REPORT OF THE COMMITTEE TO EVALUATE FISH WEALTH/ IMPACT OF TRAWL BAN ALONG KERALA COAST

Submitted to the Government of Kerala, Department of Fisheries
by the Expert Committee
January 2014

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Final Document submitted January 2014

Clarifications if any may be addressed to: The Additional Director of Fisheries, 4th Floor, Vikas Bhavan, Thiruvananthapuram 695033, 0471-2304598 (off); 9496007021 (Cell); 0471-2304598 (Fax)
http://www.fisheries.kerala.gov.in/

Recommended Citation:

Mohamed, K.S., P. Puthra, T.V. Sathianandan, M.V. Baiju, K.A. Sairabanu, K.M. Lethy, P. Sahadevan, Chandrasekharan Nair, M. Lailabeevi and P.S. Sivaprasad. 2014. Report of the committee to evaluate fish wealth and impact of trawl ban along Kerala coast. Department of Fisheries, Government of Kerala. 85p.

contents

Acronyms Used

ARIMA	Auto Regressive Integrated Moving Average Model
CCRF	Code of Conduct for Responsible Fisheries
CIFNET	Central Institute of Fisheries Nautical Engineering and Training
CIFT	Central Institute of Fisheries Technology
CMFRI	Central Marine Fisheries Research Institute
COR	Central Operations Room
DFC	District Fisheries Council
DOF-GOK	Department of Fisheries – Government of Kerala
FAO	Food and Agriculture Organization
FRAD	Fisheries Resources Assessment Division of CMFRI
FVC	Fishing Village Council
GOI	Government of India
GOK	Government of Kerala
HP	Horsepower
INMARLH	Indian Marine Resources Life History Database
KMFRA	Kerala Marine Fisheries Regulation Act 1980
LOA	Length Overall of fishing vessel
LOP	Letter of Permit
LSA	Life Saving Apparatus
MATSYAFED	Kerala State Co-operative Federation for Fisheries Development Ltd
MCS	Monitoring Control and Surveillance
MCR	Maximum Continuous Rating
MMD	Mercantile Marine Department
MOA	Ministry of Agriculture
MPA	Marine Protected Areas
MSY	Maximum Sustainable Yield
NGO	Non-Governmental Organization
nmi	Nautical miles
TOR	Terms of Reference
SFC	State Fisheries Council
t	Tonnes
VMS	Vessel Management System
WWF	World Wide Fund for Nature

Preface

With a consumption rate exceeding 3-times the national average, fish is a very important and integral part of the average Keralite's daily life. An unsubstantiated estimate puts the daily fish consumption as exceeding 3000 tonnes. Moreover, a significant 3.3% of the Kerala State population is involved with fishing and allied activities. Because of the high demand for fish in the state, considerable amount of fish is also brought in from other states. It is therefore no wonder that the legislative and executive of the state is also much concerned about the sustainability of fishery resources and the welfare of the people involved in fisheries trade and business. Underlying the Government of Kerala's concern in this issue is the fact that fish is not a private commodity but a public good held in trust by the government on behalf of all citizens, and that fishing rights should be allocated to fishermen on the basis of sound environmental and economic criteria. More than 20 committees appointed by the Government of Kerala have gone into various issues plaguing the fisheries sector. The number of legislations passed by the Kerala Assembly is also considerably high when compared to other Indian states. All these point to the heightened attention that fisheries have in this maritime state.

After a gap of 6 years, the GOK formed this committee to once again relook into the whole gamut of issues with regard to sustainable marine fisheries in Kerala State. A major issue hounding the people involved with fisheries and the general public is the big question whether the trawl ban which has been in existence for the past 25 years has any beneficial impact on the fish resources and the fishermen of the state.

This expert committee has approached these issues in a radically different way. First, it has obtained the stakeholder response on the various critical issues, and then, based on their response, drafted the report. Very similar to the participatory management approach advocated in this document, this report is also drafted through a participatory approach. Video records of the stakeholder consultations are also available with the DOF-GOK. Second, it has analyzed the fishery data of 27 years pre-ban and 25 years post-ban with a unique statistical model. The committee has also looked into the differences in valuation of the fisheries. Finally, the draft recommendations were made available to all stakeholders and the general public through the official website for comments. These comments were consolidated and based on the opinions of the fishermen (Fishermen Coordination Subcommittee) the final recommendations were made.

It is hoped that users of this report will find the contents interesting and the conclusions and suggestions made here to be of value and of good standard. Comments and suggestions are welcome and may be addressed to any of the committee members.

THE EXPERT COMMITTEE ON FISH WEALTH OF KERALA
January 2014

Terms of Reference (TOR)

1. Evaluate how far the monsoon trawl ban imposed along Kerala coast for the last 25 years was beneficial in sustaining fish wealth of the state
2. Review the changes in fishing methods and practices and its influence in the sustainability of resources
3. Evaluate the length-power combinations of fishing vessels, suggested by the previous committees and offer practical recommendations
4. Suggest administrative and regulatory measures for the sustainable development of fisheries in the state
5. The committee will submit the report within 3 months

GOVERNMENT OF KERALA
Abstract

Fisheries & Ports Department – Fishery Wealth – Scientific Study – Constitution of Expert Committee - Sanctioned - Orders issued.

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FISHERIES & PORTS (B) DEPARTMENT

G.O.(Rt)No. 906 /2012/F&PD Dated, Thiruvananthapuram, 27.10.2012.

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Read:- 1) Minutes of the meeting convened by the Hon'ble Minister(F,P&Ex) on 15.05.2012.
2) Letter No. G2-14423/12 dated 11.09.12 from the Director of Fisheries.

ORDER

In the meeting held on 15.05.2012 it was decided to constitute an Expert Committee to evaluate the Fishery Wealth/Impact on the implementation of trawl ban along the Kerala Coast. As per letter read as 2nd paper above, Director of Fisheries has requested to constitute an Expert Committee to evaluate the fishery wealth/Impact on the implementation of trawl ban along the Kerala Coast.

2) Government have examined the matter in detail and are pleased to constitute an Expert Committee with the following 7 members to evaluate the fishing wealth /impact on the trawl ban along the Kerala Coast.

1) Additional Director of Fisheries - Chairperson
2) Dr.K.Sunil Mohammed, Principal Scientist, Head of Division, CMFRI, Kochi - Member
3) Dr.P.Praveen, Senior Scientist, CIFT, Kochi - Member
4) Joint Director of Fisheries (HQ) - Member
5) Law Officer, Directorate of Fisheries - Member
6) Sri.Sahadevan, Executive Director, FIRMA - Member
7) Deputy Director of Fisheries (Marine), Directorate of Fisheries - Convenor.

3) The terms of reference of the Committee are as follows:

1. Evaluate how far the Monsoon trawl ban imposed along Kerala Coast for the last 18 years was beneficial in sustaining fish wealth of the state.
2. Review the changes in fishing methods and practices and its influence in the sustainability of resources.
3. Evaluate the length-power combinations of fishing vessels, suggested by the previous committees and offer practical recommendations.
4. Suggest administrative and regulatory measures for the sustainable development of fisheries in the State.
5. The committee will submit the report within 3 months.

PROCEEDINGS OF THE DIRECTOR OF FISHERIES, KERALA, THIRUVANANTHAPURAM

Sub:- Fisheries –Fishery wealth – Scientific Study – Constitution of Expert Committee –sanctioned – Orders issued

Read:- 1. G.O (Rt) No.906/2012/F&PD dated: 27.10.2013
2. Minutes of the meeting held on 15.1.13 at the Training Hall of CMFRI, Kochi.

ORDER NO.G2/14423/2012 Dated: 18 .03.2013

As per the reference cited 1st Government have constituted an Expert Committee with seven members to evaluate the impact of Trawl ban on fishing wealth along the Kerala Coast. Considering the fact that a lot of statistical data is required which needs to be analyzed and compiled it was decided in the meeting to held on 15.1. 2013 to include Sri. Dr.T.V.Sathyanandan, Principal Scientist & Head, Fisheries Resource Assessment Division, CMFRI, Kochi, and Sri. M.V.Baiju, Senior Scientist, Fishery Technology Division, CIFT, Kochi, in the Expert Committee.

In the circumstances Director of Fisheries is pleased to Co-opt the above two officers to the Expert Committee as members for the preparation of the report within the stipulated time.

Sd/-
C.A. LATHA I.A.S
DIRECTOR OF FISHERIES

Forwarded by order

Deputy Director of Fisheries (Marine)

Authorized Signatories

1. Chairperson
Smt. K.A. Sairabanu
Additional Director of Fisheries
Department of Fisheries, Kerala

2. Member
Dr. K. Sunil Mohamed
Principal Scientist & HOD
Central Marine Fisheries Research Institute, Kochi

3. Member
Dr. P. Pravin
Principal Scientist
Central Institute of Fisheries Technology, Kochi

4. Member
Dr. T.V. Sathianandan
Principal Scientist & HOD
Central Marine Fisheries Research Institute, Kochi

5. Member
Dr. M.V. Baiju
Senior Scientist
Central Institute of Fisheries Technology, Kochi

6. Member
Smt. K.M. Lethy
Joint Director of Fisheries
Department of Fisheries, Kerala

7. Member
Shri. Chandrasekharan Nair
Law Officer
Department of Fisheries, Kerala

8. Member
Shri. P. Sahadevan
Executive Director, FIRMA
Department of Fisheries, Kerala

9. Convenor
Dr. M. Lailabeevi
Deputy Director of Fisheries (Marine)
Department of Fisheries, Kerala

10. Co-Convenor
Dr. P.S. Sivaprasad
Technical Assistant
Department of Fisheries, Kerala

Executive Summary

The expert committee constituted by the Government of Kerala to evaluate the fish wealth and impact of implementation of trawl ban along Kerala coast conducted 3 separate stakeholder consultations in Kochi, Thiruvananthapuram and Kozhikode and made several sittings to arrive at findings and recommendations. A total of 66 recommendations have been made which touch upon the impact of trawl ban both in terms of yield and value; optimum mesh sizes for different gears; restrictions on engine horsepower for different fishing crafts; restriction on certain destructive fishing practices; and a new fisheries governance structure in participatory mode. A main finding of the committee is that the benefit of the trawl ban in terms of yield and value was not sustained after 9 years post-ban, and after the year 2000 there has been a decline in both yield and value of the mechanized fisheries. Some of the key recommendations are listed below:

1. Extension of ban on trawling from 47 to 60 days (in two periods, one in June-July and another in October-November, each of 30 days) for sustaining the beneficial impact of trawl ban on fishery yields which has been lost in recent years in the mechanized sector.
2. Introduction of a new ban for 60 days on ring seining for pelagic fish during the peak spawning period of April-May to conserve pelagic spawning stocks which has not been agreed to by stakeholders.
3. Provision of monetary relief to fishermen during periods of fishing ban in both mechanized and traditional sector.
4. Enhanced fuel subsidy to all fishing units complying with rules of the KMFRA.
5. Change in the manner of fishing license from a broad all-encompassing license to individual gear based license valid for 2 years.
6. All fishermen and boat drivers to undergo compulsory free training on navigation and sea safety.
7. All large mechanized vessels to have toilets, sleeping berths and kitchen facilities.
8. Optimum mesh sizes and dimensions for all commonly used gears and restrictions on engine horsepower based on fishing craft sizes.
9. Due to excess boat capacity in the sector a moratorium on new boat construction.
10. The DOF to do away the monitoring of marine fishery catches and to rely on CMFRI estimates of catch and effort for reporting.
11. Strengthening of the Marine Enforcement Wing of the DOF with additional staff and post of an Additional Director and provision for satellite based vessel management system (VMS).
12. Embracing a consultative participatory management fisheries governance system involving stakeholders at the village, district and state level through formation of Fisheries Councils.

The draft recommendations were placed in public domain for comments of stakeholders. The comments on the 67 draft recommendations were consolidated by the Fishermen Coordination Subcommittee for placing before the Expert Committee. Of the final 66 recommendations, 59 were wholly accepted or accepted with modifications; only 8 recommendations were not accepted by the Subcommittee. The 85 page document has been submitted to the GOK with the hope that all of the accepted recommendations will be acted upon. A plan for implementation of the recommendations has also been given by the committee.

Approach of the Committee

The committee had its first sitting on 14th December 2012 from 11 am to 1 pm in the chamber of the Additional Director of Fisheries, Office of the Directorate of Fisheries, Vikas Bhavan, Thiruvananthapuram. Members debated on the TOR given by the Government to decide on a plan of action for compiling the data, analyzing it and writing of the report. The following decisions were reached:

1. It was agreed that several eminent committees had gone into the issue in earlier and recent years, and this committee need to only consolidate the relevant recommendations into a practical format for implementation by the Department.
2. The impact of trawl ban has been studied up to 2005 by the earlier committee, and this committee would consolidate and further analyze the data for the pre-ban and post-ban period up to 2012 (1961-1987: 27 years pre-ban; 1988-2012: 25 years post-ban) to bring out the impact of trawl ban.
3. Several major recommendations made by earlier committees could not be implemented by the DOF because stakeholders had points of disagreement with the views of the committee recommendations.
4. In the present approach, this committee would first prepare a questionnaire or schedule of major new issues facing the sector and the major recommendations made by the earlier committees, get the opinion of the stakeholders through consultative meetings, and then prepare the report.
5. It was also decided to conduct stakeholder interactions/ consultations with fishermen, trade union and association leaders, NGOs, researchers etc. at the 3 major fishing locations in the state – Kochi, Thiruvananthapuram and Kozhikode during the months of January and February 2013. The entire proceedings of the stakeholder consultations would be video recorded for the first time for future reference.
6. The committee decided to co-opt into the committee Dr. T.V. Sathianandan, Principal Scientist & Head, FRAD, CMFRI, Kochi and Dr. M.V. Baiju, Senior Scientist, CIFT, Kochi for additional strength in the analysis and preparation of the report. It was also decided to co-opt Dr. P. S. Sivaprasad, Technical Assistant, as Co-Convener of the expert committee.

Examining the effect of seasonal trawl ban on marine fish landings in Kerala

In Kerala the seasonal fishing ban was introduced in 1988 and is in effect till now. It is important to examine the effects of seasonal fishing ban on the marine fish landings of the state. Here an approach based on time series modeling is adopted to examine the effect of seasonal fishing ban on the total landings in the state. The model used is the autoregressive integrated moving average model (ARIMA) and the effect is quantified through intervention analysis. If by *Y(t)* we represent the landings in time period *t* (year or quarter) then the functional form of an ARIMA (p,d,q) model (with p autoregressive terms, q moving average terms and regular differencing d) is:

$$a(B)\,(1-B)^d\,Y(t) = b(B)\,e(t)$$

where,

$a(B) = 1 - a_1 B - a_2 B^2 - \ldots - a_p B^p$

$b(B) = 1 - b_1 B - b_2 B^2 - \ldots - b_p B^q$

$B^k Y(t) = Y(t-k)$

e(t)'s are independently and identically distributed random variables with mean zero and constant variance.

Orders p, d and q were determined based on Akaiki's Information Criterion AIC and Schwarz Information Criterion SIC. Input time series used is the annual total marine fish landings in Kerala during 1961 to 2012 (52-years). Based on the above criterion with the time series prior to the intervention (1987, prior to seasonal fishing ban) the suitable order determined was p=3, d=2 and q=0. The model was then extended to 2012 by incorporating intervention terms in the model at 1988 and 2010 through auxiliary variables, the later period to account for the extraordinary boost in oil sardine landings.

The entire analysis was carried using SPSS software.

WHAT IS AN ARIMA MODEL?

In statistics and econometrics, and in particular in time series analysis, an autoregressive integrated moving average (ARIMA) model is a generalization of an autoregressive moving average (ARMA) model. These models are fitted to time series data (for e.g., fishery catches) either to better understand the data or to predict future points in the series (forecasting). They are applied in some cases where data show evidence of non-stationarity, where an initial differencing step (corresponding to the "integrated" part of the model) can be applied to remove the non-stationarity.

The model is generally referred to as an ARIMA(p,d,q) model where parameters p, d, and q are non-negative integers that refer to the order of the autoregressive, integrated, and moving average parts of the model respectively.

Valuation of Marine Fisheries of Kerala

This work was carried out by Dr. Shyam S. Salim, Fisheries Economist and Senior Scientist of CMFRI. The total unit value of marine fisheries for the period 1980 to 2012 (32 years; 8 years pre-ban) was used for data analysis. The valuation of the marine fish landings in Kerala was done during the period from 1980 to 2012 (33 years) representing 8 years of pre-ban period and 25 years of post-ban period. The valuation is based on the following formula.

$$\sum_{i=1}^{n} FVAL = \sum_{i=1}^{n} (FLAN.\ FUPR)$$

FVAL = Valuation of fish landings in Kerala

FLAN = Marine fish landings in Kerala

FUPR = Unit price realized in landing centre/ point of first sales

The data has been sourced from CMFRI[1], Kochi and published reports from DOF-GOK. The current / nominal valuation of marine fish landings were further deflated to the constant / real valuation using the price indices with 2004 as the base year. The valuation was done at two stages with and without oil sardine landing.

Growth rate of the Fishery: Growth rate was used to measure the past performance of economic variables. It was used to find out the trend in the valuation of landings landing during pre and post ban periods. The periods were divided into four, viz., pre ban (1980-88), post ban I (1989-1999) post ban II (2000-2005) and post ban III (2006-2011). The post ban period was divided into three to capture the effects of the regulation and because of the nature of phases in the trend line. The growth in valuation of the landings were analyzed by using the exponential growth function of the form,

$$Y = ab^t e_t \quad \ldots\ldots\ldots\ldots\ldots\ldots (1.1)$$

Where, Y= dependent variable for which growth rate was estimated

a = Intercept
b = Regression co-efficient
t = Time variable
e = Error term

The compound growth rate was obtained for the logarithmic form of the equation (1.1) as below.

$$\text{In } Y = \text{Ln } a + t \text{ Ln } b + \text{Ln } e_t \quad \ldots\ldots\ldots\ldots\ldots (1.2)$$

Then, the compound growth rate (r) was computed by using the relationship

$$r = (\text{Anti Ln of } b - 1) \text{ X } 100 \quad \ldots\ldots\ldots\ldots\ldots (1.3)$$

Exponential growth occurs when the growth rate of the value of a mathematical function is proportional to the function's current value. Exponential decay occurs in the same way when the growth rate is negative. In the case of a discrete domain of definition with equal intervals it is also called geometric growth or geometric decay (the function values form a geometric progression).

The exponential growth model is also known as the Malthusian growth model.

[1] Sathiadhas, R, Narayanakumar, R and Aswathy, N (2012) Marine Fish Marketing in India. CMFRI Kochi, Ernakulam. ISBN 978-81-901219-8-9

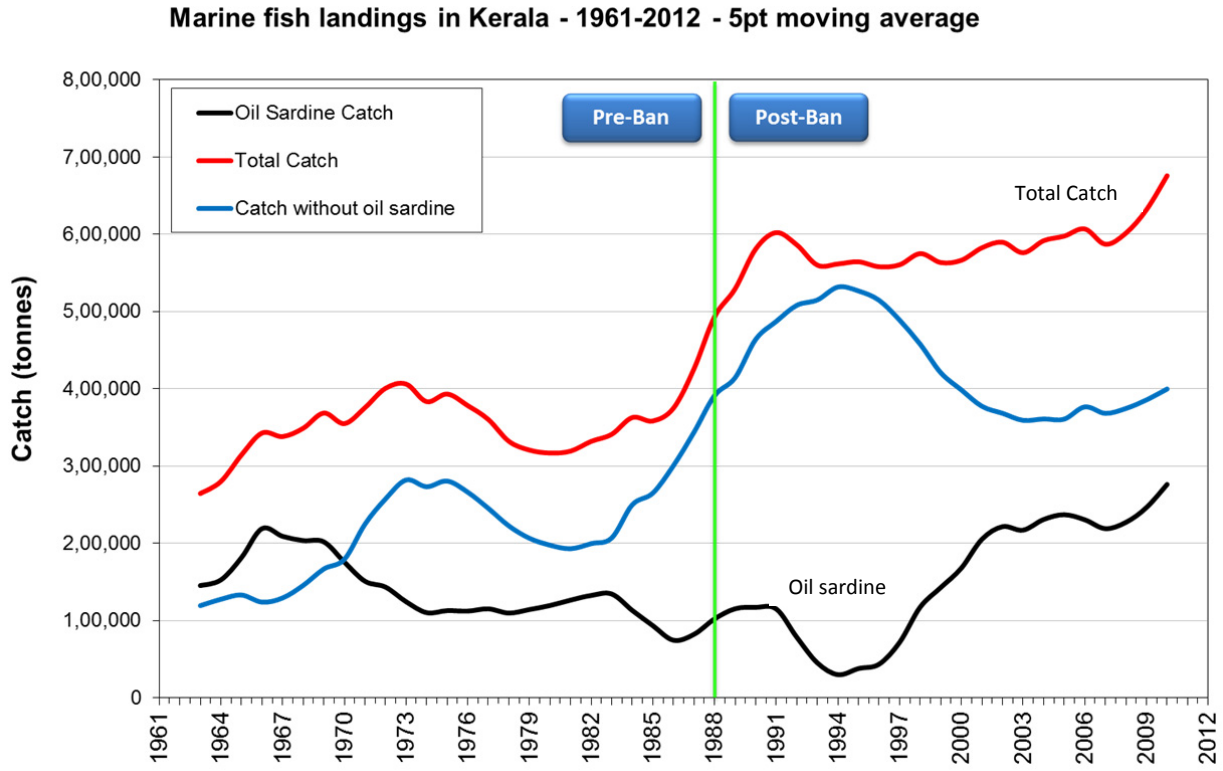
TOR #1

Evaluate how far the monsoon trawl ban imposed along Kerala coast for the last 25 years was beneficial in sustaining fish wealth of the state

Evaluating the effect of seasonal fishing ban on marine fish landings in Kerala through ARIMA intervention model

In Kerala the seasonal fishing ban was introduced in 1988 and is in effect for the past 25 years, although for differing periods in some years. Almost at the same period another significant intervention also took place by introducing crafts fitted with outboard engines and suitable gears especially ring seines which mainly catch small pelagics such as oil sardine. It is important to examine the effects of seasonal fishing ban on the marine fish landings in the state. In the current ARIMA interventional analysis the total marine fish landings, oil sardine landings and total landings excluding oil sardine during 1961 to 2012 (52 years) in Kerala were examined.

