Indian
Journal of
Fisheries

Trade-off between monsoon trawl ban and the livelihood of trawl labourers in Maharashtra

SHYAM S. SALIM, HENA VIJAYAN AND K. M. SANDHYA
Central Marine Fisheries Research Institute, Kochi - 682 018, Kerala, India
e-mail: shyamssalim@rediffmail.com

ABSTRACT

Indian fisheries sector in view of its potential contribution to national income, nutritional security, employment opportunities, social objectives and export earnings, plays an important role in the socio-economic development of the country. Fisheries sector contributes 4.3 % to the agricultural GDP and export earnings are presently valued at over Rs. 6,800 crores from a volume of 4.6 lakh tonnes. In addition, it provides direct and indirect employment and dependency for over seven million people in the country. With an estimated production potential of 8.4 million tonnes, the present level of production in the country is 5.9 million tonnes with almost equal contribution from both the marine and inland fisheries. The estimated fisheries potential from Indian Exclusive Economic Zone was found to be 3.9 million tonnes. But inspite of the increased efforts in fish production, the catch stagnated around 2.9 million tonnes. The stagnation in catches mainly due to the overexploitation of dwindling marine resources forced the government to impart some management measures to regulate the fishery and for the sustenance of the marine resources. The monsoon trawl ban in fisheries was one of the major reforms, which had created a substantial increase in fish production in the past few years. The ban on trawling during monsoon season was introduced in Maharashtra, after a series of studies, from 1992 for a period of 65 days form June 10 to August 15 (or Naralipoornima whichever is earlier). A notable increase in production from the marine sector of the country occurred in the post-ban period. Nevertheless, it had created problems in employment, poverty and income distribution of fishermen during ban period and was always a matter of unrest among mechanized and traditional sector of fishing. The aim of this study is to understand the impact of ban on monsoon trawling in employment pattern, poverty and income distribution of fishermen along the western coast of Maharashtra. The study was conducted at Versova fishing village, Mumbai and provides reflections on the possible impact of monsoon ban on the livelihood and standard of living of the fishermen in the state.

Keywords: Livelihood, Monsoon trawl ban, Trawl labourers

Introduction

The Indian fisheries sector in view of its potential contribution to national income, export earning, nutritional security, employment opportunities and social objectives, plays an important role in the socio-economic development of the country. Presently the contribution of fisheries sector to GDP and agricultural GDP has been estimated to be 1.24 and 4.34 % respectively. Fish, which is a source of cheap animal protein, has an annual per capita consumption of 9 kg in India as compared to the 11 kg recommended by WHO. The sector is also an important employment generator providing direct employment to seven million and indirect employment to about three million fisher folk. The sector is also a primary foreign exchange earner and contributes to one third of the agricultural exports.

India, with a coastline of 8129 km enjoys the right over an exclusive economic zone (EEZ) of 2.02 million km sq. The country is also bestowed with rich inland fishery resources including rivers, reservoirs, lakes, ponds and wetlands. The estimated fisheries potential of Indian EEZ was found to be 8.4 million tonnes with 3.9 million tonnes for the marine sector and 4.5 million tonnes from the inland sector. Even though aquaculture is considered as a viable option for the provision of food security, the productivity from inland resources are rather low compared to marine, due to the lack of harnessing the resources, multiple uses associated with the water bodies and the different institutional and policy mechanisms (Mukherjee *et al.,* 2004). In marine fisheries sector inspite of the increased efforts in production, the catch is stagnating much below the potential. This was due to overexploitation of dwindling marine resources in the inshore and offshore areas and under exploitation of deep sea resources. The exploitation of the deep sea fisheries resources was not found to be economical due to high capital investment and many joint ventures in this sector were not very successful. Therefore in order to augment the production, the only way is to conserve the overexploited resources of the oceans and the pressure on those resources forced the Government to impart various management measures and reforms inorder to regulate the fisheries and for the sustenance of the marine resources (Shyam *et al.,* 2002).

