

## **Socio-economic Impact of Sea cucumber Conservation in Palk Bay and Gulf of Mannar Region of Tamil Nadu**

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### **ABSTRACT**

Sea cucumber is one of the important marine resources and its fishery is a source of income to coastal communities. It contributes to poverty alleviation for more than three million fishers globally. The indiscriminate exploitation for this lucrative trade would have resulted in overexploitation leading to endangering of the species in the wild. The blanket ban on collection and trade on sea cucumber in India was imposed during 2002 by listing this organism in Schedule I category of the Wildlife Protection Act of 1972. The present study aimed to analyze and understand the impacts of listing on the conservation of sea cucumber resources in the wild and on the livelihood of the fishers. The enforcement of ban has affected the livelihood of thousands of fishermen families involved in sea cucumber fishing. There was a loss in their regular income as they were not able to do other fishing activities due to lack of capacity for investment. The fishers opined that they want the ban to be lifted at least for a few commercially important species. They are agreeable to follow regulatory measures like size restriction on fishing of undersized sea cucumbers, exclusion of breeding stock from fishing, restraining from use of destructive gears, exclusive fishing ban period for stock replenishment, sea ranching and stock enhancement programmes for conservation of the resource through participatory co-management principles.

**Key words:** Livelihood, management measures, socio-economic impact.

### **INTRODUCTION**

Sea cucumbers are marine animals with a leathery skin and an elongated body. The length ranges from a few millimetres to a metre (Lawrence, 1987). Sea cucumbers are found on the sea floor worldwide and are sedentary. They are consumed both in dried (*beche-de-mer*) and wet forms, with muscles cut in strips and boiled (Sloan, 1984). Medicines are prepared from sea cucumbers. It helps to recycle the detritus. Sea cucumber fisheries occur worldwide, from mono-specific temperate fisheries to multispecies tropical ones. Globally 66 species of sea cucumbers are commonly exploited through fishing (Purcell, 2010). Of the 154 genera and 1150 species recorded globally, James (1995) reported 27 species from

Gulf of Mannar area and among this, only seven are commercially important.

The Indian Government imposed total ban on sea cucumber fishing under Schedule I of Amendment (2002) to the Wildlife (Protection) Act 1972 for the protection and conservation of the natural stock of sea cucumber. The enforcement of ban by the Government might have perhaps helped in reviving the population of sea cucumbers in the Gulf of Mannar and Palk Bay, but at the same time, the ban has affected the livelihood of thousands of fishermen families involved in sea cucumber fishing. In spite of ban, the collection and trade continues illegally and may increase in future due to increase in the demand for '*beche-de-mer*' in the

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international market (Asha *et al.*, 2017). It is therefore imperative to analyze and understand the socio economic consequences of listing of sea cucumbers on the livelihood of the fishers. By conducting interview survey, the study aims to identify the potential management measures that can be implemented to sustain the sea cucumber stocks if the ban is lifted/relaxed.

## METHODOLOGY

An *ex-post-facto* research design was undertaken in Gulf of Mannar and Palk Bay to study the socio economic consequences on sea cucumber conservation in Palk Bay and Gulf of Mannar region of Tamil Nadu. In Gulf of Mannar, Ramanathapuram and Tuticorin districts; and in Palk Bay Ramanathapuram, Pudukottai and Thanjavur districts were selected for the survey. A total of 21 villages in Gulf of Mannar and 20 villages in Palk Bay were selected for the survey based on available documents on occurrence of sea cucumber and discussions with fishermen and officials of fisheries and forest departments. A total of 400 fishermen who are engaged in sea cucumber fishery, 80 middlemen and 20 traders were selected using proportionate random sampling technique from the selected villages. Data collection was done through interview method, key-informant interview and focused group discussion. Percentage analysis and Garrett ranking (Garret and Wood worth, 1969) were done to process the data and to arrive at meaningful conclusions.

## RESULTS AND DISCUSSION

Most of the respondents opined that the sea cucumber population has increased during the ban. However, they also reported clandestine removal of sea cucumbers and accidental catch in trawlers.