High pass filtering: A five point moving average of time series data on total marine fish landings, oil sardine landings and total landings excluding oil sardine were carried out and the plots were made. In the later period the behavior of both the filtered oil sardine series and total ladings have almost similar upward trend which is an indication that the influence of oil sardine landings on the total landings is very high especially in the later periods.



The plot of the series on total landings excluding the oil sardine landings has a shift immediately after the introduction of seasonal fishing ban and this positive peak persisted only for a short period (9 years) after which the catches came down and reached a steady level from 2000 but not to the level before implementation of ban. This indicates that the seasonal fishing ban had high impact in the initial years (for 10 years) but the impact was not sustained. Though there are two significant interventions almost in the same period, namely the seasonal ban and introduction of outboard crafts, the resource mainly targeted by the second intervention is oil sardine and hence the impact on the series on total landings excluding oil sardine can be fully attributed to the effect of seasonal fishing ban.

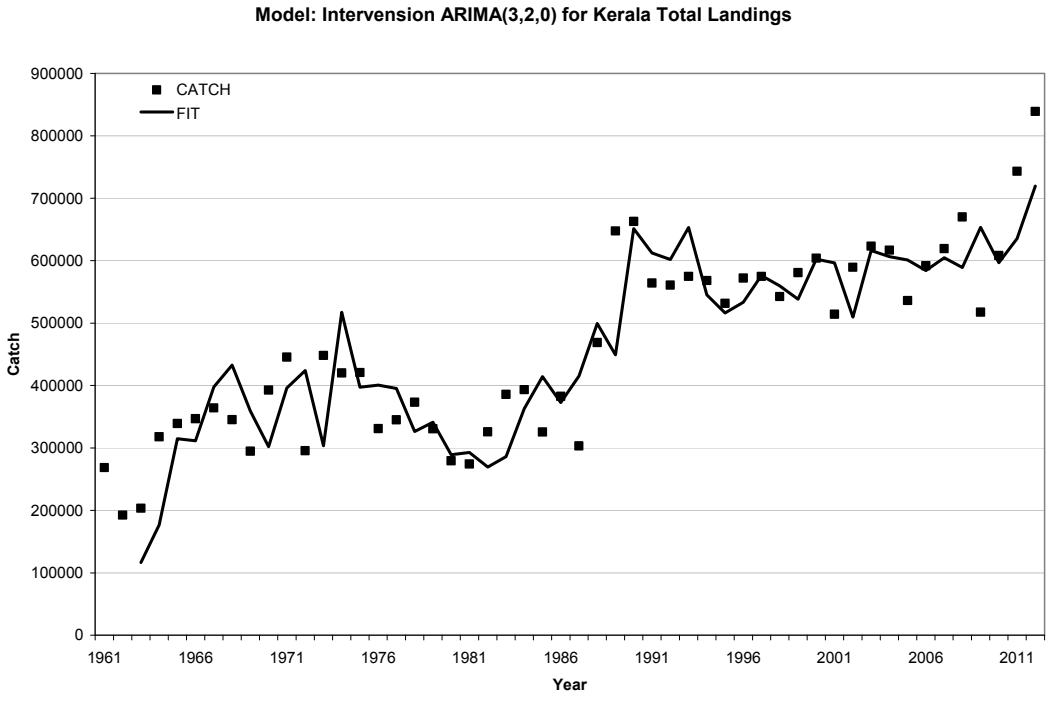
Details of the fitted models and parameters estimates are given in table below.

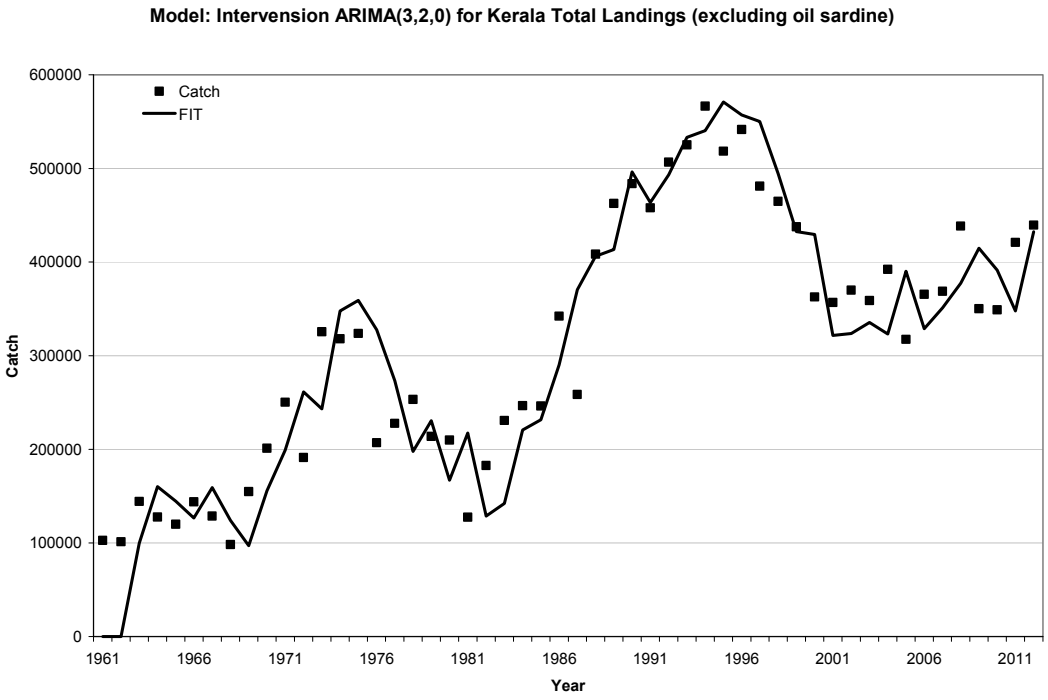
Series	**Total landings**			
Model:	ARIMA(3,2,0)		(73.5% fit)	
Interventions years			1988, 2010	
Parameter estimates and significance probability				
	B	**SE (B)**	**t-ratio**	**Probability**
ϕ_1	-0.95652	0.13622	-7.02198	0.00000
ϕ_2	-0.90014	0.14328	-6.28229	0.000001
ϕ_3	-0.51614	0.14217	-3.63047	0.000721
β_1	218391.5	63143.41	3.458658	0.001199
β_2	262187.6	98060.95	2.673721	0.010416
Series	**Oil sardine landings**			
Model	ARIMA(2,2,0)		(47.1% fit)	
Interventions years			1988, 2010	
Parameter estimates and significance probability				
	B	**SE (B)**	**t-ratio**	**Probability**
ϕ_1	-0.73480	0.11375	-6.4598	0.000000
ϕ_2	-0.57697	0.11391	-5.0650	0.000007
β_1	60875.97	50133.68	1.2143	0.230709
Series	**Total landings excluding oil sardine**			
Model	ARIMA(3,2,0)		(84.4% fit)	
Interventions year			1988	
Parameter estimates and significance probability				
	B	**SE (B)**	**t-ratio**	**Probability**
ϕ_1	-0.99797	0.12824	-7.7822	0.000000
ϕ_2	-0.75988	0.16605	-4.5761	0.000036
ϕ_3	-0.49793	0.13395	-3.7172	0.000545
β_1	117110.23	45343.01	2.5828	0.013048

The ARIMA intervention models fitted explained 73.5% of the variability in the time series on total landings, 47.1% of the variability in oil sardine landings and 84.4% of the variability in the series with total landings excluding oil sardine. In the selected models all the model parameters are significant except the intervention parameter β_1 in the case of oil sardine series. This indicates that the intervention model does not suit the oil sardine landings and the effect of seasonal fishing ban on oil sardine landings is not significant as oil sardine landings has its characteristic behavior especially some kind of a periodicity which resulted in its reduction in 1994 to just 14,000 tonnes from two lakh tonnes in the past and to 3 lakhs tonnes and above from 2010 onwards.

As per the model the estimated increase in total landings in Kerala due to the interventions in 1988 is about 2,18,000 tonnes which is a composite effect of both seasonal fishing ban and introduction of outboard engines with ring seines. The effect of outboard engines and ring seines can be separated from the total if we remove the oil sardine landings as ring seines mainly catch oil sardine. Thus the ARIMA intervention model applied to the time series data on total landings excluding oil sardine can be used to estimate the effect of seasonal fishing ban introduced in the state from 1988 onwards. As per this model the effect can be quantified as 1,17,000 tonnes per year.

- This analysis clearly indicates that there has been a positive impact on fishery yields (without oil sardine) in Kerala State due to the introduction of the trawl ban from 1988. However, the 5-point moving average graph unmistakably shows that the positive impact on fishery yields was present only up to 1997 (9 years), and thereafter, the fishery yields are declining, the net decline being more than one lakh tonnes after 2000. This indicates that the benefit in terms of yield was not sustained.





Valuation of Marine Fisheries of Kerala

The committee further wanted to examine whether the seasonal fishing ban from 1988 had an impact on the value of marine fisheries in Kerala. It also wanted to look at how far inflationary trends in the economy had an impact on the value of the fisheries and indirectly the incomes of fishermen. The analysis carried out by Dr. Shyam S. Salim, a Fisheries Economist and Senior Scientist of the CMFRI at Kochi revealed the following.

This brief analysis indicated that the total value of Kerala's marine fisheries has on an average increased by 17.3-times during the 25 year post ban period based on nominal prices. When the nominal value is considered without oil sardine catches the increase is to the tune of 17.4-times. This indicates that although the volume of catches of oil sardine is substantial, its unit value is very low. With deflated values (2004 base year) the increase in average value is 6.3 and 6.4-times respectively. Therefore, in deflated (real) terms, the increase in value of the landings is not substantial during the 25 year period.

Although the nominal values show a rising trend in recent years touching more than Rs. 4300 crores in 2011, in real terms, the value shows a decline from 2000 and from 2005 shows a marginal improvement, yet, it does not reach the peak value of 2000 in 2011.

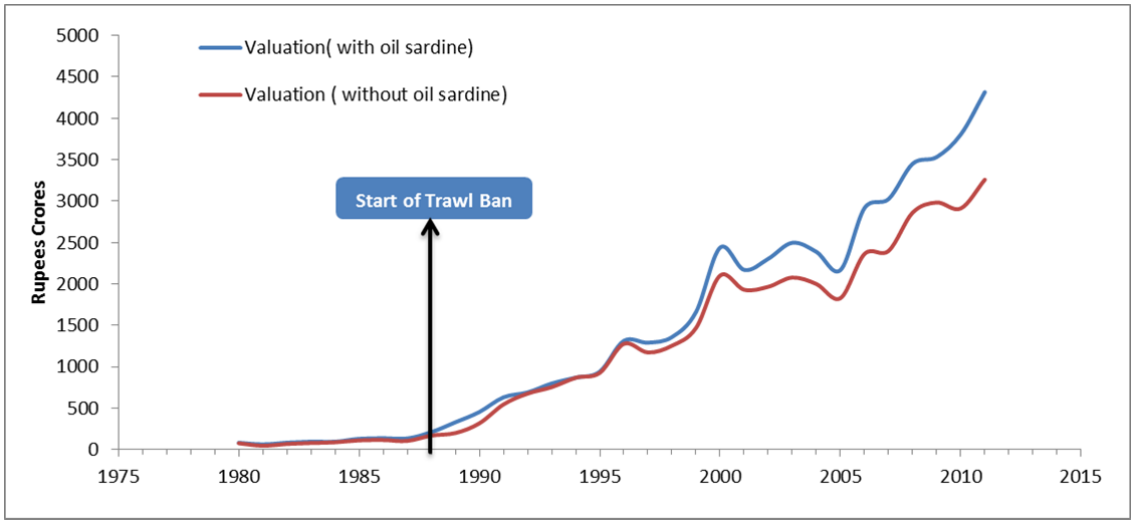


Fig. Trend in nominal value of Kerala's marine fisheries with and without oil sardine

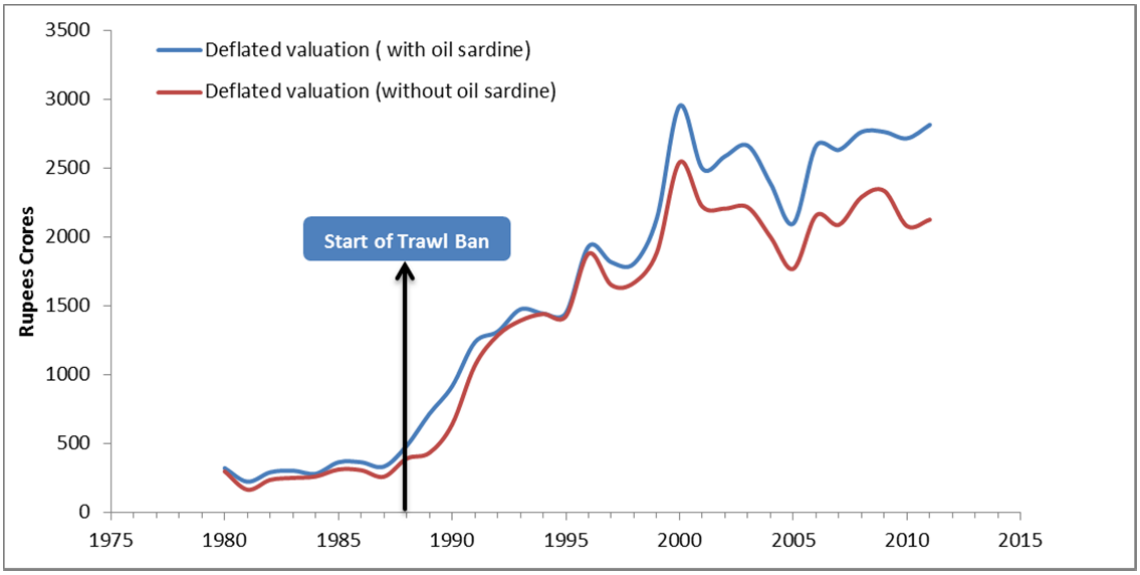


Fig. Trend in deflated value of Kerala's marine fisheries with and without oil sardine

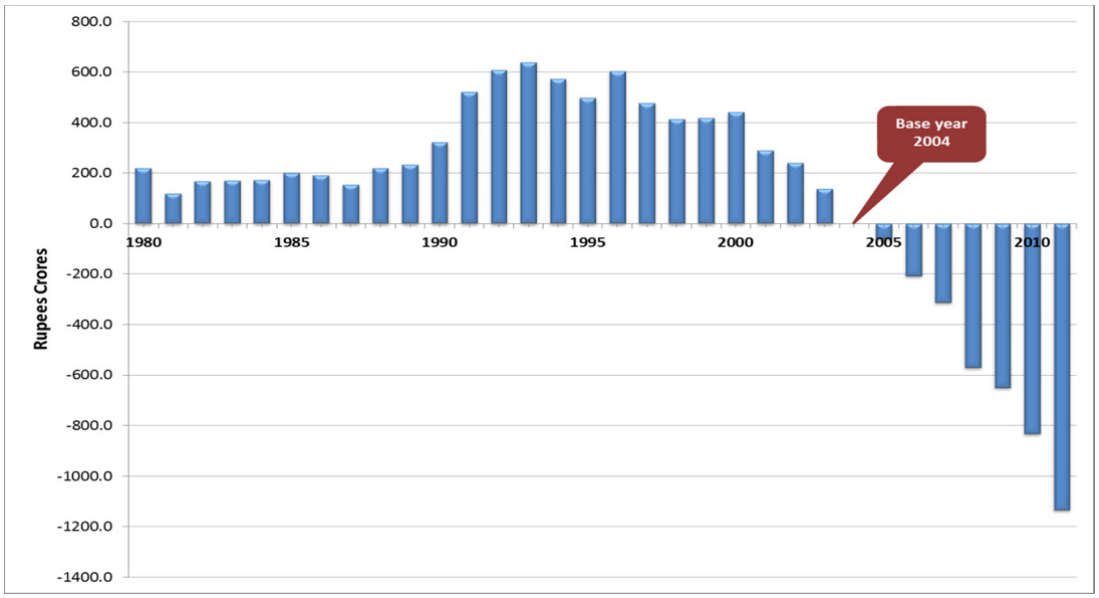


Fig. Anomalies between nominal and real (deflated) value of Kerala's marine fisheries. Deflation carried out with the base year as 2004.

With the base year as 2004, the difference between nominal and real values is shown in the above figure. Because of inflationary trends in the economy, from 2004 onwards, the difference has been negative and every year it shows an increase. In 2011, the difference between nominal and real value is nearly Rs. 1200 crores. During the post ban period from 1989 to 2000, the difference has been positive and the decline in difference starts post 2000.

Growth Rate of Value: The table below shows the compounded growth rate in the value of Kerala's marine fisheries during the pre-ban and 3 post-ban phases. The comparison has been made with and without oil sardine in the total value.

Period	Nominal valuation		Deflated valuation	
	Total	Without Oil Sardine	Total	Without Oil Sardine
1980-88	12.99	12.45	5.95	5.45
1989-99	15.73	19.15	9.61	12.85
2000-05	-0.63	-1.51	-5.05	-5.89
2006-11	7.93	6.58	1.07	-0.19

The growth rate shows an increase immediately after the ban was implemented for a period of 11 years, and thereafter, the growth rate has become negative in the next 6 years. In the deflated valuation without oil sardine, which actually reflects the status of the mechanized fisheries, the growth rate remains marginally negative even up to 2012. Therefore, it is quite evident that the trawl ban has initially helped in increasing the catches and value in the mechanized fisheries sector; however this advantage could not be sustained after about 10 years. After the initial spurt, the growth rates have turned negative in recent years.

In view of the above the committee concludes the following:

- The economic analysis indicates that in value terms the benefit of the trawl ban was present only up to the year 2000, after which there has been a decline in real value of the fisheries and ultimately incomes to fishermen in spite of increase in nominal value.
- The growth rate analysis also clearly indicates that growth rate in the mechanized sector is negative after the year 2000, and the benefit of the trawl ban was not sustained after 2000.
- Therefore, a hard, but necessary option would be to increase the duration of the trawl ban such that the benefit of the trawl ban in terms of yield and value is sustained.

TOR #2

Review the changes in fishing methods and practices and its influence in the sustainability of resources

Current Position of Kerala's Marine Fisheries

Kerala[2] which has a coastline of 590 km ranks first in marine fish production of India, contributing nearly 21% (8.39 lakh tonnes in 2012) to the total annual production. The export of marine products from the State earns valuable foreign exchange besides affording innumerable job opportunities in the industry. The total population of marine fishermen and their families has steadily increased over the years and stood at 6,10,165 in 2010 (Marine Fisheries Census, CMFRI, 2010). Kerala has been in the forefront of absorbing innovative and new technologies in fishing practices, which have led the marine fisheries sector to take a complex structure. The 1980s was an important period in the development of marine fisheries in Kerala. In the first half of the period the motorized sector grew rapidly and became the most important sector yielding the maximum catch in 1988. By that time, ring seine became very popular in exploiting the pelagic resources and replaced the boat seines to a very great extent. Huge size of the new net (450 to 1000 m long) and large number of crew (30 to 50) needed for its operation necessitated larger boats with high capacity outboard engines (3 outboard engines of 40 hp each). This facilitated extension of fishing grounds for the motorized sector. The fishing grounds covered by the mechanized sector also extended by increasing the boat size and fishing effort and efficiency through multi-day fishing during the late 90s.

During 2003-2012, the total marine fish production from Kerala varied from 5.18 lakh tonnes to 8.39 lakh tonnes, with an annual average landings of 6.37 lakh t. According to the CMFRI census 2010 there are 21,781 marine fishing crafts in Kerala, of which 11,175 (51.3%) and 4,722 (21.7%) crafts belong to the motorized and mechanized sector respectively and 5,884 (27%) constitute the traditional sector. The landings are mainly contributed by the mechanized (56%) and motorized (42 %) sectors.