About 53000 mechanised vessels are used for fishing in the marine sector of India and among them around 75 % are trawlers. The percentage share of trawlers to total marine landings in India is around 50 % which may vary across different coastal states.   The high profit enjoyed by the trawlers in the sector motivated more and more trawlers and trawl labourers into the lucrative business of trawl fishing. This instead of increasing the profit, ended up with the phenomenon of "tragedy of the commons". The decreasing returns and unscientific practices in this sector led to a chaotic condition and the management of the sector in an efficient way was the only solution for the prevailing situation. Based on recommendation of Central Government and State committee, many of the maritime states like Maharashtra, Kerala, Tamil Nadu, Andhra Pradesh, Karnataka, Gujarat, Orissa, West Bengal and Goa have enacted suitable policies and regulations in the fisheries sector and introduced the Trawl ban during the monsoon months. Trawl ban is the prohibition of fishing using mechanized vessels like trawlers during monsoon season which is considered to be the breeding and pre-recruitment period of most of the commercially important species.

 The implementation of ban, a major step to regulate capture fisheries, had its own impact in the sector. The different studies (Pillai, 1995; Balakrishnan Nair, 2000) on the monsoon ban and its effect on the resource productivity has clearly indicated that the monsoon trawl ban is a powerful regulatory measure to augment the marine fish production. In spite of this achievement, in many states, it created inter-sectoral conflicts in traditional and mechanized sectors, problems between fishing groups of different states and conflict between ring seine and trawl labourers. But the worst impact was the changes it brought in the livelihood pattern of the labourers working in trawlers. For almost two months of the year those fishermen who contribute a major portion of export valued marine products are deprived of any source of employment and their income levels face a serious setback during the period. This period is usually associated with problems like poverty, malnutrition and increase in debt among the fisher folk communities engaged in trawling (Kurien John, 1978,1995; Datta *et al.,* 1989; Joseph Sherry, 1995). The present study was undertaken to address changes in the livelihood of fishermen in the form of problems like unemployment, poverty and low-income level, following implementation of trawl ban in the marine fisheries sector.

Materials and methods

The study was conducted in the state of Maharashtra owing to its importance in the contribution towards the marine fish production of the country mainly from trawl fishing. In the state of Maharashtra around 22,322 fishing fleets are operating, out of which 52.07 % are mechanized

and 47.93 % are non-mechanized. Trawlers are around 4200 in which 500 (11.9 %) are operating in Versova fishing village. In Maharashtra about 98.78 % of the total marine fish landings is contributed by the mechanized sector and a marginal 1.22 % by the non-mechanized sector. Trawlers contribute 52.83 % of the total mechanized sector landings and the remaining is contributed by bag nets, long lines, gillnets, purse seines and others. The Versova fishing village in Maharashtra coast was selected for the study, where about 500 trawlers are operating in the territorial sea. In Versova fishing village, marine fish landings by trawlers account for 24.93 % of total marine fish production of Greater Mumbai District.

In order to ascertain the problems faced by the trawl labourers during the ban period, primary data from 60 labourers was collected to draw a meaningful conclusion about the problem faced by the community in the ban period and the factors contributing towards their opinion on implementing the ban. The employment pattern, income, poverty, and opinion about the ban were analyzed. A total of 60 trawl labourers were interviewed and data regarding their experience, family size, level of education, occupational level, annual income, assets, availability of credits, incidence of unemployment, poverty and the mitigating measures by means of support from cooperatives, Government and others were collected.

Tools of analysis

Conventional analysis

The analysis was done to find out the different levels of income, incidence of poverty, and mitigating measures by the Government, cooperatives and other sources in providing support or alternate source of employment during the ban period.

Garette Ranking Technique

In order to analyse the problems encountered during the monsoon trawl period as felt by the trawl labourers, 60 sample trawl labourers were interviewed using a pretested interview schedule on the different problems encountered. The important problems were ranked by the trawl labourers, based on their priorities. The order of merit given by the trawl labourers was transmitted into scores. For converting the scores assigned by the trawl labourers towards the particular problem, percent position was worked out using the formula,

$$\text{Percent position} = \frac{100 \ (\text{Rij-0.05})}{\text{Nj}}$$

where,

Rij = rank given for the ith problem by the jth trawl labourer

N_i = number of attributes

Opinion towards ban – Probit Model

In order to evaluate and identify the factors that influence the opinion towards ban, Probit model was employed. Here the dependent variable (favourable or unfavourable opinion towards ban) is a dichotomous response variable taking a 1 or 0 value. For a favourable opinion, Y = 1 and for unfavourable opinion, Y = O.