### Economics of sea cucumber fishing before the ban

**Table 1: Economics of sea cucumber fishing before ban**

| Mode of fishing sea cucumber   | Operating cost per trip (₹) | Gross revenue per trip (₹) | Operating ratio (Operating cost / Gross revenue) |
|--|-----------------------------|----------------------------|--|
| Skin diving  | 70                          | 1500                       | 0.05   |
| Trawling*  | 32,600                      | 54,000                     | 0.60   |
| Thallumadi <sup>†</sup><br>(Mini-trawl/indigenous trawl which is locally called as thallumadi)   | 1,900                       | 4,000                      | 0.47   |
| Chankuvalai (by-catch)<br>(Indigenous bottom-set gillnet which is locally called as chankuvalai) | 1,800                       | 3,000                      | 0.60   |

\*Overall length of trawlers was 34-60 feet, with 70-120 horse power engines. The length of trawl net was 13 meters with cod end mesh size of 25 mm.

<sup>†</sup>Overall length of country craft with thallumadi was 12-32 feet. The length of thallumadi was 8 meters, with cod end mesh size of 15-25 mm.

Before ban, sea cucumber fishing was mainly carried out by skin diving and trawling. Fishing by skin diving was economically most efficient than other modes of fishing as the cost of operation and investment were very low. It is clear from Table 1 that sea cucumber fishers were able to get good revenue before the ban. The revenue was five times the operating cost during the pre-ban period, which has reduced significantly in the ban period, since fishers are receiving lesser price during ban as it is a clandestine activity. Moreover most of the fishers were selling fresh sea cucumbers during ban for which they receive lower prices (BOBLME, 2015).

### Impact of ban on their livelihood

Garrett's Ranking Technique was used to identify and rank the attributes based on what ways sea cucumber ban has affected their livelihood, (Table 2).

Chellaram *et al.*, (2003) reported that about 20,000 fishers were involved in sea cucumber fishery and more than 50,000 (including fishers, middlemen and traders) were benefited from this fishery in the Gulf of Mannar and Palk Bay. In the present study, it was found that those who left the sea cucumber fishing due to blanket ban reported that it has affected their livelihood. There was a loss in their regular income as they were not able to do other fishing activities due to lack of capacity for investment. As a consequence, their debts increased and they were unable to give quality education to their children. They also found difficulty in arranging marriages of their daughters. A few fishers (3.8%) migrated to other districts and states in search of occupation after implementation of the ban. (BOBLME, 2015).

**Table 2: In what ways sea cucumber ban affected your livelihood**

| Particulars  | Score | Garrett Rank |
|--|-------|--------------|
| Affected the standard of living  | 72.9  | I            |
| Loss in regular income   | 55.2  | II           |
| Increase in debts  | 40.3  | III          |
| Loss in savings  | 33.6  | IV           |
| Not able to provide quality education to children  | 25.0  | V            |
| Lack of investment to shift to new fishing options   | 17.6  | VI           |
| Before blanket ban, sea cucumber fishing was a remunerative option during 45 days trawl ban. But during ban, sea cucumber fishing is not possible during trawl ban period. | 11.4  | VII          |
| Difficulty in arranging marriages for their daughters  | 7.8   | VIII         |
| Increase in migration of fishermen who are involved in sea cucumber collection to other districts and states in search of occupation                                       | 3.8   | IX           |

### Management measures suggested by the fishers

The fishers opined during the survey that they want the ban to be lifted at least for a few commercially important species. They are agreeable to follow regulatory measures like size restriction on fishing of undersized sea cucumbers (Conand, 1989; Purcell *et al.*,

2009), exclusion of breeding stock from fishing (James, 2004), restraining from use of destructive gears, exclusive fishing ban period for stock replenishment (Bruckner, 2006; Toral-Granda, Lovatelli and Vasconcellos, 2008), sea ranching and stock enhancement programmes for conservation of the resource through participatory co-management principles (Table 3).