In the mechanized / motorized sector, ring seines (4.68 lakh tonnes in 2012) is the major contributor to the landings followed by trawls (2.49 lakh tonnes in 2012). Other gears deployed by the fishermen include the gillnets, hooks and line, boat seines and purse seines. More than 800 species[3] are landed along the Kerala coast of which about 200 are commercially important and are classified as pelagics, demersals, crustaceans and cephalopods. The major pelagic resources include the oil sardine and lesser sardines, anchovies, mackerel, tunas, ribbonfishes and carangids. The major demersal fish resources include sharks, rays, threadfin breams, lizardfishes, sciaenids and soles. Penaeid and non-penaeid prawns, crabs, stomatopods and lobsters constitute crustacean resources while squids, cuttlefishes and octopus contribute to the cephalopod landings. Pelagic groups dominate the landings forming 73% followed by demersals (15%), crustaceans (6%) and molluscs (5%).

[2] Modified from Pillai, N G K, Vivekanandan, E, Ganga, U and Ramachandran, C (2009) Marine Fisheries Policy Brief-1. CMFRI Special Publication, 100. pp. 1-24.

[3] Zacharia, P U, Mohamed, K S, Sathianandan, T V, Asokan, P K, Krishnakumar, P K, Abdurahiman, K P, Durgekar, N R and Shettigar, V (2011) Alpha, beta and gamma diversity of fished marine taxa along the southwest coast of India during 1970-2005. Journal of the Marine Biological Association of India, 53 (1). pp. 21-26.

Source: CMFRI (2010)

Table. Important craft-gear combinations in marine fisheries of Kerala[4]

Craft	Fishing gear
Mechanised fleet	
1. Mechanised Trawlers Small (8.5-9.7 m LOA; 90 hp) Medium (9.7-16.7 m LOA; 100 -158 hp) Large (16.7-21 m LOA; 177 hp)	Shrimp trawls – 5 types Fish trawls – 3 types Cephalopod trawl – 1 type Gastropod trawl – 1 type
2. Mechanised Gill-netter-liner (9.7 – 21 m LOA; 110-140 hp)	Gillnets; longlines; handlines
3. Mechanised Purse seiner (15.2 – 16.7 m LOA; 110-156 hp)	Large mesh (45 mm) purse seines for tuna, seerfish, mackerel and carangids
Motorised (IBM or OBM) Traditional fleet	
4. Crafts with inboard engine (steel or wood hull; 18.3-25.8 m LOA; 90-140 hp)	Ring seines (18 mm mesh) for sardines and mackerel
5. Crafts with OBM (wood, steel, fibreglass hull); 12.2 to 21.3 m; 22+22 hp, 40+22 hp, 40+22+22 hp, 40+40+22 hp or 40+40+40 hp)	Ring seines (18 mm mesh size) for sardines, mackerel, carangids and prawns
6. Crafts with OBM (wood and fibreglass hull; 9.9-22 hp)	Ring seines (8-12 mm) for anchovies; Mini trawls; Gillnets; Hooks and lines; Encircling nets; Boat seines; Shore seines
Non-motorised traditional fleet	
7. Catamaran Plank canoe Dugout canoe FRP canoes	Encircling nets; Boat seines; Shore seines; Gillnets; Hooks and lines; Cast nets

[4] Pillai, N G K, Vivekanandan, E, Ganga, U and Ramachandran, C (2009) Marine Fisheries Policy Brief-1. CMFRI Special Publication, 100. pp. 1-24.

Stock Status

Catch data of a total of 19 species in Kerala were analysed (Table below). Nearly 37% of the species considered in Kerala were in healthy status (abundant or less abundant) and 47% were in declining status. In Kerala, the whitefish, *Lactarius lactarius* and the silver pomfret, *Pampus argenteus* were identified as depleted stocks as their recent average catch levels were between 10 and 6% of the historical maximum and *Arius* sp. was identified as a collapsed stock as its recent average catch level was only 0.7% (below 5%) of the long-term maximum catch.

Table: Recent average catch during 2003-2005 of different species as percentage of the historical maximum catch (baseline catch) during 1970-2002 in Kerala and stock status classification based on the method of Mohamed et al. (2010)[5]

Species/ Stock	Historical maximum catch (t)	Recent 3-year average catch (t)	% of maximum catch	Stock status
Scomberomorus commerson	8126	8167	100.50	Abundant
Sardinella longiceps	241411	235958	97.74	Abundant
Saurida sp.	14126	10841	76.75	Abundant
Cynoglossus sp.	27301	18759	68.71	Less abundant
Auxis spp.	9601	5670	59.05	Less abundant
Nemipterus sp.	55078	31396	57.00	Less abundant
Sphyraena sp.	9781	4335	44.32	Declining
Trichiurus sp.	31775	13242	41.67	Declining
Euthynnus affinis	25082	10053	40.08	Declining
Stolephorus sp.	55042	21217	38.55	Declining
Rastrelliger kanagurta	128411	46512	36.22	Declining
Chirocentrus dorab	1685	587	34.84	Declining
Hemiramphus sp.	3574	1152	32.22	Declining
Leiognathus sp.	18392	5014	27.26	Declining
Carcharhinus sp.	10338	2447	23.67	Declining
Lactarius lactarius	6663	481	7.22	Depleted
Pampus argenteus	2305	122	5.31	Depleted
Arius sp.	33526	234	0.70	Collapsed

According to Mohamed et al. (2010), the depleted and declining stocks (particularly those close to the threshold of depleted status like sharks) needs to be carefully monitored and its conservation and rebuilding plans need to be made. The majority of the depleted and collapsed stocks are those species which are mainly caught in trawls. As a first step for rebuilding stocks, trawl effort has to be reduced. Strict implementation of the legal cod-end mesh sizes in trawls would particularly help in preventing growth overfishing and restoration of stocks. It is expected that small and short-lived species could recover fast. However in the case of large and long-lived species such as the catfish, it

[5] Mohamed, K S, Sathianandan, T V, Zacharia, P U, Asokan, P K, Krishnakumar, P K, Abdurahiman, K P, Shettigar, V and Durgekar, N R (2010) Depleted and Collapsed Marine Fish Stocks along Southwest Coast of India – A Simple Criterion to Assess the Status. In: Coastal Fishery Resources of India; Conservation and Sustainable Utilisation. Meenakumari, B, Boopendranath, M R, Edwin, L, Sankar, T V, and Gopal, N and Ninan, G (eds.) Society of Fisheries Technologists, Cochin, pp. 67-76.

is nearly 25 years since the species has become depleted and collapsed. The catfish stocks appear to be improving in recent years, and care must be taken that recruitment overfishing is not allowed to happen again by restricting its capture during the breeding period by seiners.

Imported High Horsepower Trawler Engines

Until 2009, the maximum engine power available for fishing boats in India was 240 hp. The imported engines (mainly Chinese) entered the Indian fishing industry in 2009 to grab the market by launching a 240 hp Weichai engine. Fortunately for the engine dealers, the fishermen were aiming to increase the size and power of the boats due the compulsion from the crew who wanted to reach the fishing ground faster and come back with catch quickly and also due to competition. The Chinese first entered the market with 240 hp and slowly increased to 550 hp. Imported engines from other countries are also entering the market.

Table. Population and power range of Chinese engines in Kerala, Tamilnadu and Karnataka

Name of engine	HP@rpm	Approximate Number
Weichai	240 - 495 @ 2150	More than 800
Cinotruck	280 -510 @ 2150	>1200
Shanghai	240 -550 @ 2150	>200
Uchai	240 -550 @ 2150	> 250

Studies made by CIFT have revealed that the installing high power engine which is not comensurate with vessel size is inefficient and leads to waste of energy. The excessive speed at whch the trawling is carried out also leads to damage of netted fish/ shellfish leading to below normal price for resources caught with Chinese engine trawls. The ideal vessel size/engine capacity combination is given in the next section of this document.

FAD Based Cuttlefish Fishery

The practice of attracting egg laying cuttlefish to artificially provided structures (Fish Aggregating Devices – FAD) such as coconut spadix, and recently plastic bottles, is currently in vogue all along Kerala coast. This type of fishing is mainly done by Vizhinjam/ Kanyakumari based fishermen. Catch of cuttlefishes through this method is substantial amounting to several thousand tonnes in a year. Studies by CMFRI have shown that more than 99% of the pharaoh cuttlefish that is caught by this method are in ripe condition. They are caught mostly before they have a chance to lay eggs. Since some of these FADs are placed in trawling grounds, the FADs are also sometimes taken by the trawls resulting in the loss of thousands of unhatched devloping eggs. This is a double impact leading to severe recruitment overfishing and places severe stress on the pharaoh cuttlefish population.

- Based on CMFRI's advice on the negative impacts, the Government of Karnataka has banned FAD based cuttlefish fishery in 2012. It is therefore imperative that the DOF-GOK also bans this type of destructive fishing method urgently to conserve this valuable resource.

Stress to Marine Biodiversity due to Fishing

An impact study[6] in 2009 shows that fishing practices in Thiruvananthapuram district (Kollengode in the south to Kappil in the north) has stressed the fished taxa biodiversity of the region. This is primarily because the fishing practice in this southern district mainly targets higher trophic level fishes and because of the intense trawling in the Wadge Bank area west of the region. Furthermore, the number of fishers in the region is the highest among all districts of Kerala, leading to very high effort level. This study suggests the creation of a small Marine Protected Area (MPA) in the region to rebuild and conserve the biodiversity of the region. This would be the first fisheries MPA in the country and would serve as a path breaking model in fisheries conservation ultimately leading to benefits to fishers.

The stakeholder survey has indicated that fishermen and fishermen leaders are not in favour of establishing MPAs in the coastal fishing zones. This is mainly because of lack of awareness on the part of fishermen on the long-term benefits in terms of resource conservation and yields of MPAs.

- The committee recommends that MPA, which is a very successful passive form of fisheries management, would become necessary in the future years. But first, the fishermen have to made aware and educated with regard to the advantages of MPAs. Therefore, the DOF-GOK should initiate awareness campaigns, particularly in Thiruvanthapuram district in the next 5 years such that MPAs can be introduced within the next 10 years.

[6] Mohamed, K.S., T.V. Sathianandan, P.K. Krishnakumar, P.U. Zacharia, P.K. Asokan, K.P. Abdurahiman, R.N. Durgekar and V. Shettigar (2009). Biodiversity stressed fishing zones in Kerala and Karnataka and identification of marine protected areas. In: Marine Ecosystems Challenges and Opportunities, Book of Abstracts (Ed. E. Vivekanandan et al), Marine Biological Association of India, February 9-12, 2009, Cochin, p. 130-132.

TOR #3

Evaluate the length-power combinations of fishing vessels, suggested by the previous committees and offer practical recommendations

Fishing crafts: Length-power combinations of fishing vessels

Trawlers: Sustained sea speed for normal boat hulls is restricted by the speed length ratio. Speed length ratio of 1.10 to 1.25 is taken as the upper limit of sustained speed. In this speed length ratio, the engine power ranges from 90 hp to 140 hp for a 15m LOA trawler. Increasing the power beyond this will not result in a proportional increase in the speed and economic operation of the vessel in terms of fuel cost and initial investment. Based on these considerations, the dimensions and maximum allowable engine power recommended for different length classes of trawlers are given in Table below.

Table: Dimensions and maximum allowable engine horsepower for different length classes of trawlers

Sl. No.	Length (m)	Breadth (m)	Depth (m)	Maximum allowable main engine horsepower (MCR)
i.	Up to 15.00	Up to 4.70	2.40	140*
ii.	15.00 -17.50	4.60 – 5.20	2.40 – 3.00	200*
iii.	17.50 – 20.00	5.20 – 5.50	2.65 – 3.10	250*
iv.	> 20.00	> 5.25	> 3.0	> 250**

***Permitted for operation beyond the specified area vide G.O.(P) 29/86/F&PD dated 14.03.1986*
***Operation beyond territorial waters.*

Purse Seiners: Purse seining is an active fishing method which involves operation of gear having a length of 1000-1200m and depth of 90 – 100m in the deep sea. Propulsion is required for reaching and returning from fishing ground and for operation of the gear. In the case of purse seine operations, speed during encircling operations is important for the success of fishing, along with other factors such as sinking speed of the seines. A higher speed length ratio is desirable in purse seiners, for speedy and successful encircling operations. Based on these considerations, the dimensions and maximum allowable engine power recommended for different length classes of purse seiners are given in Table below.

Table: Dimensions and maximum allowable engine horsepower for different length classes of purse seiners

Sl. No.	Length (m)	Breadth (m)	Depth (m)	Maximum allowable main engine horsepower (MCR)
i.	Up to 15.00	Up to 4.60	2.40	190*
ii.	15.00-20.00	4.60-5.50	2.40-3.20	240*
iii.	> 20.00	> 5.25	> 3.00	> 240*

** Operation beyond territorial waters.*

Gillnetters and longliners: Gillnetting and long lining are a passive method and propulsion is used for reaching the fishing ground, deployment of the gear and return to the base. Advantages of optimum speed length ratio could be used effectively for maximizing operational economics. Based on these considerations, the dimensions and maximum allowable engine power recommended for gillnetters and long liners are given in Table below.

Table: Dimensions and maximum allowable engine horsepower for different length classes of mechanized gillnetters

Sl. No.	Length (m)	Breadth (m)	Depth (m)	Maximum allowable main engine horsepower (MCR)
i.	Up to 15.00	Up to 4.60	Up to 2.40	Up to 90*
ii.	15.00-20.00	4.60 – 5.50	2.40 – 3.20	140*
iii.	> 20.00	> 5.25	> 3.00	>140**

***Permitted for operation beyond the specified area vide G.O.(P) 29/86/F&PD dated 14.03.1986*
***Operation beyond territorial waters.*

Longliner-cum-Trawlers: This category of vessels are intended for both trawling and long lining, one an active and the other a passive type of fishing. Many longliners which have been recently introduced under conversion schemes supported by the government agencies are, during the off-season for long lining, operating as trawlers. In such cases, higher installed engine power would be required and maximum value can be as for trawlers.

Table: Dimensions and maximum allowable engine horsepower for different length classes of longliner-cum-trawlers

Sl. No.	Length (m)	Breadth (m)	Depth (m)	Maximum allowable main engine horsepower (MCR)
i.	Up to 15.00	Up to 4.70	2.40	140*
ii.	15.00-17.50	4.60 – 5.20	2.40 – 3.00	200*
iii.	17.5 – 20.00	5.20 – 5.50	2.65 – 3.10	250*
iv.	> 20.00	> 5.25	> 3.00	> 250**

**Permitted for operation beyond the specified area vide G.O.(P) 29/86/F&PD dated 14.03.1986*
*** Permitted for operation outside territorial waters*

Ring seiners: The Expert Committee for Registration of Fishing Vessels (Kurup et al., 2009) has given recommendations for standardization of ring seine craft and gear which are subscribed by the present Committee. The recommendations are as follows:

Table: Dimensions and maximum allowable engine horsepower for different length classes of ring seiners

Sl. No.	**Length (m)**	**Breadth (m)**	**Depth (m)**	**Maximum allowable main engine horsepower** (MCR)
i.	Sardine/mackerel			
	<20 m	Up to 4.70	2.40	<65 hp
ii.	Anchovy			
	15.00-17.50	4.60 – 5.20	2.40 – 3.00	25 hp
iii.	17.5 – 20.00	5.20 – 5.50	2.65 – 3.10	250*
iv.	> 20.00	> 5.25	> 3.00	> 250**

Recommendations

It is quite clear that many vessels conducting fishing operations in Kerala would not meet the vessel length- engine power combinations set out above. This is a process which would take time to achieve. Very recently the introduction of very high horse power engines of Chinese origin in the trawl sector has been considered by fishing gear experts as an unnecessary and inefficient intervention. The engine power is far in excess of that required for the length class of the vessel. These operations bring in catches which are damaged due to the high speed and pressure of the net drag, and currently in the landing centres, a separate lower than normal pricing structure has emerged for catch from high speed boats. In the neighboring state of

Karnataka, it has also led to conflicts among mechanized fishermen (between purse seine and trawl operators), which ultimately has been resolved by restricting the operations of high speed vessels to beyond 30m depth.

Similar extraordinary increase in vessel size and engine capacity is also prevalent in the ring seine fishery. Such interventions have come about due to the intense competition among fishing vessels for getting higher catches to make their operations profitable. This is the phenomenon of too many people chasing the same fish. In the light of the above this Committee recommends the following.

- The length-power combinations given in this report should be incorporated as an amendment in KMFRA rules and serve as a guideline for the DOF-GOK for the future.
- DOF-GOK should declare moratorium on new vessel construction. New vessel construction if permitted by the DOF-GOK should follow the norms set herein.
- In course of routine inspections of vessels and vessel registrations, the DOF-GOK should issue advisory notes to the vessel owners if they are violating the set norms and ask them to comply with regulations within a period of 5 years failing which registrations are liable to be cancelled. This time allowance is given considering the investments made by the fishermen and the time for reasonable returns from investments.

TOR #4

Suggest administrative and regulatory measures for the sustainable development of fisheries in the state

Stakeholder Views

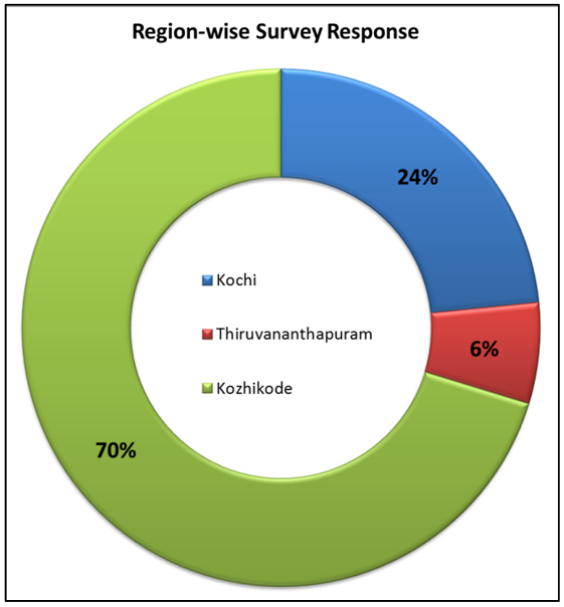
Stakeholder consultations and interactions were held at the following dates and locations:

Location	Place	Date	Number of people attending
Kochi	CMFRI Meeting Hall	14-01-2013	49
Thiruvananthapuram	Vikas Bhavan Hall	22-01-2013	36
Kozhikode	Nalanda Hall	05-02-2013	54

The questionnaire/ schedule prepared contained a total of 55 questions under the following sections:

- General opinions on fishery regulations
- Evaluation of trawl ban
- Agreement to previous committee findings/ recommendations
- Opinion on new regulatory measures and concepts proposed by present committee

The questions were made in as simple a manner as possible with only YES/NO answers. Additional space was provided for detailed comments. The forms were provided to stakeholders after translation into Malayalam. It was assessed that it would take approximately 20 minutes to fill in the form. A sample form in English is provided in Table. Many stakeholders, particularly those representing groups and associations opined that they would submit the filled forms after a few days as they needed to have wider consultations on certain views. However, in general, return of filled-in forms was poor. Almost all the stakeholders responded when given an opportunity to speak briefly on their opinions and all proceedings were video recorded and made available in this report in CD form in the Annexure. Maximum response of stakeholders was form Kozhikode.