Out of the binary models, the model that emerges from the use of normal cumulative density function is popularly known as the Probit model which is also known as normit model. It's explained on the basis of utility theory or rational choice perspective on behaviour (Mc- Fadden,1973; Pindhyk,1991).

The assumption is that the favourable or unfavourable opinion towards trawl ban depends on an unobservable utility index, Ii, that is explained by an explanatory variable Xi, in such a way that, larger the value of the index Ii, the greater the probability of the opinion having an association. The Index Ii is expressed as: $Ii = ß_1 + ß_2 X_i$

where, X_1 is the ith explanatory variable.

There is a critical threshold level of the index, Ii, such that if Ii exceeds Ii*, the opinion will be unfavourable, otherwise the opinion will be favourable. Though the threshold Ii*, like Ii, is not observable, it is possible to estimate the parameters of the index, if we assure that Ii is normally distributed with same mean and variance.

Given the assumption of normality, the probabilities that Ii* is less than or equal to Ii can be computed from the standardized normal Cumulative Distributive Function (CDF) as :

$$Pi = Pr\,(Y=1) = Pr\,(Ii * \le Ii) = F\,(Ii) = 1/\sqrt{2\pi} \int_{-\infty}^{Ti} e^{-t^2/2}\, dt$$

$$Pi = 1/\sqrt{2\pi} \int_{-\infty}^{ß1 + ß2\,Xi} e^{-t^2/2}\, dt$$

where, 't' is a standardized normal variable *i.e.*, N (0,1)

To obtain information on Ii, the utility index, as well as the coefficients $ß_1$ and $ß_2$ inverse is taken

$Ii = F^{-1}\,(Ii) = F^{-1}\,(Pi)$
   $= ß_1 + ß_2 X_1$

where, F^{-1} is the inverse of the normal cumulative density function (CDF).

In the language of Probit analysis, the unobservable utility index Ii is simply known as Normal Equivalent Deviate (NED) or simply normit. Since the NED or Ii will

be negative whenever Pi < 0.5, in practice, the number 5 is added to the NED and the result is called a Probit.

Probit = N. E .D. + 5 = Ii + 5

To estimate $ß_1$ and $ß_2$ we write

   $Ii = ß_1 + ß_2 X_1 + U_i$

where U_i is the stochastic disturbance term.

In this study a Probit model of the following form was employed for deducing the opinion towards trawl ban during monsoon.

Ii $= ß_0 + ß_1\ EXP + ß_2\ FAM + ß_3\ EDN + ß_4\ OCC + ß_5\ INC + ß_6\ CRE + ß_7\ LUE_+ ß_8\ POV$ is conceptualized and estimated where:

Ii   = The unobservable utility index which determines the opinion towards ban (1 for agreeing ban and 0 for disagreeing with the ban)

EXP = Experience in years (Number)

FAM = Number of dependent family members (Percentage)

EDN = Level of education (Number of years)

OCC = Dependency on fishing (Dummy) 0- Fishing alone, secondary occupation 1

INC = Annual Income (Rupees)

CRE = Credit availed (Dummy) 0- availed, 1-not availed

LUE = Number of days unemployed

POV = Poverty Dummy (0- incidence, 1-not incident)

Predicted probabilities are computed as : $\hat{I}_t = \hat{P}_t = \hat{F}(\hat{X}'\ ß)$

The coefficients tell the effect of a change in the independent variable on the utility index. The impact of a unit increase in an explanatory variable on the choice probability is obtained by estimating the marginal effect as follows.

The Probit model : $(\delta \hat{P}_t / \delta X_{kt}) = f(\hat{X}'_t\ \hat{ß})\ ß_k$

The elasticity gives the percentage change in the choice probability in response to percentage change in the explanatory variable. For the ith coefficient this is estimated as:

$E_{kt} = (\delta \hat{P}_t / \delta X_{kt})\ (\hat{X}_{kt} / \hat{F}(\hat{X}'_i\ ß))$

Results and discussion

The trawl labourers were from the neighbouring states of Gujarat, Southern Maharashtra, and North India. It was found that the trawl labourers were having extensive experience in trawling operations, which made it difficult

for them to have experience in other skilled jobs. The educational level was found to be low with majority having less than high school education. The only alternate source of employment available included the agricultural labour in their native as well as in the repair and maintenance of craft and gear. But again the wages were too low and employment highly seasonal in nature. On an average the trawl labourers were paid Rs. 30000-40000/- for the ten-month trawling operations. It was found that there exists a considerable level of unemployment during the two-month ban period. There was no Governmental support or support from cooperatives during the ban period. As a result of unemployment, the trawl labourers were forced to avail credit either from money lenders or from financial institutions to cope up with the expenditure during the ban period. There was no incidence of poverty as such, though it might be not that late for such a phenomenon to occur.

