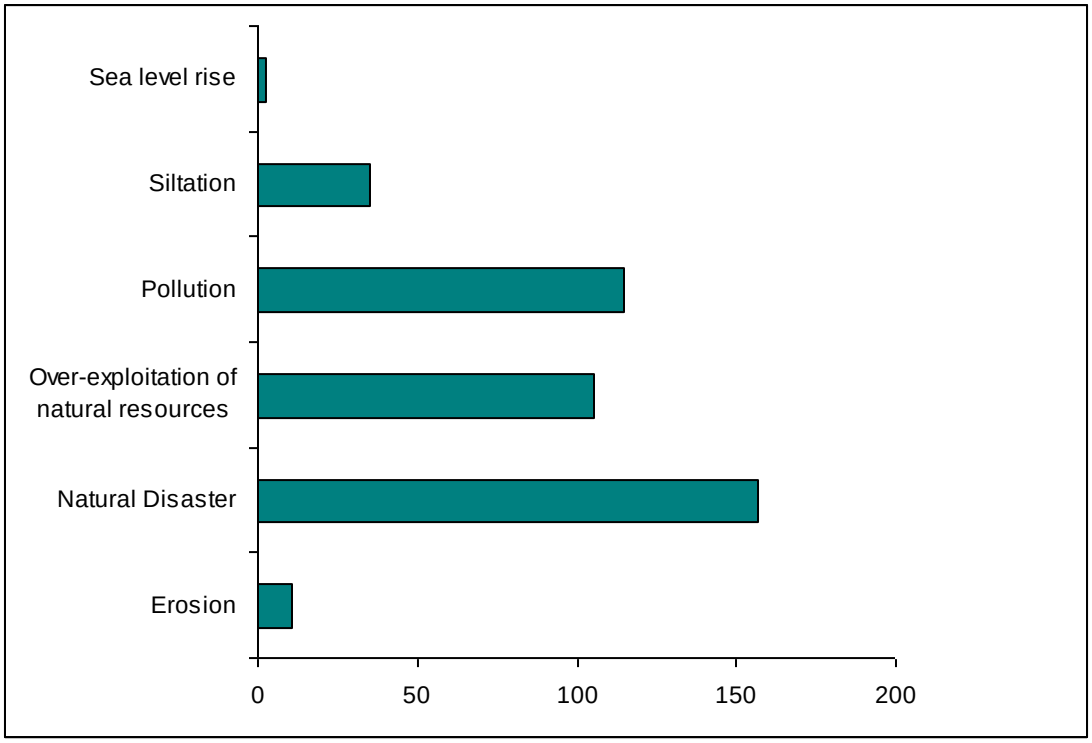

Fig.1. Variation of threat scale of Respondent Type 1 (Policy makers)

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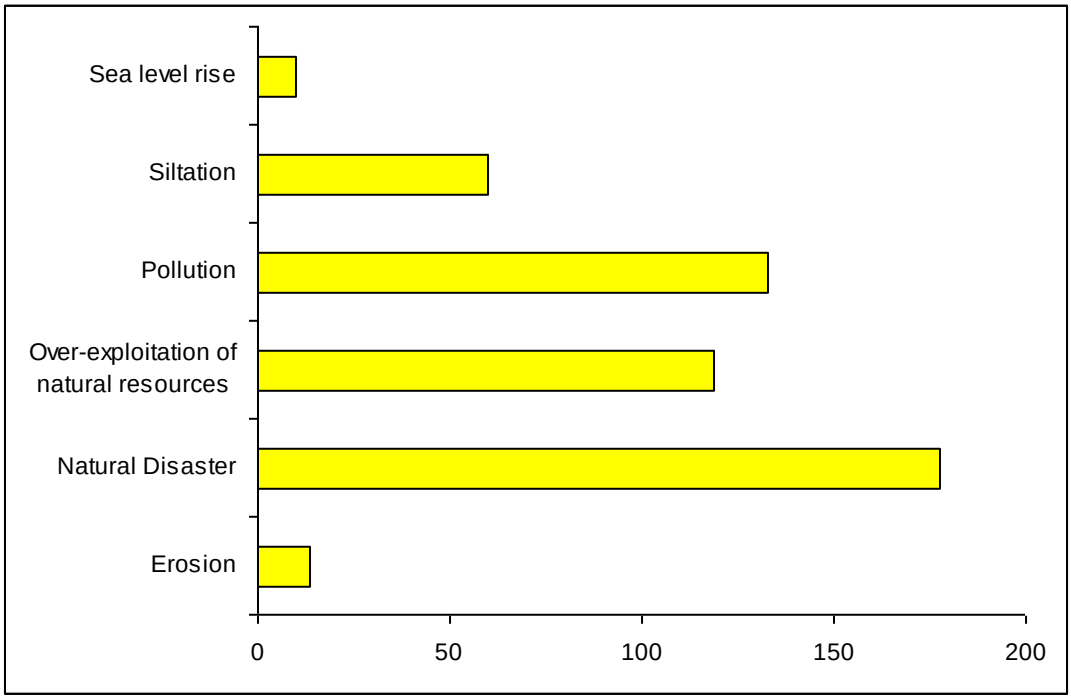