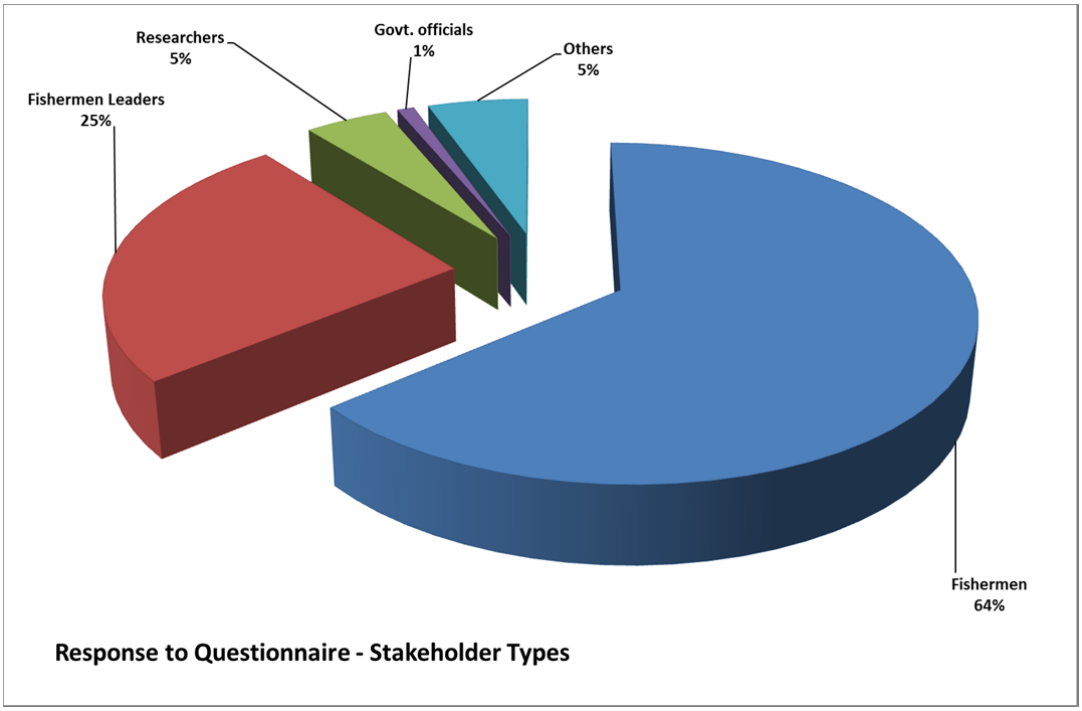


Table: Questionnaire distributed among stakeholders

No	Questions
	General Opinions
1	Are you engaged in fishing after completing 60 years
2	Are laws and regulations essential in fisheries sector
3	Are the acts and rules of KMFR Act 1980 sufficient to sustain the fishery wealth of coastal waters of state
4	Are time-to-time modifications required in KMFR Act
5	Have you noticed change in fish availability in last 10 years
	Evaluation of trawl ban
1	Have you heard about the monsoon trawl ban implemented along Kerala coast since 1988
2	If yes, is it good
3	Should the trawl ban be continued in the present form
4	Should the tenure of trawl ban be extended
5	If yes, what period
6	Do you feel that the trawl ban has helped in increasing fish production
7	Has the trawl ban helped in sustaining the fish wealth
8	Should there be controls for use of ring seiners (OBM & IBM)
9	Is the Kerala Monsoon Fishing (Pelagic) Conservation Act 2007 sufficient for conservation of pelagic resources
10	Is trawl ban is acceptable to you
11	Which sector in fisheries is badly affected by trawl ban - trad (T)/motor (MO)/mech (ME)/other (O)
12	Those affected are engaged in - BW fishing/ IBM/ OBM/ Trad boat (TB)/ Ancillary (AN)

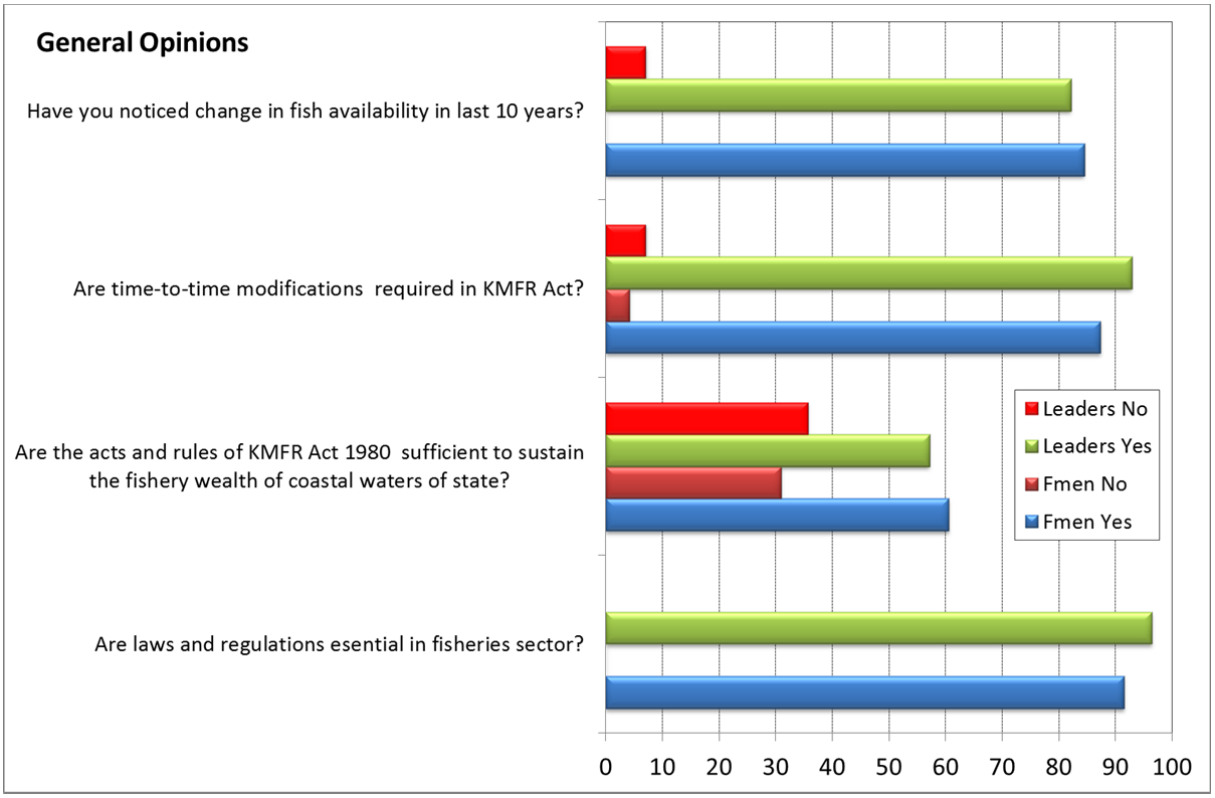
13	Is the free ration made available to fishermen and their families enough during trawl ban
14	After the trawl ban has the number of species caught increased
15	Has the landing of commercially important species increased after trawl ban
	Evaluation of major finding and recommendations of former expert committees
1	The finding that 25 years of trawl ban has been helpful to environment, benthos and fishes is correct
2	Do you agree that the fish wealth and annual per capita earning of fishers increased due to trawl ban
3	Do you agree with the recommendation that small pelagics can be fished with ring seiners during ban period
4	Do you agree with the recommendation that the present number of trawlers and ring seiners operated along Kerala coast should be limited
5	Do you agree with the recommendation of decommissioning the mechanized/ motorized fishing crafts more than 20 years old
6	Do you agree with the recommendation of decommissioning the mechanized/ motorized fishing crafts more than 10 years old
7	Do you agree with the recommendation of strictly restricting replacement eligibility of fishing crafts to bonafide fishermen/fishermen group
8	Do you agree with the recommendation of all the new fishing crafts construction shouldbe with prior approval from fisheries department
9	Do you agree that IBM ring seiners are more efficient than OBM ring seiners with respect to operational economics and environmental impacts
10	Do you agree that existing OBM ring seiners shall be permitted to convert to IBM ring seiners in course of time
11	Do you agree with the recommendation that IBM ring seiners shall be allowed to fish only in coastal waters beyond 10 m depth
12	Do you agree with the recommendation that mini trawls should be banned from operation in Kerala
13	Do you agree with the suggestion of constituting Village- District -State Level Councils for the sustainability of Fisheries
14	Do you agree that small mesh seine nets should be regulated
	Fishing implements, methods and control measures - Newly proposed
1	Trawlers should be prohibited in inshore waters
2	Ring seiners should be prohibited in inshore waters
3	Mini Trawlers should be prohibited in inshore waters/backwaters
4	Stake net should be prohibited in inshore waters/backwaters
5	Is the fuel subsidy given to various fishing craft s sufficient
6	Do you agree for raising fuel subsidy for fishing
7	Do you agree with the concept of establishment of Marine Protected Areas in selected fishing areas for the long -term sustainability
8	Are you agree with restricting the state's control of fishing to territorial waters of 12 nautical miles
9	Should this limit be extended
10	Whether the law and regulations in fishing sector are implemented strictly at present
11	Do you agree with the concept of buy-back of fishing crafts from fishers with compensation for reducing fishing effort
12	Is it good for the fisheries sector to cancel the license fishing crafts if found violating the marine fishing rules and regulations
13	Do you feel that the fishing boats are equipped with enough primary sanitary/sleeping facilities for fishermen
14	Do you feel that the size of the fish hold has to be limited
15	Do you agree that there should be control on craft size and engine horsepower
16	Do you feel that excess fishing craft operated in inshore waters be diverted for deep sea fishing
17	If yes, do you feel the present programmes for deep sea fishing are sufficient
18	Do you feel that small fishes are destroyed during coastal and deep sea fishing

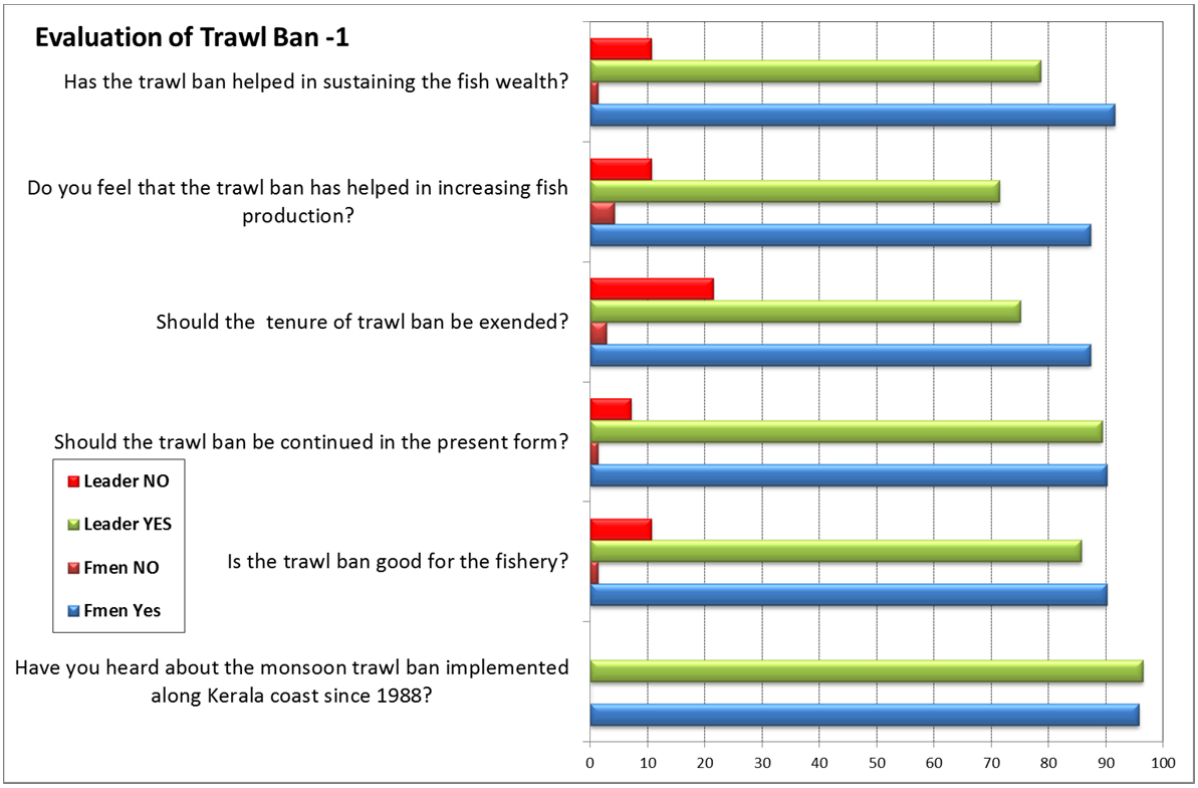
19	Should technical skill certification be made mandatory for drivers of fishing vessels
20	Are restrictions or regulations necessary for neighboring states fishing crafts operated along Kerala coast
21	Do you feel that uncontrolled reclamation of estuarine and backwaters areas affect the sustainability of aquatic resources

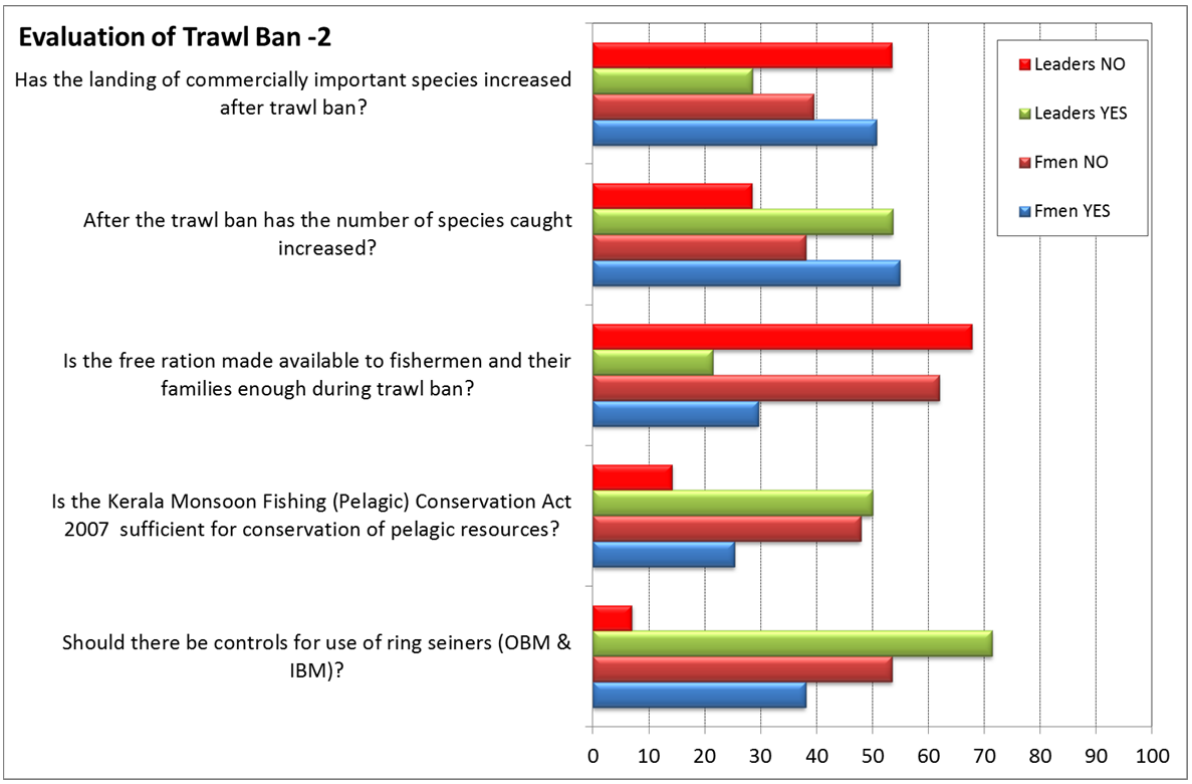
Fishermen responded maximally to the questionnaire (64%), followed by fishermen leaders (25%) which also included trade union leaders and fishermen association office bearers. Others, such as researchers (students and scientists), government officials and NGOs formed 11%.

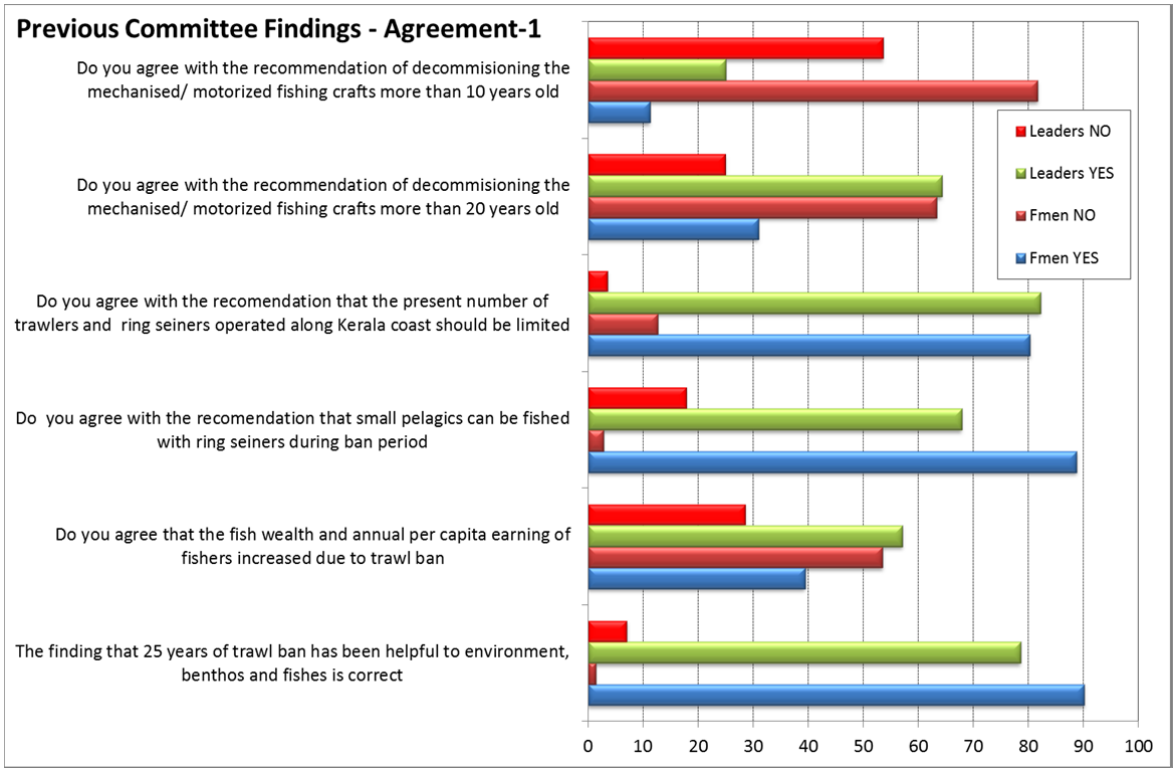
The filled-in forms were consolidated in an Excel sheet and then made into bar charts for analysis and interpretation. The grouped results in percentage are shown separately for fishermen and fishermen leaders, as in some cases, there were small differences in the reponses. These responses form the basis for the subsequent drafting of the committee's report.

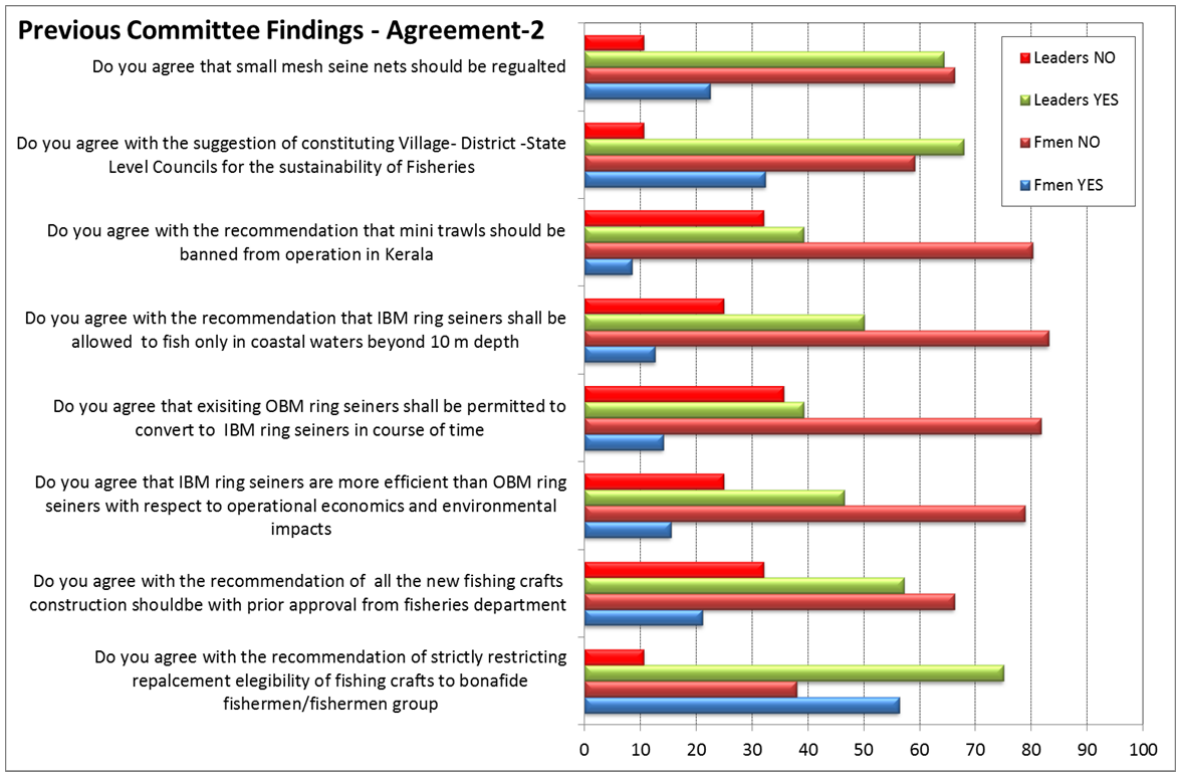
Set of 8 charts showing stakeholder responses (Questions to be read from bottom of chart to top)