Problems during ban period – Garette Ranking Technique

The results of the Garette ranking technique are furnished in Table 1. It could be inferred from the results that unemployment was the most prominent problem associated with ban, which was ranked first with a mean score of 68.41. This was followed by seasonal employment (mean score-57.04), non-availability of credit (mean score-53.32), low wage rate (mean score-50.49), lack of Government support (mean score-45.58), support from trawl owners (mean score-38.8), and poverty (mean score-37.48). It was found that poverty was the least affected problem, due to the kind payments obtained from the agricultural sector for the labour.

Table 1. Analysis of the problems during ban period – Garette Ranking Technique

Reason	Mean score	Rank
Trawler owner's support	38.8	VI
Poverty	37.48	VII
Non-availability of credit	53.32	III
Unemployment	68.41	I
Lack of governmental support	45.58	V
Seasonal employment	57.04	II
Low wage rate	50.49	IV

$$\text{Percent position} = \frac{100\ (R_{ij} - 0.05)}{N_j}$$

The trawl ban period was characterized by considerable amount of unemployment to the tune of 35-40 days during the ban period. Alternate sources of employment available are working as an agricultural labourer and in the tertiary sector of fisheries in the repair and maintenance of craft and gear. However, agricultural labour was found to be seasonal as the trawl ban period is not coinciding with the transplanting or harvesting of paddy. As a result, the trawl labourers were not getting sufficient

employment for their subsistence. There were also apprehensions of low wage rate. The wage rates were too minimal when compared to the income from trawling as there was excess supply of labourers during the ban period.

Governmental interventions supporting trawl labourers were seldom found either in the form of providing employment or ensuring some mitigating measures. The lack of support and unemployment coupled with low wage rate and seasonality of the employment forced them to avail credit as an imperative means to meet the household expenditure.

However, there was an inherent problem of non-availability of credit. Availing credit was difficult as credit institutions and money lenders charged an exorbitant rate of interest and complex legalities were required. The support from trawler owners was not so encouraging and they were not provided with any advance since the trawl owners were not assured of the labourers reporting for duty in the next season. Poverty was not noticed as such because of the kind payments made in the form of agricultural produce.

Factors affecting the opinion towards ban - Probit analysis

The Probit analysis on the factors affecting the opinion towards ban is furnished in Table 2. Mostly the income levels of trawl labourers and their experience determined the favourable opinion towards ban. The positive association of income, with a favourable opinion towards ban indicated that 10 % increase in the income will increase the probability of opinion towards ban by 6% at 1% level of significance, *ceteris paribus* from mean level of elasticities. Similarly a 10% increase in experience in years would generate a favourable opinion towards ban by 2% at 5% level of significance, *ceteris paribus* from mean level of elasticities. On the contrary, the level of unemployment was negatively related in a favourable opinion towards ban. A 10 % increase in the level of unemployment will decrease the probability of opinion towards ban by 0.6 % at 1% level of significance, *ceteris paribus* from mean level of elasticities. The number of dependent family members also has a negative relation with opinion towards ban. A 10% increase in the number of dependent family members would decrease the probability of favourable opinion towards ban by 2%, at 5% level of significance, *ceteris paribus* from mean level of elasticities. Thus it was found that the important factors, which generated a favourable opinion towards ban, were the income levels and experience. The level of unemployment and number of dependent family members generated an unfavourable opinion towards ban. Even though the trawl labourers were deprived of employment for two months, owing to their experience in the field, they favoured the implementation of trawl ban.