Fig.2. Variation of threat scale of Respondent Type 2 (Researcher)

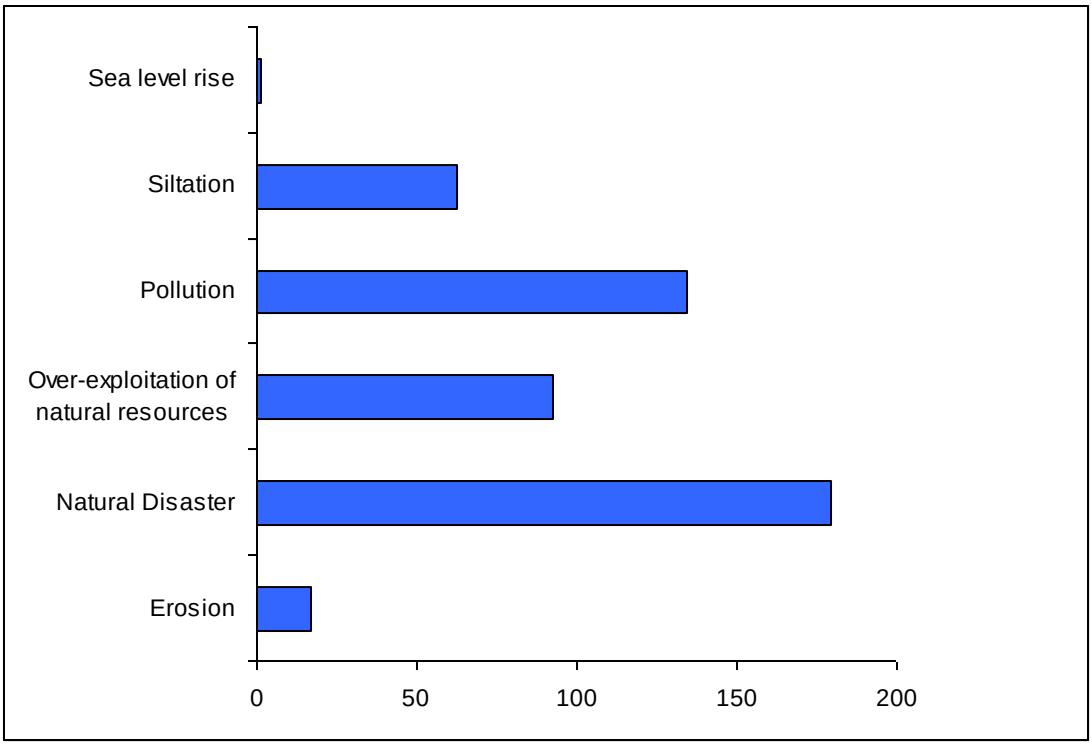

Fig. 3. Variation of threat scale of Respondent Type 3 (Fisherman)

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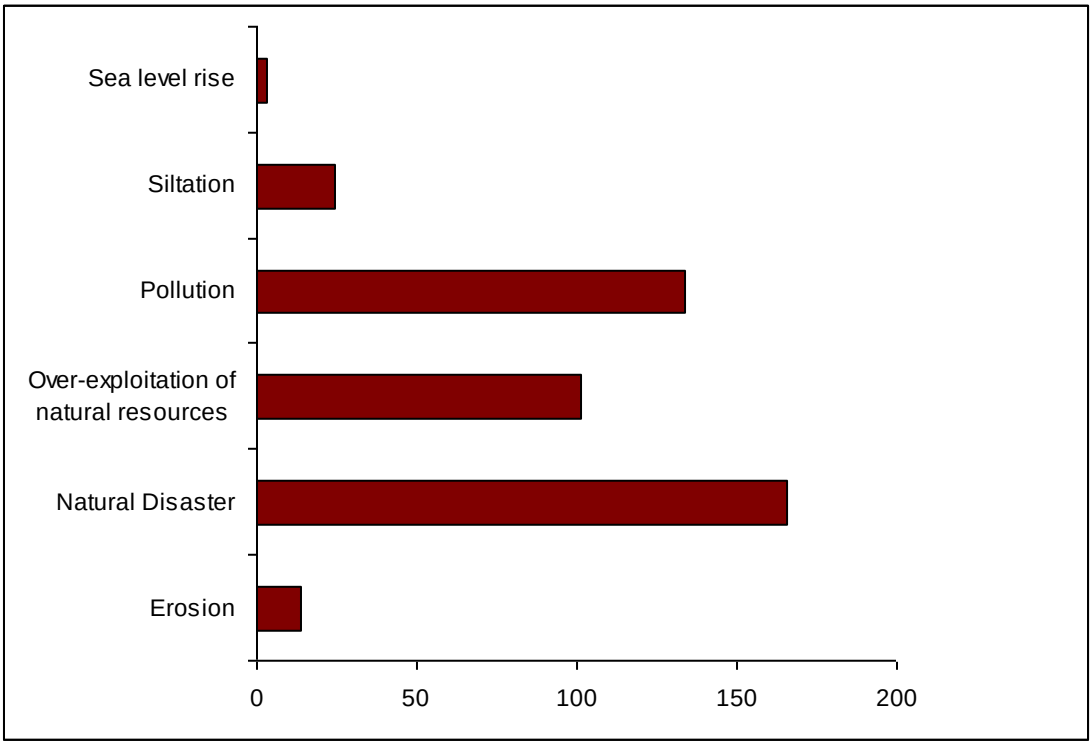