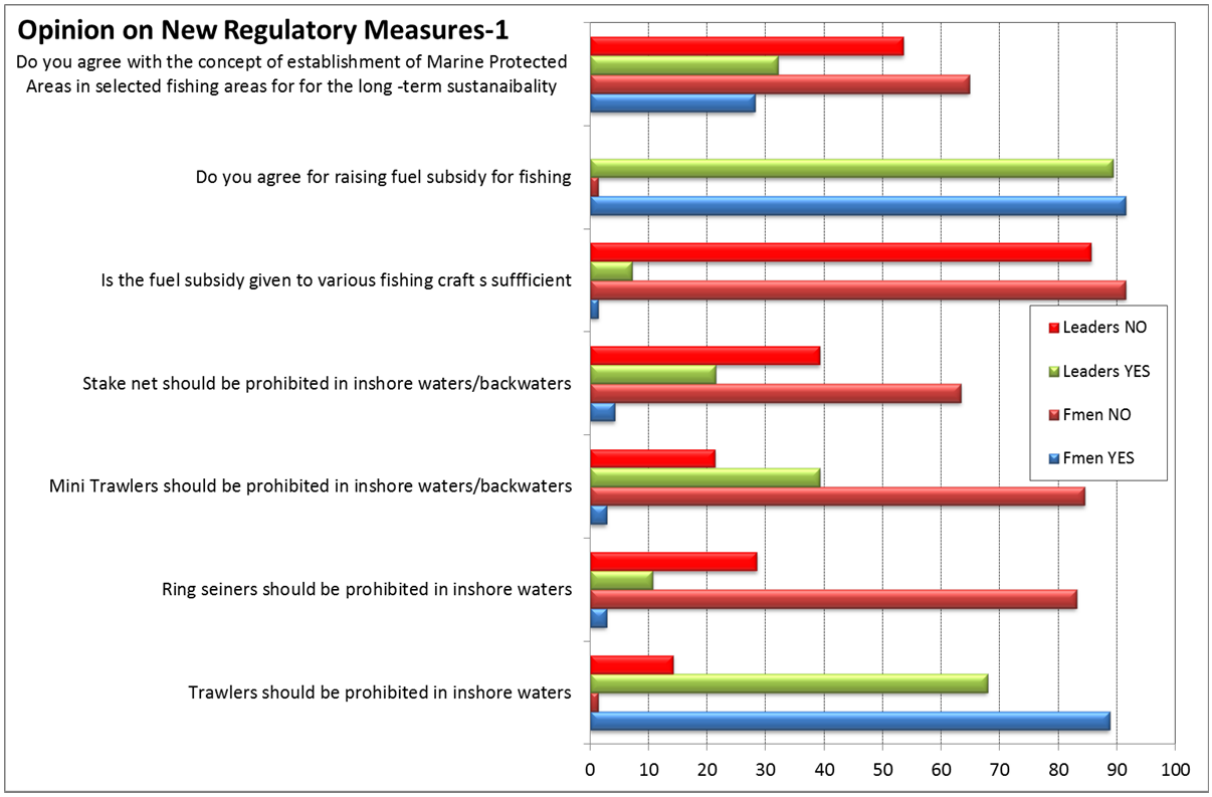


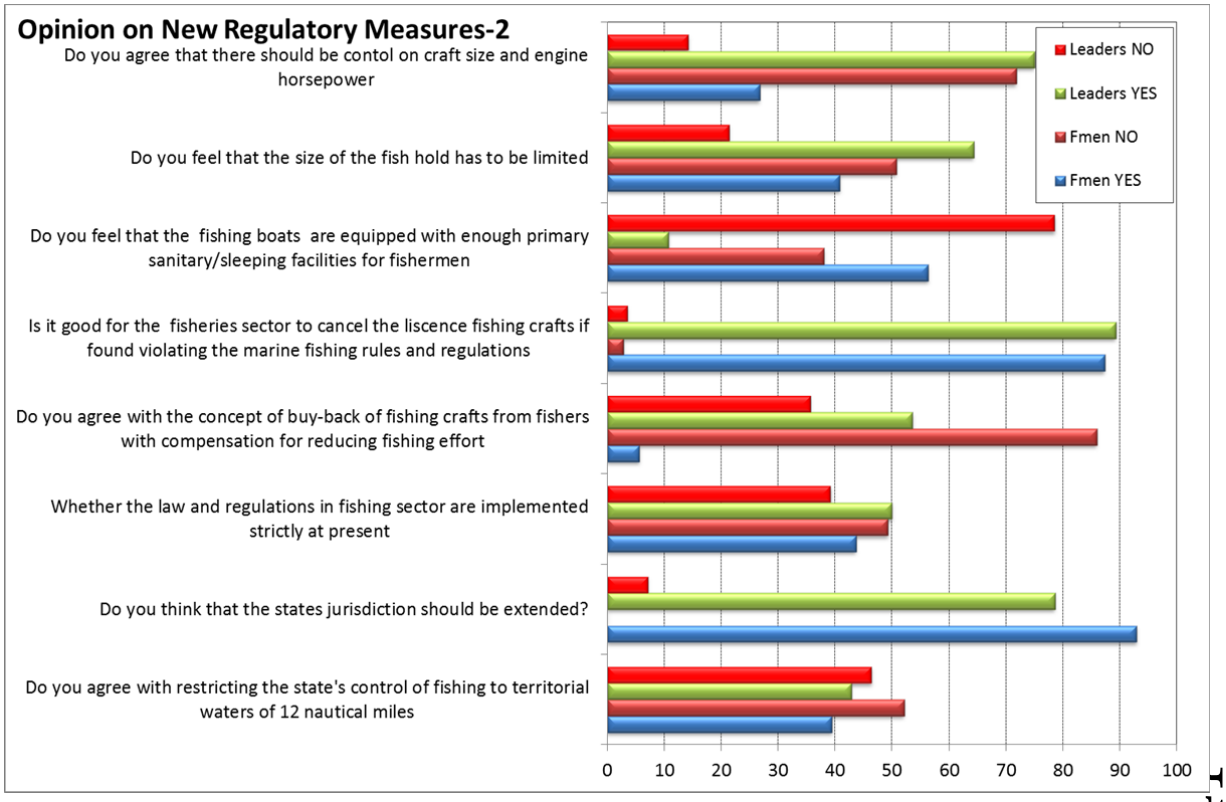

Evaluation of Trawl Ban -1
Has the trawl ban helped in sustaining the fish wealth?
Do you feel that the trawl ban has helped in increasing fish production?
Should the tenure of trawl ban be exended?
Should the trawl ban be continued in the present form?
Is the trawl ban good for the fishery?
Have you heard about the monsoon trawl ban implemented along Kerala coast since 1988?
Leader NO
Leader YES
Fmen NO
Fmen Yes
0 10 20 30 40 50 60 70 80 90 100

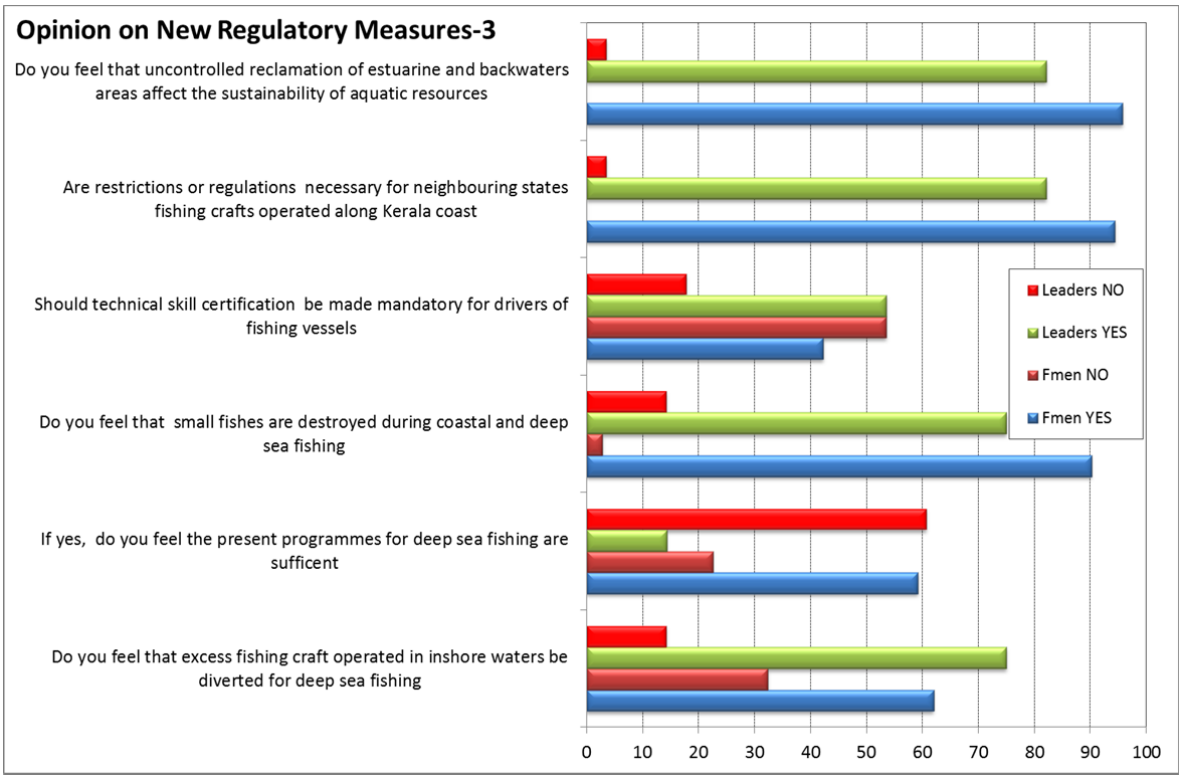

Evaluation of Trawl Ban -2
Has the landing of commercially important species increased after trawl ban?
After the trawl ban has the number of species caught increased?
Is the free ration made available to fishermen and their families enough during trawl ban?
Is the Kerala Monsoon Fishing (Pelagic) Conservation Act 2007 sufficient for conservation of pelagic resources?
Should there be controls for use of ring seiners (OBM & IBM)?
Leaders NO
Leaders YES
Fmen NO
Fmen YES
0 10 20 30 40 50 60 70 80 90 100


Previous Committee Findings - Agreement-1
Do you agree with the recommendation of decommisioning the mechanised/ motorized fishing crafts more than 10 years old
Do you agree with the recommendation of decommisioning the mechanised/ motorized fishing crafts more than 20 years old
Do you agree with the recomendation that the present number of trawlers and ring seiners operated along Kerala coast should be limited
Do you agree with the recomendation that small pelagics can be fished with ring seiners during ban period
Do you agree that the fish wealth and annual per capita earning of fishers increased due to trawl ban
The finding that 25 years of trawl ban has been helpful to environment, benthos and fishes is correct
Leaders NO
Leaders YES
Fmen NO
Fmen YES
0 10 20 30 40 50 60 70 80 90 100


Previous Committee Findings - Agreement-2
Do you agree that small mesh seine nets should be regualted
Do you agree with the suggestion of constituting Village- District -State Level Councils for the sustainability of Fisheries
Do you agree with the recommendation that mini trawls should be banned from operation in Kerala
Do you agree with the recommendation that IBM ring seiners shall be allowed to fish only in coastal waters beyond 10 m depth
Do you agree that exisiting OBM ring seiners shall be permitted to convert to IBM ring seiners in course of time
Do you agree that IBM ring seiners are more efficient than OBM ring seiners with respect to operational economics and environmental impacts
Do you agree with the recommendation of all the new fishing crafts construction shouldbe with prior approval from fisheries department
Do you agree with the recommendation of strictly restricting repalcement elegibility of fishing crafts to bonafide fishermen/fishermen group
Leaders NO
Leaders YES
Fmen NO
Fmen YES
0 10 20 30 40 50 60 70 80 90 100


Opinion on New Regulatory Measures-1
Do you agree with the concept of establishment of Marine Protected Areas in selected fishing areas for for the long -term sustanaibality
Do you agree for raising fuel subsidy for fishing
Is the fuel subsidy given to various fishing craft s suffficient
Stake net should be prohibited in inshore waters/backwaters
Mini Trawlers should be prohibited in inshore waters/backwaters
Ring seiners should be prohibited in inshore waters
Trawlers should be prohibited in inshore waters
Leaders NO
Leaders YES
Fmen NO
Fmen YES
0 10 20 30 40 50 60 70 80 90 100


Opinion on New Regulatory Measures-2
Do you agree that there should be contol on craft size and engine horsepower
Do you feel that the size of the fish hold has to be limited
Do you feel that the fishing boats are equipped with enough primary sanitary/sleeping facilities for fishermen
Is it good for the fisheries sector to cancel the liscence fishing crafts if found violating the marine fishing rules and regulations
Do you agree with the concept of buy-back of fishing crafts from fishers with compensation for reducing fishing effort
Whether the law and regulations in fishing sector are implemented strictly at present
Do you think that the states jurisdiction should be extended?
Do you agree with restricting the state's control of fishing to territorial waters of 12 nautical miles
Leaders NO
Leaders YES
Fmen NO
Fmen YES
0 10 20 30 40 50 60 70 80 90 100



The views of the fishermen and fishermen leaders are clearly evident from the charts. In general, both fishermen and fishermen leaders welcomed more regulations and control on the marine fisheries of the state by the government. They were also in favour of fining/ punishing those fishermen who were violating the rules. It appears that for protecting their rights and their future, the marine fishermen of the state were in favour of more effective state regulations and control over them and the resources they are exploiting. On the other hand, presently, the state does not have sufficient rules and regulations in the present act to effectively regulate the fisheries. And, to further compound the situation, the existing rules were not being effectively implemented in full.

The proposals contained in this report almost always take the stakeholder view into account while drafting the final recommendations.

The Kerala State's objective is to conserve and utilize marine resources in a sustainable manner, as fishes are significant renewable resources in its territorial sea and exclusive economic zone. The suggested vision statement for the development of Kerala's marine fisheries is shown in Box. As many as 11 lakh people (3.3% of total population) are dependent on marine fisheries as livelihood; and it contributes to 1.2% of the State's GDP. Fisheries are also a key part of the nutritional security of the State's population as the per capita fish consumption is 27 kg which is 3 times the national average and 63% higher than global average.

Suggested Vision Statement for Kerala's Marine Fisheries

To maintain in a sustainable manner the marine fishery yields from the presently exploited continental shelf of the state and to increase production through exploitation of deep sea resources.

The goal of fisheries management is to maximize the economic opportunities and benefits from the State's waters within sustainable harvesting limits. According to the FAO, fisheries monitoring, control and surveillance (MCS) is the most critical facet to achieve this goal.

A brief definition of MCS as per the FAO and its status in the State is given below:

Monitoring:	The continuing requirement for the measurement of fishing effort characteristics and catches	*Being continuously done by CMFRI and data now accepted by the MoA-GOI as official statistics. The mechanism existing for its collection in the State can be dispensed with and redeployed in surveillance*
Control:	The legal framework within which the resource must be exploited, *i.e.*, management schemes	*KMFRA exists but needs modifications*
Surveillance:	Those measures required to ensure compliance with the regulations formulated under 'control'	*Virtually non-existent; needs to be strengthened*

MCS involves:

a) Data collection and analyses for both operational planning and execution, as well as management planning, defined as monitoring (M);
b) Involvement in the participatory management planning to include discussions on appropriate implementing mechanisms;
c) Development and approval of appropriate and enforceable legislative instruments and control mechanisms such as licenses, permitted fishing gear, seasons, vessel sizes, fish sizes, species, catch limits, by-catch limits, and area controls, or other restrictions to support the management plan, referred to as the control mechanisms (C); and
d) Implementation of the plan through "preventive" and "deterrent" MCS techniques, included in the idea of surveillance (S).

Unfortunately, not all fisheries administrators understand MCS, or its critical role as an implementing mechanism for fisheries management. Some view arrests as the only relevant indication of the effectiveness of MCS efforts. The real indicator for MCS is the level of compliance, and this is governed by many factors, e.g. the number of fishers; the number of vessels; effort and area coverage of patrols; results of patrols, increase in voluntary compliance, etc.

The MCS components are examined one by one and recommendations are bulleted.

Monitoring

The necessity of fisheries data cannot be overemphasized. Reliable and timely data on fish catch and effort are essential for managing sustainably these renewable, yet exhaustible, natural marine fish resources. Since it deals with a human food source, and because it is concerned with nutritional security of the people, such data are also essential for the state to develop effective control measures and to formulate policies which have an impact on the lives of all people of the state, particularly the stakeholders.

The DOF has a Statistics Wing comprising of DD (2) and several RO for collection of statistics from both inland and marine production sectors. It is well known that the national fisheries institute CMFRI also collects fish landing and effort data in all maritime states of the country using a time tested and statistically sound method. This data which has high taxonomic resolution (more than 800 species in the case of Kerala) and fine spatial coverage (landing centre/village/zone) is available as a monthly time series from CMFRI. All the committees constituted by the GOK since 1970s to study the fish wealth of the state have relied on CMFRI database for analysis and interpretation.

- In the light of the above, this committee recommends that the DOF-GOK enter into a MOU with CMFRI to get the data on catch and effort from CMFRI on an annual/regular basis as and when the year's data becomes available. If necessary, annual fees for the data may also be paid to CMFRI as a matter of professional courtesy and to help the data collection process.
- The Statistics Wing may focus on collection of inland and aquaculture data.

Control

The legal framework within which the resource must be exploited, *i.e.*, the regulatory acts, rules and management plans. The KMFRA is in existence since 1980 and needs great many amendments to make it a more effective legislative tool. The amendments and changes to KMFRA recommended in the light of the stakeholder survey are given below.

Registration & Licensing

The DOF with the help of the MoA-GOI has been addressing the issue of registration of fishing crafts and a separate expert committee of the GOK has recently (2009) submitted a report. While, this excellently prepared report should form the basis for future actions by the DOF, the following additional points may also be taken into consideration.

- Currently blanket licensing is done for fishing; however, this should change to licensing for gears following legal dimensions and mesh sizes. This may be introduced by making necessary amendments in the KMFR Act. The DOF-GOK should introduce a system by which all fishing gears have a permanent DOF mark or stamp indicating its legal status following KMFRA. The license should be valid for 2 years and should be given only after inspection of gears possessed by the MEW.
- A registered fishing vessel can if necessary possess up to 2 licenses. For e.g., one for trawling and another for gillnetting. However no vessel should possess more than 6 licensed gears (for e.g., 3 trawl nets and 3 gillnets or 6 trawl nets).
- At present provisions exist for in KMFR Act for enforcing fine and forfeiting the vessels in case of violations. Provision for temporary cancellation of license may also be included in the KMFRA by making necessary amendments.
- No new fishing vessels should be introduced without the permission of the DOF-GOK.

Ideally.....

a fishing vessel operating in the Arabian Sea off Kerala should be registered (registration prominently displayed); should be possessing only DOF marked legal gears and should have only fishermen possessing valid identity cards.

Setting Fisheries Management Area

Management of fish stocks, and the advisories provided by CMFRI for this purpose, are primarily based on the MSY concept. Here, it is assumed that the stock under management is taken from the State's waters and landed in the State's fishing ports. If stock exploited is from another neighbouring state or if Kerala state's stock is caught and landed at other state's fishing ports, it leads to erroneous estimates of MSY, making the whole exercise infructuous.

- In the light of the above, registration and license for other states vessels should be restricted, and if given, should be at high cost (in order to discourage the practice) with the condition that catch is landed only in Kerala fish landing centres.

- The coastal waters off Kerala, up to the legal jurisdictional limit, should be declared as Kerala Fisheries Management Area (KFMA). And, in the case of specific, characteristic and unique fisheries, such as clam fisheries in an estuarine system or the artisanal fisheries off Thiruvananthapuram coast, specific management areas need to be set. Once the area is specified, the specific rules can become applicable to the management area. Thus fisheries management becomes more local and regional which is one of the basic tenets of the FAO's CCRF.

Jurisdiction of Fishery Regulations

According to the Constitution of India, fisheries is a state subject, and fishing beyond the territorial waters of the country is a central subject. However, what is paradoxical is that while the KMFRA is the regulatory act pertaining to the 12 nautical mile territorial limit, there are no rules or acts pertaining to the area between 12 and 200 nautical mile EEZ. A Central Act as of now is absent. What is even more ironical is that more than 70% of the demersal trawl catch of the state is taken from outside the 12 mile zone where no rules and regulations are binding. This is a situation which leads to IUU (Illegal, Unreported and Unregulated) fishing and needs urgent correction.

The stakeholder survey (Opinion on new regulatory measures-2) has revealed that both fishermen and their leaders want the state's jurisdiction to be extended. This opinion is likely to be due to their unhappiness on the operation of LOP vessels in the EEZ with the MoA-GOI licenses.

- It is strongly recommended that the GOK urge the MoA-GOI to take necessary steps to correct the lack of rules and regulations in the area of sea from 12 to 200 nmi and to stop the LOPs issued by the MoA-GOI.
- According to the FAO-CCRF, fisheries are best managed on a regional and local basis, and therefore, it is more pertinent to have the state manage and regulate the fisheries in the 12-200 nmi zone as well. The DOF-GOK may communicate this concept to the MoA-GOI.
- The DOF-GOK may also communicate to the MOA-GOI the vehement opposition of the State's fishermen to the operation of LOP vessels in the 12-200 nmi zone.

Prohibition of Destructive Gears/Nets

Scientific studies have shown that some of the gears used in the state are highly destructive to the resources mainly by causing growth overfishing. Exploitation of juveniles of fast growing and high value species such as for example shrimps results in considerable economic loss, in terms of what could have been obtained had the fishers waited for a few months and allowed the animals to grow in size and weight. This phenomenon called as growth overfishing has been reported by many and

recently Najmudeen and Sathiadhas (2008)[7] estimated the economic loss due to juvenile fishing in India as Rs. 85,558 crores and Mohamed et al. (2009)[8] estimated the annual loss due exploitation of juvenile cephalopods as Rs. 426 crores in India.