Table 2. Factors affecting the opinion towards ban - Probit analysis

Parameter	Coefficient	Standard Error
CON	0.197	0.322
EXP	0.024*	0.012
FAM	-0.106**	0.041
EDN	0.179	0.091
OCC	-0.044	0.106
INC	0.068**	0.000
CRE	-0.143	0.232
LUE	-0.006**	0.003
POV	-0.021	0.323
GVS	-0.006	0.146

**1% level of significance   *5% level of significance

CON	= Constant	EXP	=	Experience in trawl operation
FAM	= Family size	EDN	=	Education levels
OCC	= Occupation	INC	=	Income
CRE	= Credit availed	LUE	=	Level of unemployment
POV	= Poverty	GVS	=	Governmental support

The details on the prediction success of factors causing the opinion towards ban through the Probit analysis are presented in Table 3. It could be observed from the table that the number of right predictions for the probability of having a favourable opinion was 48 out of 60 and the percentage of right prediction was worked out to be 80. This confirms the fact that the probit function was a good fit for this type of analysis and prediction.

Table 3. The probability of agreement or disagreement towards monsoon trawl ban prediction-Probit analysis

Choice		Actual		Total	Right prediction	
		0	1		Number	Percentage
Predicted	0	38	2	20	38	63.3
	1	51	10	10	10	16.7
Total		48	12	60	48	80

The decadal average marine landing during the pre-ban years was found to be 3.91 lakh tonnes which has increased to 4.04 lakh tonnes. Even though the increase in landings cannot be resorted to trawl ban alone, the implementation of trawl ban appeared to serve the purpose of augmenting marine fish production. But its impact on the income level of the labourers and the unemployment they face during the period forced some fishermen to oppose the ban on trawling, which was very well emphasized in the survey. But inspite of the unemployment problem they face during the period, most of the experienced labourers in the field gave a positive opinion about the ban, which showed their concern towards conservation of the resources, which they count on, for their livelihood. It was evident from the survey that, the ban has favourably resulted in the conservation of the resources and has also helped to improve the spawning and recruitment of the resources.

Nevertheless, the disparity arising in the income levels of labourers during the ban and the non-ban period is very high which make a substantial difference in their livelihood. The lack of adequate governmental support was one reason for their added misery along with unemployment problems. There needs to be some level of support for the fishermen, during the period to have a normal standard of living during the ban period. There needs to be some alternative source of livelihood for the trawl labourers during the monsoon ban period. In addition, there can be a policy guideline or intervention from the government, directing the trawl owners to enhance the closed season relief amount from the existing Rs. 1500 to 3000 per month. The trawl owners can also engage the labourers in the secondary and ancillary industries like boat making, net mending and maintenance of the crafts and gear during the trawl ban period. New policies for the socio-economic upliftment of labourers need to be put forward after looking into the problems they face during the ban period. The implementation of a separate fishing policy, based on scientific principles, highlighting the need of the common fisher folk, is the need of the hour.

References

Balakrishnan Nair, 2000. Report of the Expert Committee for Fisheries Management Studies, Government of Kerala.

Datta, K. K., Dan, S. S. and Datta, A. K. 1989. Productivity, profitability and income distribution in capture fishery : a study of the Orissa coast. *Econ. Polit. Week.*, 24(51) : 181.

Joseph Sherry, 1995. Coping with seasonality: implications for fisheries community development. *Social Action,* 45(4) : 431.

Kurien John 1978. Entry of big business into fishing : its impact on fish economy. *Econ. Polit. Week.,* 13(36) : 285.

Kurien John, 1995. Impact of joint ventures on fish economy. *Econ. Polit. Week.*, 30(6) : 300.

McFadden, M. L. 1973. E*conometric models of probabilistic choices : structural analysis of discrete data,* Cambridge, MA, MIT Press, 473 pp.

Pillai, B. N. 1995. Fish Resources in Indian exclusive economic zone and deep sea fishing, *Proceedings of the Workshop on "Fish Resources in Indian Exclusive Economic Zone and Deep Sea Fishing,* CIFT, Kochi, p. 8.

Pindhyck, S. R. and Rubinfeld, D. L. 1991. *Econometric models and economic forecasts*, Mc-GrawHill, Inc., New York, 565 pp.

Mukherjee, S. C., Biradar, R. S., Shyam S. Salim and Ayyappan, S. 2004. *Proceedings of the International Seminar on "Policy Issues in Fisheries and Aquaculture"* 19 December, 2002, Central Institute of Fisheries Education, Mumbai, 96 pp.

Shyam S. Salim and Mukunda Goswami 2002. Opportunities and policy implication for fisheries development in India, *Proceedings of the National Conference on fisheries economics research and education in India*: an overview. Central Institute of Fisheries Education, Mumbai, p. 85-93.

CONTENTS