Fig. 4. Variation of threat scale of Respondent Type 4 (Agriculturist)

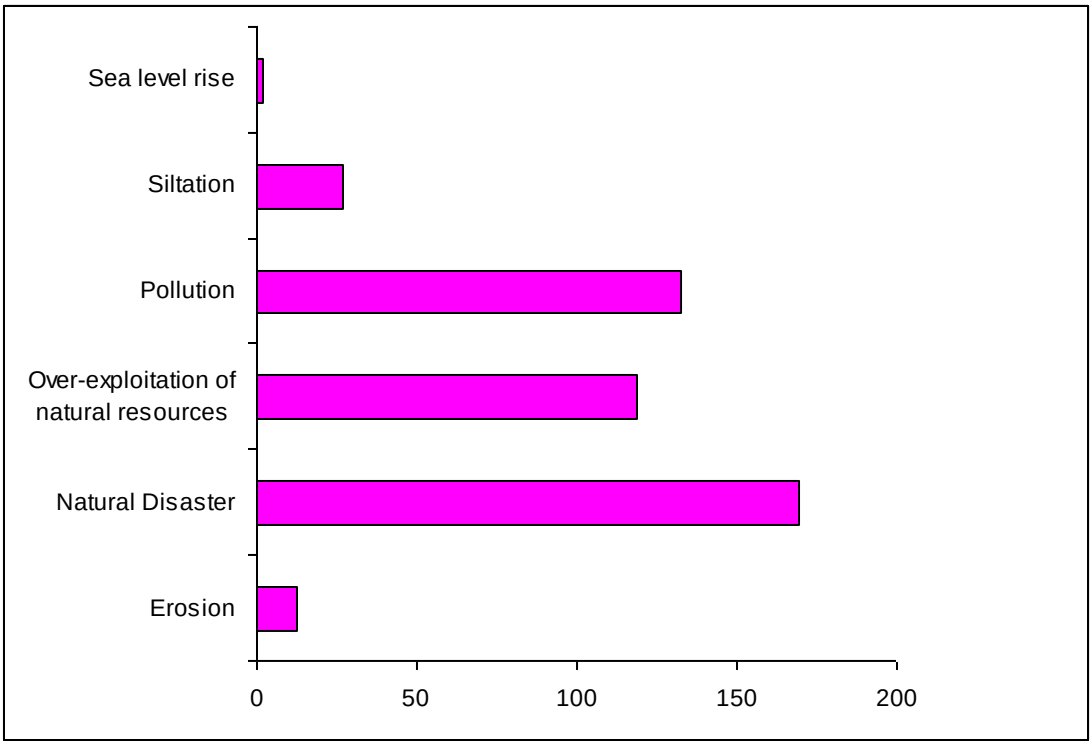

Fig.5. Variation of threat scale of Respondent Type 5 (Local inhabitant)

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IV. DISCUSSION

We observed the highest CTS value is assigned to the natural disaster (848.4) followed by pollution (648.1), over exploitation of natural resources (536.8), siltation (209.6), erosion (67.2) and sea level rise (19.2). (Table 1 and Fig.6).