The main gears causing this damage are the stake nets and the mini-trawls. A CIFT stake net review conducted by Thomas et al. (2008[9]) have recommended that the codend mesh size should be increased from the present 8-10 mm to 24 mm to allow the escape of juvenile shrimps and furthermore the Meenakumari Committee has recommended phasing out the stake net fishery by 2015 in view of the damage it causes to resources. However this recommendation was not accepted by the GOK. While the majority of fishermen and their leaders do not want any intervention with respect to stake nets, their opinion on mini trawls is divided (Opinion on new regulatory measures-1). It is quite clear that there is a clear lack of understanding among stakeholders, besides fear of loss of livelihood and incomes. However the economic loss and long-term consequences to the fishermen and resources of the state, particularly shrimp, is such that this matter cannot be ignored.

- Considering the objections with regard to stake net removal, this committee recommends that all unlicensed stake nets be removed by the DOF-GOK within one year and implement the minimum codend mesh size recommended by CIFT (24 mm) for all licensed stake nets. This should be done by periodic inspections by the backwater patrol of the DOF-GOK.
- As per the CIFT recommendation implement banning of stake net operations during high tide by raising the net above water line during this time.
- It is recommended that the DOF-GOK prohibit the operations of mini trawls in a phased manner. The DOF-GOK should formulate a registration and license buy-back scheme to help mini trawl fishermen take alternate avocations. This fishing practice should be phased out within the next 5 years (by December 2018). Existing licenses of mini-trawls should not be renewed.
- The legal mesh sizes for different gears have been set out elsewhere in this document. This should be strictly implemented by the DOF-GOK by system of inspections. Use of illegal nets and mesh sizes in nets leads to IUU fishing.
- Besides, the MATSYAFED, which is a government agency supplying nets to fishers should not manufacture nor supply illegal mesh size nets to any party. Research institutions testing experimental fishing nets and gears can be exempted. The argument that if MATSYFED is not supplying, private net manufactures would supply does not hold, as the system of checks and punishments set out in this document would effectively stop the illegal practice in course of time.

[7] Najmudeen, T M and Sathiadhas, R (2008) Economic impact of juvenile fishing in a tropical multi-gear multi-species fishery. Fisheries Research, 92 (2-3): 322-332.

[8] Mohamed, K S, Joseph, M, Alloycious, P S, Sasikumar, G, Laxmilatha, P, Asokan, P K, Kripa, V, Venkatesan, V, Thomas, S, Sundaram, S and Rao, G S (2009) Quantitative and qualitative assessment of exploitation of juvenile cephalopods from the Arabian Sea and Bay of Bengal and determination of minimum legal sizes. Journal of Marine Biological Association of India, 51 (1): 98-106.

[9] Thomas, S.N, L. Edwin and B. Meenakumari. (2008). Stake net fishery: significance and impact. INFOFISH International. 6: 57-61.

Zonal Restrictions

The KMFRA has zonal restrictions with regard to operations of traditional and mechanized crafts based on depth. Up to 20m depth line (30m for Kollengode to Paravur) is reserved for traditional/motorized crafts, and this needs to be continued with stricter implementation. The stakeholder survey showed that both fishermen and fishermen leaders were firmly in favor of this restriction, while they were not in favor of restricting ring seiners in this zone (Opinion on new regulatory measures-1).

- Implementation of zonal restrictions is possible only if the DOF-GOK implements the satellite based VMS as detailed in the surveillance section.
- If the OBM and IBM ring seiners are using mechanized power to deploy and haul the nets, then they will lose their traditional/motorized status and will come under the status of mechanized, and therefore, the 20/30m zonal restriction will apply to them as well.

Fishing Vessel Specifications

This Committee was deeply concerned with the living conditions in the State's mechanized fishing vessels, particularly those which undertake multi-day voyages. Almost all mechanized vessels do not have basic sanitary facilities such as toilets with flushing cistern systems, no kitchen or galley space and no sleeping or berthing arrangement. The fishermen and crew are forced to live in very primitive conditions which are tantamount to human right violations. All these basic facilities are sacrificed to increase the fish hold capacity. The DOF-GOK has not set any standard for building fishing vessels.

All fishing vessels (including traditional) are also lacking basic navigational lights and other signals. The Committee strongly felt that the recent spate of open sea mishaps were partly due to the failure of our fishermen in putting up appropriate signals indicating that the vessel is fishing/cruising/idling etc. Most fishermen are unaware of the basic navigational signals while operating at sea. This is a very significant shortcoming which places our fishermen's lives at grave and continued risk while at sea.

The fishermen and fishermen leaders have responded differently to the questions regarding the above (Opinion on new regulatory measures-2, 3). While the fishermen felt that basic facilities were not available on board vessels, their leaders did not feel the same. It may be because of lack of sea experience in the case of the latter. On the other hand, the fishermen leaders wanted the fish hold capacity to be reduced by law. In the light of the above, the following recommendations are made.

- All multi-day mechanized fishing vessels with LOA 12m and above should possess toilets, kitchen (galley) and at least 5 sleeping berths.
- The under-deck fish hold capacity of these vessels should not exceed 25% of the total volume of the vessel. Already registered vessels should get this modification done within the next 2 years, failing which their registrations should be cancelled.
- All sea going fishing vessels should be fitted with appropriate lights and flags for signaling as per international maritime norms. They should also possess LSA and fire-fighting apparatus as per sea safety rules. These rules should be made effective immediately.

- All identity card holding fishermen (both traditional and mechanized) of the state should undergo a 3-day course on navigation and sea safety. This course can be conducted by CIFNET who have the expertise and facilities to conduct such courses. The DOF-GOK should enter into a MOU with CIFNET for conducting this all-expense paid course. The entire exercise should be completed within the next 2 years and the fact that the fisherman has completed the course should be indicated in his/her identity card.
- The drivers and serangs of vessels should undergo a more detailed 10-day course on navigation and other mechanical skills. This too can be made with a MOU with CIFNET and under conditions as given above. The rule that mechanized fishing vessels should be driven only by certified serang/drivers should be made a mandatory requirement within the next one year.
- The fishing vessels are also lacking adequate communication facilities. All vessels capable of and carrying out operations outside the 12 nmi zone should possess not only VHF but also RT (radio telephone) communication facilities. The DOF-GOK should enter into dialogue with the Ministry of Communications for enabling all deep-sea going fishing vessels to be fitted with RT facilities on subsidized rates. This is an urgent sea safety requirement for which the DOF-GOK has to play an enabling or facilitating role.
- Creation of a separate Fishing Vessels Act to address the above should be considered by the DOF-GOK in consultation with the legal cell.

Encouragement for Deep Sea Fishing

The committee looked at the lack of adequate development of the deep sea fishing fleet in Kerala and felt that the present policies do not encourage such ventures. One of the main hindrances is the extra input costs incurred by fishermen because of making large vessels as they have to meet MMD regulations on hiring certified skippers, bosuns and mates. The current class of 20m LOA vessels are not sturdy enough for long duration deep sea operations.

- This committee therefore recommends that the DOF-GOK take permission of the MMD to register fishing vessels up to 24m LOA with all safety and navigational features. The proposed Fishing Vessel Act can take these into consideration.

Restrictions on Gears

Gillnetters – regulations

- Optimum mesh sizes have been determined for species targeted by gillnets by CIFT and are given in Table below. Minimum mesh size is 33 mm and maximum mesh size 152 mm.

Targeted fishery	Scientific name	Optimum mesh size (mm)
Oil sardine	*Sardinella longiceps*	33.4
Indian mackerel	*Rastrelliger kanagurta*	50
Narrow barred spanish mackerel	*Scomberomorus commerson*	152
Indo pacific king mackerel	*Scomberomorus guttatus*	104
Silver pomfret	*Pampus argenteus*	126
Indian white prawn	*Fenneropenaeus indicus*	38
Bullet Tuna	*Auxis thazard*	84
Little Tuna	*Euthynnus affinis*	104.2

Ring seiners - regulations

- Mesh size for sardine/mackerel ring seines for both mechanized and OBM categories may be regulated at 22 mm or more in the bunt and main body and maximum dimension of the gear may be limited to <600 m hung length and <60 m hung depth, for all new and replacement ring seines.
- Mesh size for anchovy ring seines may be regulated at 12 mm and maximum dimension of the gear may be limited to <250 m hung length and <50 m hung depth.

Trawl nets- regulations

Mesh regulation in the cod-end of trawls can reduce by-catch of juveniles and small sized non target species and is an important step towards reducing growth overfishing.

- Codend mesh of 35 mm has been prescribed for trawl net in KMFRA. It is recommended that this be changed to 35 mm square mesh as studies by CIFT shows that it provides better opportunity for juveniles to escape.

Time Restriction – Fishing Ban

Invoking the relevant provisions in the KMFRA, the GOK has been implementing the ban on mechanized fishing during the monsoon months since 1988 (i.e., for the past 25 years). The purpose of the ban has been officially stated as protection of spawning stock and the period of the ban, which has been variable, has been fixed as 47 days for the past years.

This ban has been well accepted by all fisher groups, and both fishermen and fishermen leaders were of the opinion that the trawl ban has been good for the fishery and has helped in increasing fish production in the state (see chart on Evaluation of Trawl Ban-1 & 2). The scientific intervention analysis (data from 1960 to 2012 – 52 years) carried out by this Committee and presented elsewhere in this document also point to the fact that the trawl ban has significantly helped in increasing the marine fish production in the state. The stakeholder response to whether the trawl ban has helped in increasing landings of commercially important species and on whether the number of species caught has increased was not very clear.

A recent national study (Vivekanandan et al., 2010[10]) for the period 1985-2008 on the impact of seasonal fishing ban concluded that there is no significant difference in catch and CPUE trends before and after introduction of fishing ban along the west coast. However, there is marginal improvement in catch and CPUE trends after introduction of fishing ban for different species/groups of fish along the east coast. The increase in catches along the Indian coast is essentially due to increase in efficiency of craft and gear and extension of fishing to offshore regions in the last two decades. See Box on next page for a summary of the findings of this study.

Admittedly, the trawl ban gives much required respite to the trawling grounds of the state and helps to rejuvenate the benthic fauna which are essential for growth and replenishment of commercial fish stocks. The national study by Vivekanandan et al. (2010) had very few pre-ban years to make an effective comparison, and that is probably the reason why the study came up with the result that the seasonal fishing ban had no significant impact. However, this study also recommended continuation of the trawl ban along with several other control measures for replenishment of fish stocks.

The scientific advantages of the trawl ban and the perception of fishermen and fishermen leaders that trawl ban has been helpful, lends strength to this Committee to consider increasing the tenure of the trawl ban for the ultimate benefit of the fishermen and the State. In fact the majority of the stakeholders (70 and 85%) responded to whether the tenure of the trawl ban should be extended with a YES. Furthermore, they (70% of fishermen leaders and ~40% of fishermen - chart on Evaluation of Trawl Ban-1 & 2) also felt that there should be more controls (time restriction) on operations of OBM and IBM ring seiners. In view of this the Committee recommends the following.

[10] Vivekanandan, E, Narayanakumar, R, Najmudeen, T M, Jayasankar, J and Ramachandran, C (2010) Marine Fisheries Policy Brief-2; Seasonal Fishing Ban. CMFRI Special Publication, 103: 1-44.

- The tenure of the trawl ban should be extended from 47 days to 75 days (two and half months), `starting from June 18 to August 31 (both days inclusive). The advantages of such an extension period should be reviewed after 3 years by a scientific committee.
- The OBM and IBM ring seiners should be banned from operation for a period of 60 days from April 1 to May 30 (both days inclusive) to protect pelagic spawning stocks. The advantages of such a ban should be reviewed after 3 years by a scientific committee.
- There will not be any seasonal fishing ban for non-mechanized vessels.
- In view of the extended ban period for mechanized vessels and the new ban for ring seiners, the DOF-GOK should provide adequate monetary relief to fishermen.

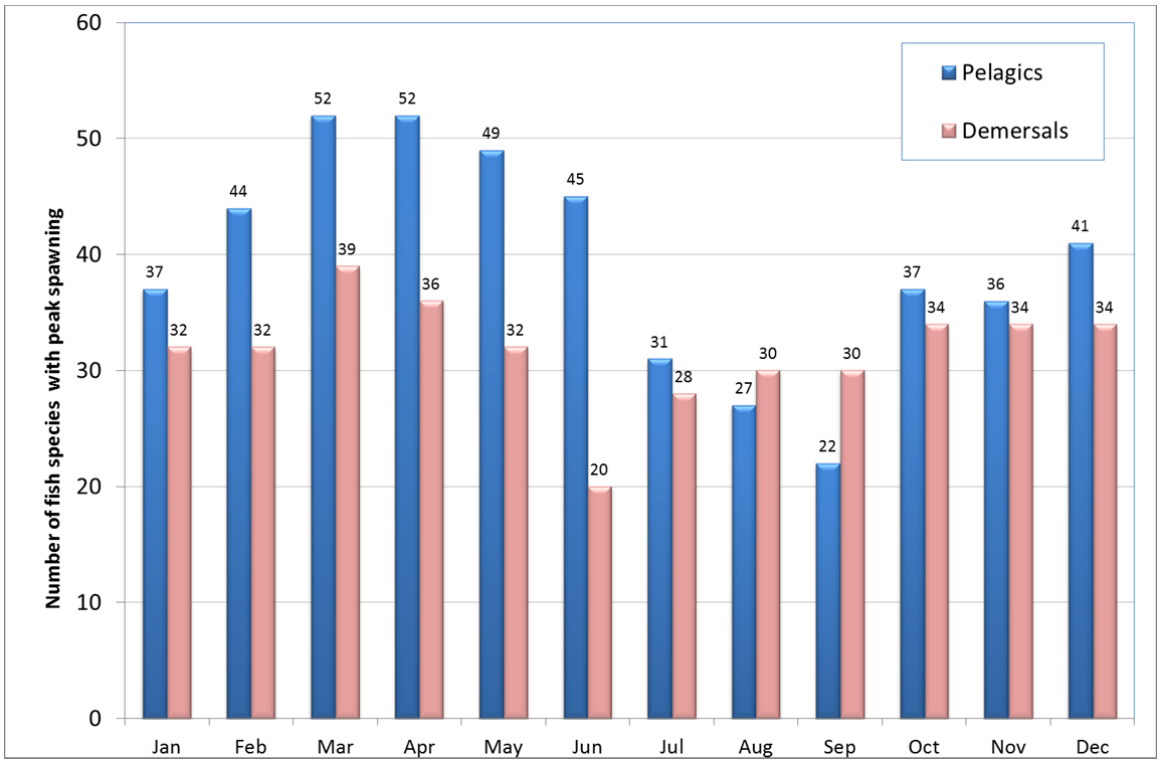
BOX

Impact of Seasonal Fishing Ban in India – Vivekanandan et al., 2010

SUMMARY & CONCLUSIONS

- There is no significant difference in catch and CPUE trends before and after introduction of fishing ban along the west coast. However, there is marginal improvement in catch and CPUE trends after introduction of fishing ban for different species/groups of fish along the east coast.
- The increase in catches along the Indian coast is essentially due to increase in efficiency of craft and gear and extension of fishing to offshore regions in the last two decades.
- Seasonal fishing ban has helped arresting the increasing annual fishing effort. Removal of seasonal fishing ban will result in spurt in fishing effort, which is detrimental to fish stocks.
- Seasonal ban helps the fish to grow, thereby improving the price and value.
- Boats with outboard motors with different engine capacity have become dominant in the fishery all along the Indian coast. When the ban exists for larger boats, removal of large quantities of spawners of small pelagics by motorized craft is evident. Proper regulations of these boats are important.
- There is an improvement in recruitment of dominant demersal species into the fishery immediately after the ban, but for a short duration of one to two months.
- Many species have a prolonged spawning season lasting for 6 to 7 months, but with peak spawning at least twice a year. As these spawning peaks are during different months for different species, spawning period could not be considered as the sole criterion for the period or duration of closure.
- There is no indication to suggest that fishing ban has helped long-term sustainability of stocks. Perhaps a combination of several other regulatory measures such as minimum/maximum legal size at capture, mesh size regulation, licensing, regulation of operation of motorized boats and capping the number of boats are necessary along with seasonal closure for replenishment of fish stocks.

Most tropical fishes spawn throughout the year. A quick analysis of the peak spawning periods of 90 marine species (182 records) comprising of 42 pelagic species and 48 demersals sourced from the national database maintained by CMFRI (Indian Marine Resources Life History [INMARLH] database) showed that even peak spawning periods do not show much differences among months. In general, however, a good percentage of the pelagic species have peak spawning during March to June, and in the case of demersals, it is less clear, but in two periods, March-April and October-December. Biologically, if protection of spawners is the main consideration for conservation of fish wealth of the State, then the ideal seasonal ban period would be pre-monsoon period for ring seiners and post-monsoon period for trawlers. However, this is an aspect which should be considered in future (by future expert committees); if there is no appreciable improvement in the fish wealth of the State and real incomes of fishers even after the present recommendations are implemented.



Analyzed data on peak spawning months of pelagic and demersal species in India culled from the INMARLH database of CMFRI

Subsidies and Incentives

At the 2002 World Summit on Sustainable Development in Johannesburg, the elimination of subsidies that drive overfishing was recognized as one of the top global priorities for achieving healthy oceans. Arguably, removing subsidies would drive unprofitable units out of fishing, and

overcapitalization which is the bane of marine fisheries in Kerala, can get reduced. It can also be argued that subsidy for marine fisheries *per se* are very small and limited in Kerala.

The stakeholders, both fishermen and fishermen leaders have very strongly stated that the subsidy is insufficient and should be raised (Opinion on new regulatory measures-1). Keeping in view the rising cost of diesel and kerosene this appears to be a genuine plea which needs to be addressed by the DOF-GOK.

The goal of the DOF-GOK need not be to eliminate subsidies, but to guarantee that they produce real and lasting benefits to fishing communities by sustaining the resources that they are exploiting. Therefore, the way forward is to link subsidies with sustainable resource management as recommended by the WWF (2011)[11]. In view of this the Committee recommends the following with the hope that it will motivate fishers to comply with rules and regulations leading to sustainable fisheries.

- The subsidy for fuel for all fishing crafts in the state shall be fixed at 1% of fuel (diesel or kerosene) cost and it should vary with varying price of fuel as fixed by the GOI from time to time.
- This subsidy should be given to only those registered and licensed vessels which are complying with all rules of the KMFRA. Since license is to be renewed every 2 years, the subsidy allowance should also be reviewed at this point.
- Other welfare (housing, education, ration etc.) subsidies to fishermen should be quantified by the DOF-GOK as a database for future reviews and for applying the above management-motivation scheme.

Overcapacity and fleet size regulation

The earlier committees have gone into this issue based on several studies made by CMFRI and others to estimate the optimum fleet size using different methodologies. The fact that is consistently brought out is that there is considerable amount of overcapitalization in the fishing fleets in Kerala. Very recently (in 2010) as part of the revalidation of potential yield exercise advocated by the MoA, the CMFRI scientists came up with a superior state-wise estimate based on improved methodology. In this method first the potential yield (PYE) was estimated by non-linear Schaefer Model using a genetic algorithm. Then this PYE was applied to the fleet-wise catch rates to derive the optimum fleet size. These estimates have been adopted by this committee to frame recommendations.

The table on excess capacities shows that overall the state has an excess capacity a little above 10%. Maximum excess capacities were seen in mechanized purse seines, mechanized gillnets, outboard trawl (mini trawl; now recommended as prohibited), mechanized ring seines (inboard ring seines) and non-mechanized gears. Some of the outboard gears such as OBRS, OBBS and OBHL and mechanized hooks and lines had fleet sizes less than the optimum indicating that their numbers can be increased. However, some of the OBRS have been converted into MRS (or IBRS) which is already

[11] URL: http://awsassets.panda.org/downloads/wwf_briefing_on_subsidies_reform_.pdf

in excess by 60%, and therefore there appears to be no cause for increasing the fleet size whatsoever.

Table: Excess capacity in different fishing fleets in Kerala based on PYE and Catch Rate estimates

Gear Description	Gear Code	Optimum Fleet size	Group Totals	Existing Fleet	Excess Capacity	Percent Excess
Mechanized Multiday Trawl Net	MDTN	2489				
Mechanized Trawl Net	MTN	1121	3610	3678	68	1.9
Mechanized Gillnet	MGN	64				
Mechanized Drift net	MDN	12	72	460	388	538.9
Mechanized Hooks & Lines	MHL	34		29	-5	-14.7
Mechanized Purse Seine	MPS	7		60	53	757.1
Mechanized Ring Seine	MRS	309		495	186	60.2
Outboard Gillnet	OBGN	ND		5121	0	0
Outboard Ring Seine	OBRS	928		681	-247	-26.6
Outboard Trawl Net	OBTN	0		861	861	100
Outboard Boat Seine	OBBS	1098				
Outboard Hooks & Lines	OBHL	5178				
Outboard Others	OBOHTS	2	6278	4512	-1766	-28.1
Non-mechanized	NM	3896		5884	1988	51.0
Total		**15138**		**21781**	**1526**	**10.1**

ND – not determined

The fishermen and fishermen leaders have responded with a very strong YES to reduce the number of trawlers and ring seiners (see chart on Previous Committee Findings – Agreement-1). Both the groups did not agree for decommissioning vessels of more than 10 years age, while they agreed for decommissioning vessels of more than 20 years age. Although fishermen were not in favor of a vessel buy-back scheme, a majority of fishermen leaders were in favor of such a package.