**Table 3: Effective management measures as suggested by the respondents for sustaining the sea cucumber stocks if the ban is lifted.**

| Management measures                                    | (n=500) (%) |
|--|-------------|
| Size restriction                                       | 80          |
| Gear limitation  | 55          |
| Strict enforcement of banned gears and fishing methods | 75          |
| Seasonal closure                                       | 90          |
| Catch quotas   | 2           |
| Rotational harvest closures                            | 75          |
| No-take zone   | 5           |
| Stock enhancement through sea ranching                 | 70          |
| Awareness programme on conservation                    | 60          |
| Licensing  | 5           |
| Reporting the catches                                  | 2           |

Temporal closures could be viewed as a measure to protect sea cucumbers at certain critical times of the year such as spawning period (Bruckner, 2006). This measure is being adopted in Japan and British Columbia, Canada (Asha *et al.*, 2017).

The option to allow the harvest of sea cucumbers above 75mm size and restricting the collection of undersized of less than 75 mm was suggested by majority of the fishers. "A principal use of size limits in sea cucumber fisheries is to protect juveniles and recently matured adults to allow individuals one or more seasons to spawn before they can be fished (Purcell *et al.*, 2009). Size restrictions have been successfully implemented at Galapagos Islands (Ecuador), New Caledonia (France) and Yap, Federal States of Micronesia (Asha *et al.*, 2017). Globally, sea ranching and stock enhancement programmes is an important intervention to restore the wild sea cucumber stocks. In the Philippines, communities apply for permits from the local municipal government and village council to have exclusive access to inshore plots (5–10 ha) for sea ranching. The granting of access rights requires public consultations on proposed sea ranching, implementation mechanisms and arrangements including sharing of costs (*e.g.* labour, guarding of area) and benefits (*i.e.* harvest and access rights) (Purcell and Kirby, 2006). Programmes like "sea farming and sea ranching" are gaining importance in the Indo-Pacific region and Indian Ocean for the purpose of providing income for coastal livelihoods (Robinson and Pascal, 2009; Lavitra *et al.*, 2009; Pickering and Hair, 2008). Such programmes have positive effects in

rebuilding sea cucumber stocks in neighbouring fishing grounds. A study was conducted at New Caledonia to determine optimal methods for releasing the juveniles in the wild for restocking. It was found that the size-at-release of the cultured juveniles (more than 3 grams) and microhabitat are important criteria to specify in restocking sea cucumbers (Purcell and Simutoga, 2008). In Gilbert Islands, Kiribati it was found that 'sea cucumber juveniles need to be released into no-take reserves to ensure they are protected from fishing and they can act as breeders to replenish the stocks more broadly' (Purcell, 2004). The partnership between local communities, NGOs and private sector stakeholders led to the success of mariculture of sea cucumbers in Madagascar. Villagers grow hatchery-produced sandfish (*H. scabra*) in pens in shallow sandy habitats and areas around the pen have been designated as a permanent no-take reserve protected by a local law. Only the pen owners and researchers are allowed access to the sea pens in the reserve, which limits poaching (Conand, 2008). The lessons learnt from above countries reveal that the sea ranching and sea farming programmes has positive effects in rebuilding sea cucumber stocks and at the same time success of such programmes is due to the involvement and collective efforts of stakeholders.

Majority of the respondents suggested that the participatory co-management of sea cucumber and conservation can be done through community monitoring at village level, for which they suggested establishment of Councils at the village level for management/conservation of sea cucumbers. The local institutions such as fishermen associations and fisherwomen cooperatives can be included for effective management of sea cucumber fishery. Apart from these community organizations, non-government organisations, and self-help groups may be considered as stakeholders for effective management of the resources. "The implementation of a co-management regime in the Galapagos has increased the effectiveness of license and quota control and reduced conflict between management and fishers" (Shepherd *et al.*, 2004). Similar successful cases from many countries show that co-management will be effective.

## CONCLUSION

Results of interview surveys based on the perception of fishermen reveals that the status of sea cucumber population has significantly increased after the implementation of ban on sea cucumber fishing in the Gulf of Mannar and Palk Bay region. As the fishermen do not want to engage in alternate livelihood options, they have resorted to clandestine fishery. The fishermen want the ban to be lifted at least for a few commercially

important species. They are agreeable to follow regulatory measures for conservation of the resource with participatory co-management.

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