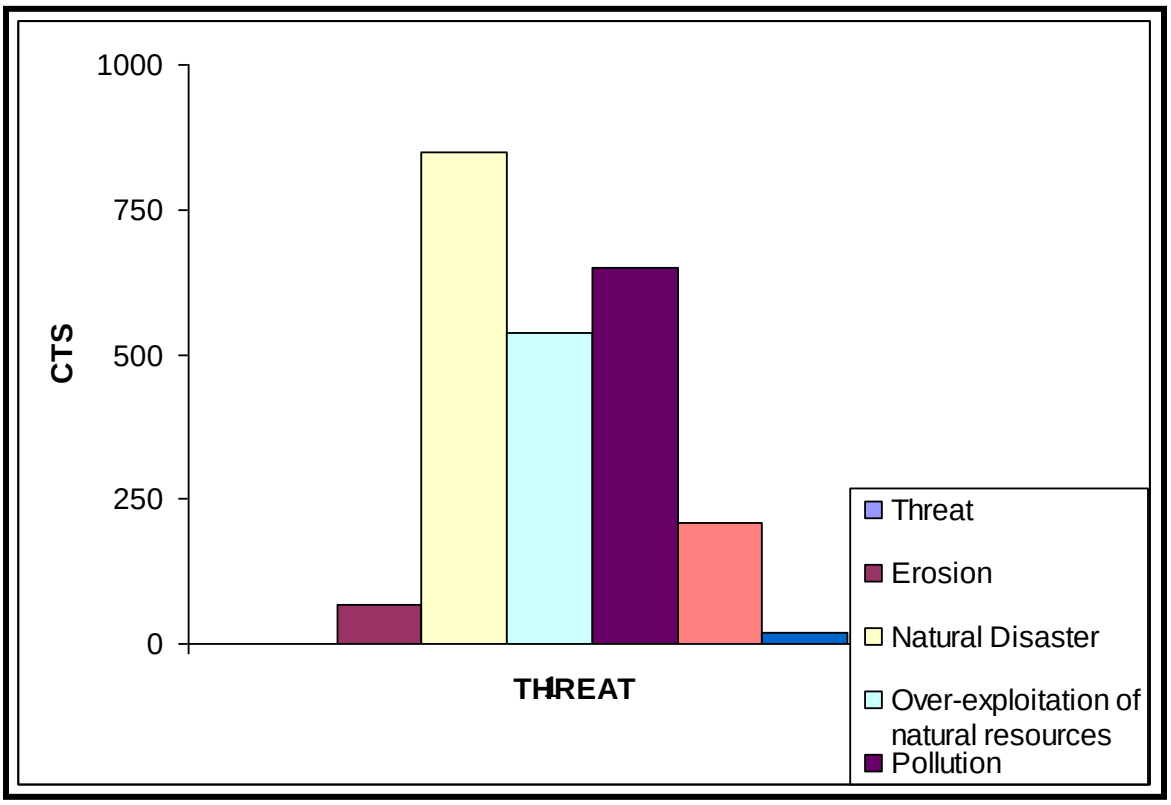

Fig. 6. Bar chart showing the CTS values versus various threats

The state of Odisha is cyclone prone which generates high tidal surges and wave action.The present region (Chandipur, Chilika and Gopalpur) also experiences the adverse impacts of waves and tidal surges to a great scale. This may be the reason behind highest CTS for natural disaster.

Pollution is a major problem in the coastal zone of Odisha because of the presence of several unplanned tourism units which release lot of nutrients rich in nitrogen and phosphorus that causes eutrophication and results in the depletion of oxygen which may be lethal to the fish population of coastal zone. The solar radiation is obstructed to a great extent by eutrophication. These results in the inhibition of growth and survival of phytoplankton which constitute the main diet of the fishes [2],[3],[4],[5],[6].

In the state of Odisha, over exploitation of natural resources particularly fisheries and mangroves are very common. Mangroves, being the nursery and breeding ground of large number of fish species result in the decrease of fish gene pool of the state due to cutting and destroying the mangrove ecosystem [7],[8],[9],[10].

Siltation has also been given considerable weight age by the respondents. In this context siltation in the Chilika lagoon is a supportive case study. It has been reported [11],[12] that, the amount of silt brought into the lake by the distributaries of the Mahanadi river system is about1.5 million tons year^{-1} , while that from the western catchment stands at 0.3 million tons year^{-1}.

Erosion is also a threat to coastal fisheries of Odisha whose root cause is change in land use pattern. Land use pattern promoting erosion in the upstream areas has increased the sediment load considerably.

The sea level rise is a common phenomenon in the present scenario of climate change but in the present study lowest weight age was given to this threat by all the different classes of respondents. This may be due to lack of awareness amongst the people on the sea level rise except the policy maker (respondent type I) and fisherman community (type III). The main reason for this is that the data on sea level rise actually is fed to policy makers of environmental department, pollution control department, forest department and fishing department which does not percolate to agriculturist and local inhabitants.

The fisherman community however rated this point with a greater score compared to researcher, agriculturist and local inhabitants as they spend most of their time in the sea and can evaluate the fluctuations of sea level (ground reality) through their inherent experience.

The entire study reveals that measures against natural disasters and pollution of the coastal zone should be considered with high priority for conserving the fish gene pool of the state.

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