- In the light of the high overcapacity in some of the fishing fleets in Kerala, an immediate moratorium on new vessels has to be declared by the DOF-GOK.
- Vessels older than 20 years should have their registration and license cancelled, and owners if they are fishermen, should have the right to construct a new vessel with the permission of the DOF-GOK. This replacement vessel will be strictly in the least over capacitated fishing fleet.
- New vessel construction in boatyards should be begun only with permission from DOF-GOK; otherwise registration should not be given.
- In order to reduce overcapacity and fishing effort, the DOF-GOK should formulate a scheme to buy-back vessel registration and license from owners with compensation at market prices. The DOF-GOK should earmark adequate finance in its budget to buy-back at least 20 vessels in a year. On demand, alternate avocation training should also be provided free of cost by DOF-GOK.

Surveillance

According to Flewwelling et al. (FAO, 2002[12]) surveillance involves the regulation and supervision of fishing activity to ensure that the state's legislation and terms, conditions of access and management measures are observed. This activity is critical to ensure that resources are not over exploited, IUU is prevented and management arrangements are implemented.

The basic infrastructure required for surveillance according to FAO should consist of at least the following:

a) A headquarters for the coordination of fisheries operations with a network of linked field offices – ***DOF-GOK already possesses this.***
b) A Central Operations Room (COR) where current status of fishing operations can be shown – ***DOF-GOK has to create this by modifying the Vypin Fisheries Station*.**
c) A communications system to all fisheries centres and mobile platforms in the field for both safety and control of operations - ***This network has to be strengthened by DOF-GOK.***
d) A computer data system for licensing and vessel registration, data collection and analysis – ***This network has to be strengthened by DOF-GOK.***
e) Surveillance equipment. Depending on local conditions and local government budgetary constraints, this equipment might include aircraft, vessels, air surveillance, sea surveillance (coastal, offshore and boarding equipment), VMS and satellite imaging technology, radar, GIS equipment and land transportation – ***DOF-GOK needs to concentrate on sea patrols and procure Vessel Monitoring System (VMS) for making surveillance effective.***

Unfortunately, not all fisheries administrators understand MCS, or its critical role as an implementing mechanism for fisheries management. Some view arrests as the only relevant indication of the effectiveness of MCS efforts. The real indicator for MCS is the level of compliance, and this is governed by many factors, e.g. the number of fishers; the number of vessels; effort and area coverage of patrols; results of patrols, increase in voluntary compliance, etc.

Vessel Monitoring System (VMS)

The increasingly sophisticated legal framework for international and regional fisheries management requires States to develop more extensive, accurate and verifiable data concerning fisheries activities and their effects. The declining status of many fish stocks (and of the marine environment in general) has also created a strong incentive for States to adopt VMS as a component of an overall MCS strategy. Furthermore, advances in technology, particularly in relation to satellite-based VMS, have the potential to substantially improve the effectiveness of MCS systems by generating a wider range of useful data at a substantially lower cost than exclusive reliance on more traditional MCS

[12] Flewwelling, P.; Cullinan, C.; Balton, D.; Sautter, R.P.; Reynolds, J.E. 2002. Recent trends in monitoring, control and surveillance systems for capture fisheries. FAO Fisheries Technical Paper. No. 415. Rome, FAO. 200p.

measures, such as at-sea enforcement. A number of international fisheries instruments encourage or require States to use satellite based VMS[13].

The State (GOK) must enact specific legislation (amendment to KMFRA) to enable satellite-based VMS to operate as an integral and effective part of an MCS system. For example, legislation should provide that:

1. Fishing is subject to an authorization regime (e.g. a licensing system) that requires the installation of automatic location communicators (ALCs);
2. Vessels must be clearly marked for identification purposes, allowing the comparison of visually acquired patrol sightings and the satellite-based VMS data;
3. Fishing vessels must report regularly on their position, activities and catches;
4. Landings must take place in designated ports or areas under specified conditions; and
5. Information derived from satellite-based VMS is confidential (e.g. precise locations and times of fishing activities).

A VMS in its basic form is essentially a global positioning system (GPS) linked to a satellite communications transponder, with a small processor to poll the vessel automatically and transmit information on the vessel position, course and speed. In 1998, FAO looked at the three major systems available: ARGOS; INMARSAT and EUTELTRACS, and then formed a working group of specialists to summarize their experiences into guidelines for VMS for fisheries administrations. The 1998 FAO Technical Guidelines on Vessel Monitoring Systems[14] is an excellent guide for any State Fisheries department contemplating the introduction of this technology. It must be noted that VMS is a satellite tracking system that will only provide information on those vessels carrying the equipment. Non-licensed vessels and all other vessels without compatible transponders will not be shown on the VMS. However, VMS is one of the better tools available to assist in monitoring closed areas when all licensed vessels are equipped and maintain functioning VMS units.

Marine Enforcement Wing (MEW) of DOF

The enforcement wing of DOF is reasonably well staffed headed by a policeman of the rank of SP followed by DySP, CI, HC and PC running to 61 personnel. There is also a DDF in the wing. Most of the staff in the wing are on deputation from other departments. There are also a number of patrol boats with the enforcement wing. But it is not known how often patrols are conducted and also if all the policemen in the force are seaworthy.

In view of the above facts this Committee recommends the following.

- The Marine Enforcement Wing of the DOF-GOK should be strengthened by the posting of an Additional Director under whose administrative and technical control the whole wing should function.
- The Inspectors and Sub-inspectors of Fisheries in DOF-GOK should be fully deployed in surveillance and enforcement rather than in routine department work.

[13] For example, 1995 UN Fish Stocks Agreement, Article 5(j), 18(3)(e) and (g)(iii) and Annex 1, Articles 5 and 6; FAO CCRF 7.7.3; IPOA on IUU Fishing paragraph 24.3.

[14] FAO. 1998. FAO Technical Guidelines for Responsible Fisheries. Fishing operations. 1. Vessel monitoring systems. No. 1, Suppl. 1. Rome, FAO. 1998. 58p.

- It is imperative that all staff in the MEW are seaworthy and should possess navigational skills. They should have a monthly schedule of patrols in the Arabian Sea off Kerala. During patrols they should inspect at least 10 vessels in a day and inspection reports in forms should be regularly filed.
- The MEW staff should undergo training by the DOF such that they are knowledgeable on all aspects of KMFRA rules and regulations. They should be equipped with net gauges and tape measures to measure the size and codend of nets.
- A Central Operations Room (COR) should be formed at Vypin Fisheries Station which should house the VMS base unit and also have RT and VHF base stations. This unit should work 24x7 with adequate duty rotations.
- The DOF-GOK may explore the possibility of drawing up an MOU with the Coast Guard to help in surveillance and enforcement of fishery regulations. This would help in stricter enforcement.
- VMS base stations can be established from around INR 30 lakhs upwards, and onboard units run from INR 3-4 lakhs/unit. Funding for the latter should be subsidized by the DOF-GOK, and the entire funding should be sourced through centrally sponsored schemes of the MoA-GOI.
- To aid better enforcement, the DOF-GOK should provide at subsidized rates RT units to all mechanized and motorized fishing units. This would roughly cost INR 2-3 lakhs/unit. This would also help in sea safety also.

Governance

Participatory/ co-management

During the last decade, there has been a shift in the governance of fisheries to a broader approach that recognizes fishermen participation, local stewardship, and shared decision-making in the management of fisheries. Through this process, fishers are empowered to become active members of the fisheries management team, balancing rights and responsibilities, and working in partnership, rather than antagonistically, with government. This approach is called co-management or participatory management (Pomeroy and Rivera-Guieb, 2006[15]).

It is becoming increasingly clear that governments, with their finite resources, cannot solve all fishery problems. Local communities will need to take more responsibility for solving local problems. In order to do this, however, communities must be empowered and resources provided to make decisions locally and to take actions that meet local opportunities and problems. The assistance and support of government will still be needed to achieve these results, although the role and responsibilities of government will also need to change. The concept of co-management has gained acceptance among governments, development agencies and development practitioners as an alternative fisheries management strategy to the top-down, centralized government management approach.

However, the actual process of co-management has often been problematic as the definition of co-management is quite broad and means different things to different people. However, co-management may not be an appropriate alternative management strategy for every community or area. Centralized management may be more appropriate to the community or area. The development of co-management is neither automatic nor simple, nor is its sustainability guaranteed. Co-management does show promise for addressing many of the requirements for sustainability, equity and efficiency in fisheries and coastal resources management and there are several examples of success stories in many parts of the developing world.

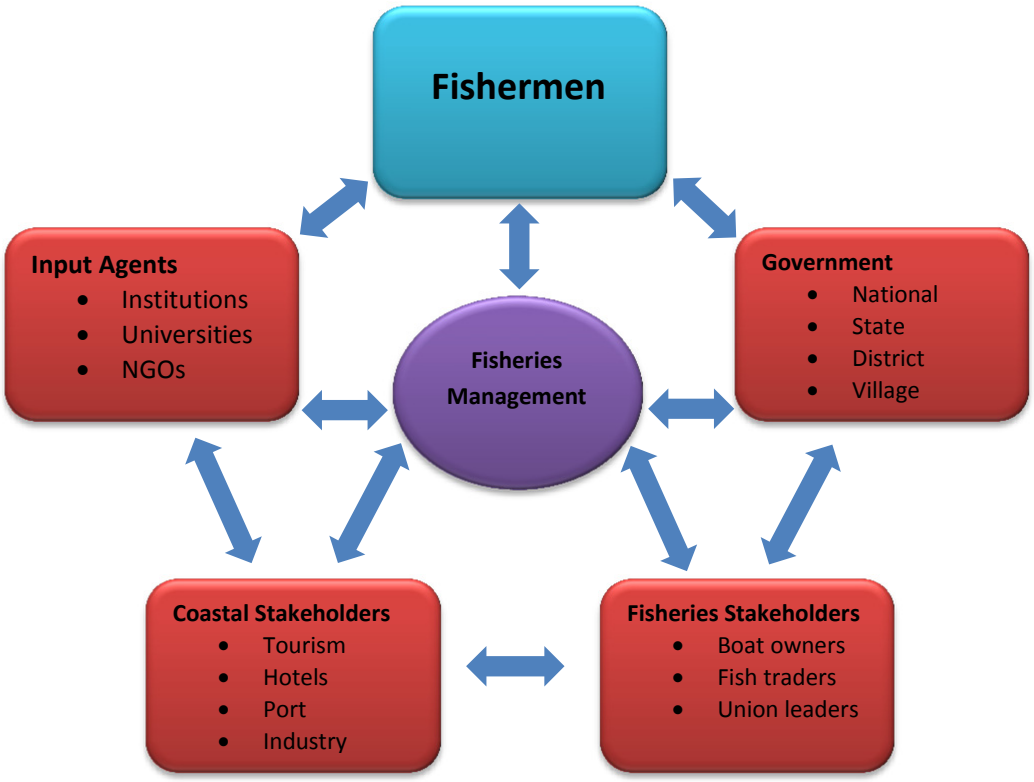
Definition of co-management

Participatory management or co-management can be defined as a partnership arrangement in which the community of local resource users (fishermen), government, other stakeholders (boat owners, fish traders, boat builders, business people, etc.) and external input agents (non-governmental organizations (NGOs), academic and research institutions) share the responsibility and authority for the management of the fishery.

Through consultations and negotiations, the partners develop a formal agreement on their respective roles, responsibilities and rights in management, referred to as 'negotiated power'. Co-management is also called participatory, joint, stakeholder, multi-party or collaborative management.

[15] Pomeroy, R.S. and R. Rivera-Guieb. 2006. Fishery co-management: a practical handbook. International Development Research Centre, Canada, IDRC e-book. 282p.

Partnership in Co-management

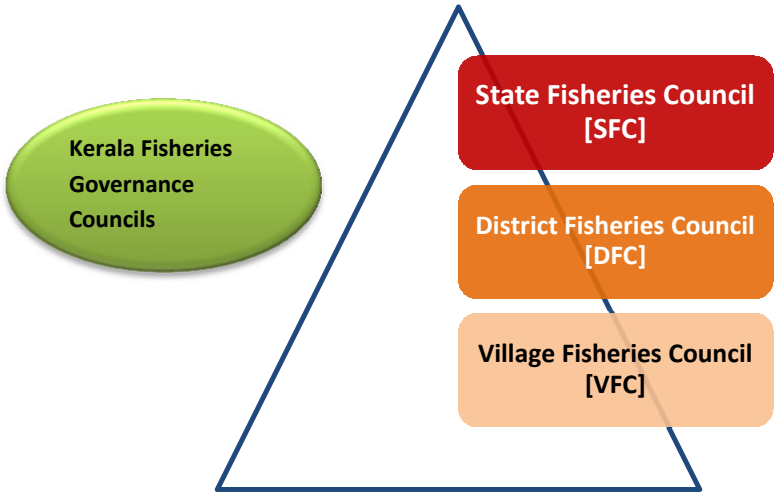


According to Pomeroy and Rivera-Guieb (2006) co-management covers various partnership arrangements and degrees of power sharing and integration of local (informal, traditional, and customary) and centralized government management systems. Fisheries co-management can be classified into five broad types according to the roles government and fishers play:

- **Instructive**: There is only minimal exchange of information between government and fishers. This type of co-management regime is only different from centralized management in the sense that the mechanisms exist for dialogue with users, but the process itself tends to be government informing fishers on the decisions they plan to make.
- **Consultative**: Mechanisms exist for government to consult with fishers but all decisions are taken by government.
- **Cooperative**: This type of co-management is where government and fishers cooperate together as equal partners in decision-making.
- **Advisory**: Fishers advise government of decisions to be taken and government endorses these decisions.
- **Informative**: Government has delegated authority to make decisions to fisher groups who are responsible for informing government of these decisions.

Fishermen and fishermen leaders in Kerala have responded differently to the previous committee's suggestion of forming 3-tier fisheries councils for effective management. While nearly 70% of the leaders agreed to the formation of councils, a majority of the fishermen were not in agreement to this proposal of the previous committee (see graph on Previous Committee's Findings - Agreement-2). This may be a problem of improper understanding of the concept of councils as a tool for co-management. The earlier committee did not specify the details of the objective and working of such councils.

- This committee recommends that the DOF-GOK embrace the consultative mode of co-management immediately and then in later years move on to the cooperative mode of co-management as communities and governments take time to adjust and understand these new governance systems.
- Under the consultative mode of co-management 3-tier fisheries councils should be formed immediately. At the lowest level should be the Village Fisheries Council (VFC) and next should be the District Fisheries Council (DFC) and finally the State Fisheries Council (SFC). The council TORs should be very clearly set. The councils should have representation from panchayats/ district/state, Department of Fisheries, CMFRI, CIFT, NGO's working in the area and fishermen associations and societies. They should meet once in a quarter. The Council should have powers to debate and recommend rules as necessary for effective management of fisheries. The scientific inputs for management of fisheries should be taken from research institutes and universities.
- The rules and regulations recommended by the VFC or DFC should ultimately be passed by the SFC within a period of one year for implementation by the DOF-GOK.



- At the VFC level separate councils can be formed for specific fishery commodities, such as for example clam fisheries. A village level clam fisheries council can exist separately and they should pass on their recommendations to the DFC.

Although the stakeholder survey conducted by this committee found wide acceptance for the trawl ban regulation among most stakeholders, it is has also brought out the fact that the general awareness of rules and regulations and the necessity of it is not is not clear to most fishermen, excepting fishermen leaders. This points to an urgent need for awareness campaigns on fisheries regulations among fishermen. Therefore, this committee recommends the following to address the issue.

- The DOF-GOK should urgently promote the wide dissemination of KMFRA rules and regulations among fishermen, boat owners and other related stakeholders.
- This booklet should also be compulsorily given to fishermen and boat owners when they are given identity cards, licenses and registration cards.
- The KMFRA and its rules should be placed in the website of DOF-GOK.
- The DOF-GOK should ensure that future evaluation and expert committees should have adequate representation from stakeholders.

Implementation of Recommendations

Sixty seven recommendations have been made this committee. Once the draft is accepted by the stakeholders and DOF-GOK, a plan of implementation is necessary. The following plan is suggested to the DOF-GOK by this committee.

- The Director of Fisheries, GOK should constitute an internal committee/ committees to examine the recommendations and suggest which of the recommendations would lead to amendments to the KMFR Act and which can be accommodated by changing the rules. This process should be completed at the earliest and should involve the Legal Officer.
- The DOF-GOK should be strengthened with more technical personnel with fisheries background and should be made into a technical department.
- The recommended administrative changes within the DOF-GOK, such as strengthening of the Marine Enforcement Wing should be completed within 3 months.
- In order to legally frame amendments to the Act and Rules, the DOF-GOK could take the help of the Centre for Law and Agriculture (CLA) in the campus of the National University of Advanced Legal Studies (NUALS), Kalamassery, Kochi who have the expertise carry out such specialized work.

Listing of all Draft Recommendations

Main Findings [page 15-21]

1. The present analysis clearly indicates that there has been a positive impact on fishery yields (without oil sardine) in Kerala State due to the introduction of the trawl ban from 1988. However, the 5-point moving average graph unmistakably shows that the positive impact on fishery yields was present only up to 1997 (9 years), and thereafter, the fishery yields are declining, the net decline being more than one lakh tonnes after 2000. This indicates that the benefit in terms of yield was not sustained.
2. The economic analysis indicates that in value terms the benefit of the trawl ban was present only up to the year 2000, after which there has been a decline in real value of the fisheries and ultimately incomes to fishermen in spite of increase in nominal value.
3. The growth rate analysis also clearly indicates that growth rate in the mechanized sector is negative after the year 2000, and the benefit of the trawl ban was not sustained after 2000.
4. Therefore, a hard, but necessary option would be to increase the duration of the trawl ban such that the benefit of the trawl ban in terms of yield and value is sustained.

Fishery Monitoring [page 45]

5. This committee recommends that the DOF-GOK enter into a MOU with CMFRI to get the data on catch and effort from CMFRI on an annual/regular basis as and when the year's data becomes available. If necessary, annual fees for the data may also be paid to CMFRI as a matter of professional courtesy and to help the data collection process.
6. The Statistics Wing may focus on collection of inland and aquaculture data.

Registration & Licensing [page 46]

7. Currently blanket licensing is done for fishing; however, this should change to licensing for gears following legal dimensions and mesh sizes. This may be introduced by making necessary amendments in the KMFR Act. The DOF-GOK should introduce a system by which all fishing gears have a permanent DOF mark or stamp indicating its legal status following KMFRA. The license should be valid for 2 years and should be given only after inspection of gears possessed by the MEW.
8. A registered fishing vessel can if necessary possess up to 2 licenses. For e.g., one for trawling and another for gillnetting. However no vessel should possess more than 6 licensed gears (for e.g., 3 trawl nets and 3 gillnets or 6 trawl nets).
9. At present provisions exist for in KMFR Act for enforcing fine and forfeiting the vessels in case of violations. Provision for temporary cancellation of license may also be included in the KMFRA by making necessary amendments.
10. No new fishing vessels should be introduced without the permission of the DOF-GOK.
11. Registration and license for other states vessels should be restricted, and if given, should be at high cost (in order to discourage the practice) with the condition that catch is landed only in Kerala fish landing centres.

Fisheries Management Area & Governing Rules [page 46-47]

12. The coastal waters off Kerala, up to the legal jurisdictional limit, should be declared as Kerala Fisheries Management Area (KFMA). And, in the case of specific, characteristic and unique fisheries, such as clam fisheries in an estuarine system or the artisanal fisheries off Thiruvananthapuram coast, specific management areas need to be set. Once the area is specified, the specific rules can become applicable to the management area. Thus fisheries management becomes more local and regional which is one of the basic tenets of the FAO's CCRF.
13. It is strongly recommended that the GOK urge the MoA-GOI to take necessary steps to correct the lack of rules and regulations in the area of sea from 12 to 200 nmi and to stop the LOPs issued by the MoA-GOI.
14. According to the FAO-CCRF, fisheries are best managed on a regional and local basis, and therefore, it is more pertinent to have the state manage and regulate the fisheries in the 12-200 nmi zone as well. The DOF-GOK may communicate this concept to the MoA-GOI.
15. The DOF-GOK may also communicate to the MOA-GOI the vehement opposition of the State's fishermen to the operation of LOP vessels in the 12-200 nmi zone.

Regulation on Destructive Gears [page 27/47]

16. Considering the objections with regard to stake net removal, this committee recommends that all unlicensed stake nets be removed by the DOF-GOK within one year and implement the minimum codend mesh size recommended by CIFT (24 mm) for all licensed stake nets. This should be done by periodic inspections by the backwater patrol of the DOF-GOK.
17. As per the CIFT recommendation implement banning of stake net operations during high tide by raising the net above water line during this time.
18. It is recommended that the DOF-GOK prohibit the operations of mini trawls in a phased manner. The DOF-GOK should formulate a registration and license buy-back scheme to help mini trawl fishermen take alternate avocations. This fishing practice should be phased out within the next 5 years (by December 2018). Existing licenses of mini-trawls should not be renewed.
19. Based on CMFRI's advice on the negative impacts, the Government of Karnataka has banned FAD based cuttlefish fishery in 2012. It is therefore imperative that the DOF-GOK also bans this type of destructive fishing method urgently to conserve this valuable resource.
20. The committee recommends that MPA, which is a very successful passive form of fisheries management, would become necessary in the future years. But first, the fishermen have to made aware and educated with regard to the advantages of MPAs. Therefore, the DOF-GOK should initiate awareness campaigns, particularly in Thiruvanthapuram district in the next 5 years such that MPAs can be introduced within the next 10 years.

Zonal Restrictions [page 49]

21. Implementation of zonal restrictions is possible only if the DOF-GOK implements the satellite based VMS as detailed in the surveillance section.
22. If the OBM and IBM ring seiners are using mechanized power to deploy and haul the nets, then they will lose their traditional/motorized status and will come under the status of mechanized, and therefore, the 20/30m zonal restriction will apply to them as well.

Fishing Vessel Specifications [page 49-50]

23. All multi-day mechanized fishing vessels with LOA 12m and above should possess toilets, kitchen (galley) and at least 5 sleeping berths.
24. The under-deck fish hold capacity of these vessels should not exceed 25% of the total volume of the vessel. Already registered vessels should get this modification done within the next 2 years, failing which their registrations should be cancelled.
25. All sea going fishing vessels should be fitted with appropriate lights and flags for signaling as per international maritime norms. They should also possess LSA and fire-fighting apparatus as per sea safety rules. These rules should be made effective immediately.
26. All identity card holding fishermen (both traditional and mechanized) of the state should undergo a 3-day course on navigation and sea safety. This course can be conducted by CIFNET who have the expertise and facilities to conduct such courses. The DOF-GOK should enter into a MOU with CIFNET for conducting this all-expense paid course. The entire exercise should be completed within the next 2 years and the fact that the fisherman has completed the course should be indicated in his/her identity card.
27. The drivers and serangs of vessels should undergo a more detailed 10-day course on navigation and other mechanical skills. This too can be made with a MOU with CIFNET and under conditions as given above. The rule that mechanized fishing vessels should be driven only by certified serang/drivers should be made a mandatory requirement within the next one year.
28. The fishing vessels are also lacking adequate communication facilities. All vessels capable of and carrying out operations outside the 12 nmi zone should possess not only VHF but also RT (radio telephone) communication facilities. The DOF-GOK should enter into dialogue with the Ministry of Communications for enabling all deep-sea going fishing vessels to be fitted with RT facilities on subsidized rates. This is an urgent sea safety requirement for which the DOF-GOK has to play an enabling or facilitating role.
29. Creation of a separate Fishing Vessels Act to address the above should be considered by the DOF-GOK in consultation with the legal cell.
30. This committee therefore recommends that the DOF-GOK take permission of the MMD to register fishing vessels up to 24m LOA with all safety and navigational features. The proposed Fishing Vessel Act can take these into consideration.

Legal mesh sizes and dimensions of nets [page 51]

31. The legal mesh sizes for different gears have been set out elsewhere in this document. This should be strictly implemented by the DOF-GOK by system of inspections. Use of illegal nets and mesh sizes in nets leads to IUU fishing.
32. Besides, the MATSYAFED, which is a government agency supplying nets to fishers should not manufacture nor supply illegal mesh size nets to any party. Research institutions testing experimental fishing nets and gears can be exempted. The argument that if MATSYFED is not supplying, private net manufactures would supply does not hold, as the system of checks and punishments set out in this document would effectively stop the illegal practice in course of time.
33. Optimum mesh sizes have been determined for species targeted by gillnets by CIFT and are given in Table below. Minimum mesh size is 33 mm and maximum mesh size 152 mm.
34. Mesh size for sardine/mackerel ring seines for both mechanized and OBM categories may be regulated at 22 mm or more in the bunt and main body and maximum dimension of the gear

may be limited to <600 m hung length and <60 m hung depth, for all new and replacement ring seines.

35. Mesh size for anchovy ring seines may be regulated at 12 mm and maximum dimension of the gear may be limited to <250 m hung length and <50 m hung depth.
36. Diamond mesh of 35 mm has been prescribed for trawl net in KMFRA. It is recommended that this be changed to 35 mm square mesh as studies by CIFT shows that it provides better opportunity for juveniles to escape.

Fishing Bans [page 52-54]

37. The tenure of the trawl ban should be extended from 47 days to 75 days (two and half months), starting from June 18 to August 31 (both days inclusive). The advantages of such an extension period should be reviewed after 3 years by a scientific committee.
38. The OBM and IBM ring seiners should be banned from operation for a period of 60 days from April 1 to May 30 (both days inclusive) to protect pelagic spawning stocks. The advantages of such a ban should be reviewed after 3 years by a scientific committee.
39. There will not be any seasonal fishing ban for non-motorized traditional vessels.
40. In view of the extended ban period for mechanized vessels and the new ban for ring seiners, the DOF-GOK should provide adequate monetary relief to fishermen.

Welfare measures [page 54-55]

41. The subsidy for fuel for all fishing crafts in the state shall be fixed at 1% of fuel (diesel or kerosene) cost and it should vary with varying price of fuel as fixed by the GOI from time to time.
42. This subsidy should be given to only those registered and licensed vessels which are complying with all rules of the KMFRA. Since license is to be renewed every 2 years, the subsidy allowance should also be reviewed at this point.
43. Other welfare (housing, education, ration etc.) subsidies to fishermen should be quantified by the DOF-GOK as a database for future reviews and for applying the above management-motivation scheme.

Fleet Overcapacities [page 55-56]

44. In the light of the high overcapacity in some of the fishing fleets in Kerala, an immediate moratorium on new vessels has to be declared by the DOF-GOK.
45. Vessels older than 20 years should have their registration and license cancelled, and owners if they are fishermen, should have the right to construct a new vessel with the permission of the DOF-GOK. This replacement vessel will be strictly in the least over capacitated fishing fleet.
46. New vessel construction in boatyards should be begun only with permission from DOF-GOK; otherwise registration should not be given.
47. In order to reduce overcapacity and fishing effort, the DOF-GOK should formulate a scheme to buy-back vessel registration and license from owners with compensation at market prices. The DOF-GOK should earmark adequate finance in its budget to buy-back at least 20 vessels in a year. On demand, alternate avocation training should also be provided free of cost by DOF-GOK.

Surveillance [page 57-59]

48. The Marine Enforcement Wing of the DOF-GOK should be strengthened by the posting of an Additional Director under whose administrative and technical control the whole wing should function.
49. The Inspectors and Sub-inspectors of Fisheries in DOF-GOK should be fully deployed in surveillance and enforcement rather than in routine department work.
50. It is imperative that all staff in the MEW are seaworthy and should possess navigational skills. They should have a monthly schedule of patrols in the Arabian Sea off Kerala. During patrols they should inspect at least 10 vessels in a day and inspection reports in forms should be regularly filed.
51. The MEW staff should undergo training by the DOF such that they are knowledgeable on all aspects of KMFRA rules and regulations. They should be equipped with net gauges and tape measures to measure the size and codend of nets.
52. A Central Operations Room (COR) should be formed at Vypin Fisheries Station which should house the VMS base unit and also have RT and VHF base stations. This unit should work 24x7 with adequate duty rotations.
53. The DOF-GOK may explore the possibility of drawing up an MOU with the Coast Guard to help in surveillance and enforcement of fishery regulations. This would help in stricter enforcement.
54. VMS base stations can be established from around INR 30 lakhs upwards, and onboard units run from INR 3-4 lakhs/unit. Funding for the latter should be subsidized by the DOF-GOK, and the entire funding should be sourced through centrally sponsored schemes of the MoA-GOI.
55. To aid better enforcement, the DOF-GOK should provide at subsidized rates RT units to all mechanized and motorized fishing units. This would roughly cost INR 2-3 lakhs/unit. This would also help in sea safety also.

Governance – Co-management [page 60-63]

56. This committee recommends that the DOF-GOK embrace the consultative mode of co-management immediately and then in later years move on to the cooperative mode of co-management as communities and governments take time to adjust and understand these new governance systems.
57. Under the consultative mode of co-management 3-tier fisheries councils should be formed immediately. At the lowest level should be the Village Fisheries Council (VFC) and next should be the District Fisheries Council (DFC) and finally the State Fisheries Council (SFC). The council TORs should be very clearly set. The councils should have representation from panchayats/ district/state, Department of Fisheries, CMFRI, CIFT, NGO's working in the area and fishermen associations and societies. They should meet once in a quarter. The Council should have powers to debate and recommend rules as necessary for effective management of fisheries. The scientific inputs for management of fisheries should be taken from research institutes and universities.
58. The rules and regulations recommended by the VFC or DFC should ultimately be passed by the SFC within a period of one year for implementation by the DOF-GOK.
59. At the VFC level separate councils can be formed for specific fishery commodities, such as for example clam fisheries. A village level clam fisheries council can exist separately and they should pass on their recommendations to the DFC.

60. The DOF-GOK should urgently promote the wide dissemination of KMFRA rules and regulations among fishermen, boat owners and other related stakeholders.
61. This booklet should also be compulsorily given to fishermen and boat owners when they are given identity cards, licenses and registration cards.
62. The KMFRA and its rules should be placed in the website of DOF-GOK.
63. The DOF-GOK should ensure that future evaluation and expert committees should have adequate representation from stakeholders.

Implementation Plan [page 65]

64. The Director of Fisheries, GOK should constitute an internal committee/ committees to examine the recommendations and suggest which of the recommendations would lead to amendments to the KMFR Act and which can be accommodated by changing the rules. This process should be completed at the earliest and should involve the Legal Officer.
65. The DOF-GOK should be strengthened with more technical personnel with fisheries background and should be made into a technical department.
66. The recommended administrative changes within the DOF-GOK, such as strengthening of the Marine Enforcement Wing should be completed within 3 months.
67. In order to legally frame amendments to the Act and Rules, the DOF-GOK could take the help of the Centre for Law and Agriculture (CLA) in the campus of the National University of Advanced Legal Studies (NUALS), Kalamassery, Kochi who have the expertise carry out such specialized work.

Stakeholder Comments & Expert Committee's Views

The draft report was submitted to the DOF-GOK on 10th May 2013 and it was placed in the department website (http://www.fisheries.kerala.gov.in/) as a PDF for comments from stakeholders and the general public. The recommendations were widely covered in the press and several comments were received by email and as written submissions. Some of these are placed below. The Hon'ble Minister of Fisheries and Ports called for a meeting of all stakeholders along with committee members on 18th May and again on 11th June, 2013 to get their opinion on the recommendations. Finally, it was decided that Malayalam translations of the recommendations would be made available to all and a Fishermen Coordination Subcommittee was formed with 10 members to form collective opinions for appraising the Expert Committee.

The Fishermen Coordination Subcommittee met with the Expert Committee under the chairmanship of the Director of Fisheries on 20th July 2013 at the Government Guest House Ernakulam and presented their views on each of the 67 recommendations. These are given in this section in a table with the Expert Committee's views for action by the DOF-GOK.

Subsequently, on 26 October 2013, the Fishermen Coordination Subcommittee met with the Expert Committee at the Government Guest House, Kochi to finalize the recommendations. Based on the discussions, the expert committee finalized the recommendations. The final recommendations are provided in the last chapter of this document.

Written Comments received from:

1 Mr. P.V. Pavithran, President, Kerala Swathanthra Malsythozhilali Union (KSMTU), Puthuvayupu, Ernakulam
2 Mr. Joseph Xavier Kalapurakkal, General Secretary, All Kerala Fishing Boat Operators Association, Munambam, Ernakulam
3 Father Thomas Kochery, National Fishworkers Forum, Kanyakumari, Tamilnadu
4 Mr. V. Vivekanandan, Adviser, South Indian Federation of Fisheries Societies (SIFFS), Karamana, Thiruvananthapuram
5 Dr. K.K. Vijayan, Principal Scientist, CMFRI, Kochi
6 Mr. Charles George, Kerala Matsyathozhilali Aikyavedi (TUCI), Kochi

Excerpts of some comments:

Dear Mohamed,
A response to the report on Trawl Ban

1. There is a need for fish resource assessment in 12 nautical miles and EEZ in the area of Kerala.
2. As per the fish resource assessment there is a `need for assessing the number of fishing gears and cuttamarams, Vallams without OBMs, with OBMs, and Trawl Boats, Ring seines, deep sea fishing gears. If these can manage let us `not have Industrial fleets at all.
3. All the fishing gears should be owner operators.
4. I agree with your recommendations, provided all these are implemented in-Toto.
5. All these gears should not be destructive gears.
6. Our fishing should be geared to feeding the masses of India rather than export oriented.
7. NABARD should give support for the feeding of the Indian masses, so that our health should get the first priority.
8. All the fishing vessels should use solar energy
9. Waste should not be thrown into sea, but bring back to the shore.
10. Fish should be sold through fisher women, so that each fishing family gets better income.
11. We need a legislation to cover the fishing in the entire EEZ to be enacted by the Parliament.

Thomas Kocherry, thomasksa@gmail.com, +91 936064 5772. www.thomaskocherry.com
10-05-2013

Brief of suggestions of Matsyathozhilali Aikyavedi (TUCI)

Marine capture fishery is declining on a global basis. But in India, during the last 5 decade, it is increasing steadily. Kerala registered an all-time high in 2011-12 (8.39lakh tones). Therefore, observations like the rate of fish production and value is not sustained after 2000, is not acceptable. In addition the committee has taken a bio-centric/ eco-centric approach. The committee failed to address the social realities in this sector. However, in general, TUCI favours majority of the recommendations of the expert committee. Important suggestions are:

1. Traditional fishers demanding that trawl ban should be continued and the period of ban to be extended to 90 days. This should be made after discussing stakeholders.
2. Instead of banning the ring seiners, strict monitoring and regulation be enforced.
3. Aquarian reforms should be implemented
4. For managing fisheries, cooperative mode of fisheries management can be adopted
5. KMFR act should be amended
6. Possibility of common management plans along the southwest coast maybe considered

Charles George, TUCI

Recommendations of the Expert committee Sl No.	Fishermen Coordination Subcommittee View	Expert Committee View
Main Findings [page 15-21]		
1	Not accepted the view that positive effect of trawl ban was not sustained after 2000. The decrease in fish catch and value may be due to a variety of factors including the use of LOP vessels in Indian waters. While making any suggestions, social impact also has to be taken into account. Extension of duration of trawl ban is not acceptable.	*This is like closing one's eyes to reality in the hope that things will turn out better in future. More options for DOF-GOK are given at #37.*
2		
3		
4		
Fishery Monitoring [page 45]		
5	For estimating the marine landing, fish auction data collected by MATSYAFED and other societies may also be taken into consideration.	*It is reiterated that duplication of data collection can be avoided by the DOF-GOK by taking steps to procure CMFRI data.*
6		
Registration & Licensing [page 46]		
7	KMFR Act should be amended. While amending the act, opinion from fishermen leaders should be considered. This suggestion can be accepted in principle. Marking or stamping may be made if practical.	*Agreed*
8	Limiting the nets to 6 numbers is not acceptable. Duplicates of nets should be allowed.	*Accordingly, this may be revised to accommodate 3 replicates of one type of licensed gear*
9	Accepted	*Agreed*
10	Accepted	*Agreed*
11	Accepted	*Agreed*
Fisheries Management Area & Governing Rules [page 46-47]		
12	Accepted	*Agreed*
13	Accepted	*Agreed*
14	Accepted	*Agreed*
15	Accepted	*Agreed*
Regulation on Destructive Gears [page 27/47]		
16	Stake nets should be removed only after giving compensation.	*Agreed*
17	Accepted	*Agreed*
18	Accepted	*Agreed*
19	Accepted	*Agreed*

20	A suggestion was that Thiruvananathapuram alone should not be selected for implementation; it should be done in all districts. However, in general, it is not acceptable.	*This is precisely why we need to do awareness campaigns to educate fishermen on advantages of MPA.*
Zonal Restrictions [page 49]		
21	Accepted	*Agreed*
22	Status of traditional fishermen is achieved through hereditary means. Irrespective of the craft and gear used, he must get the status of traditional fishermen.	*Agreed. The word traditional is to be removed. Irrespective of the craft and gear, traditional fishermen will remain traditional.*
Fishing Vessel Specifications [page 49-50]		
23	All mechanized multi-day fishing vessels with LOA 15 m and above should possess toilets, kitchen (galley) and at least 5 sleeping berths.	*Agreed for change from 12m to 15m.*
24	Accepted	*Agreed*
25	Accepted	*Agreed*
26	Accepted	*Agreed*
27	Training can be given to drivers and serangs of vessels. But the recommendation that mechanized fishing vessels should be driven only by certified serang/drivers is not acceptable as it may cause logistic problems.	*This may be implemented within a longer time-frame such that no deficiencies in services will occur.*
28	Accepted	*Agreed*
29	Accepted	*Agreed*
30	Accepted	*Agreed*
Legal mesh sizes and dimensions of nets [page 51]		
31	Accepted	*Agreed*
32	Do not mention specifically about MATSYFED alone.	*Agreed*
33	Accepted	*Agreed*
34	Accepted	*Agreed*
35	Accepted	*Agreed*
36	Accepted	*Agreed*
Fishing Bans [page 52-54]		
37	Not acceptable	*The DOF-GOK may explore reducing the recommendation to 60 days and/or making it one month in June-July and*

		another one month in November through further stakeholder consultations.
38	Not acceptable	*The DOF-GOK may explore reducing the recommendation to 45 days in April-May through further stakeholder consultations.*
39	Accepted	*Agreed*
40	Not acceptable	*If revised ban is acceptable this may be considered.*
Welfare measures [page 54-55]		
41	The subsidy for fuel for all fishing crafts in the state shall be fixed at 50% of fuel (diesel or kerosene) cost.	*An appropriate and reasonable percentage may be fixed.*
42	Accepted	*Agreed*
43.	Accepted	*Agreed*
Fleet Overcapacities [page 55-56]		
44	Accepted	*Agreed*
45	Accepted	*Agreed*
46	Accepted	*Agreed*
47	Accepted	*Agreed*
Surveillance [page 57-59]		
48	Accepted	*Agreed*
49	Accepted	*Agreed*
50	During patrols they should inspect maximum number of vessels in a day and inspection reports in forms should be regularly filed.	*The number per day may be fixed by the DOF-GOK in a practical manner.*
51	No need of tape and net gauges to measure the size and cod end of net.	*Measurements are essential for finding violations and this can be done in the fishing ports (landing centres) also.*
52	Accepted	*Agreed*
53	Omit Coast Guard	*Agreed but there are maritime security issues which are addressed by the Coast Guard.*
54	Accepted	*Agreed*
55	Accepted	*Agreed*
Governance – Co-management [page 60-63]		
56	Accepted	*Agreed*
57	NGO should be omitted. Instead of	*Agreed*

	Village Fishing Councils use Fishing Village Councils (FVC).	
58	Instead of Village Fishing Councils use Fishing Village Councils (FVC)	*Agreed*
59	Instead of Village Fishing Councils use Fishing Village Councils (FVC)	*Agreed*
60	Accepted	*Agreed*
61	Accepted	*Agreed*
62	Accepted	*Agreed*
63	Accepted	*Agreed*
Implementation Plan [page 65]		
64	Accepted	*Agreed*
65	Accepted	*Agreed*
66	Accepted	*Agreed*
67	No need of seeking the help of NUALS	*Agreed*

Summary of Opinions by the Fishermen Coordination Subcommittee

Decision	Accepted wholly	Accepted with modifications	Not accepted	Total
Number of recommendations	42 (63%)	17 (25%)	8 (12%)	67

The Expert Committee's views on those recommendations which are acceptable with modifications and those which are not acceptable are given in the Table as guidance for the DOF-GOK to initiate further steps. It is hoped that with 88% of the recommendations acceptable, the DOF-GOK can work to make a positive change in the marine fisheries scenario of the State within a short period of time.

Final Recommendations

Main Findings [page 15-21]

1. The present analysis clearly indicates that there has been a positive impact on fishery yields (without oil sardine) in Kerala State due to the introduction of the trawl ban from 1988. However, the 5-point moving average graph unmistakably shows that the positive impact on fishery yields was present only up to 1997 (9 years), and thereafter, the fishery yields are declining, the net decline being more than one lakh tonnes after 2000. This indicates that the benefit in terms of yield was not sustained.
2. The economic analysis indicates that in value terms the benefit of the trawl ban was present only up to the year 2000, after which there has been a decline in real value of the fisheries and ultimately incomes to fishermen in spite of increase in nominal value.
3. The growth rate analysis also clearly indicates that growth rate in the mechanized sector is negative after the year 2000, and the benefit of the trawl ban was not sustained after 2000.
4. Therefore, a hard, but necessary option would be to increase the duration of the trawl ban such that the benefit of the trawl ban in terms of yield and value is sustained.

Fishery Monitoring [page 45]

5. This committee recommends that the DOF-GOK enter into a MOU with CMFRI to get the data on catch and effort from CMFRI on an annual/regular basis as and when the year's data becomes available. If necessary, annual fees for the data may also be paid to CMFRI as a matter of professional courtesy and to help the data collection process. As per the suggestions of the Fishermen Coordination Subcommittee, this exercise may be jointly undertaken by the DOF-GOK and CMFRI without duplication of effort.
6. The Statistics Wing may focus on collection of inland and aquaculture data.

Registration & Licensing [page 46]

7. Currently blanket licensing is done for fishing; however, this should change to licensing for gears following legal dimensions and mesh sizes. This may be introduced by making necessary amendments in the KMFR Act. The DOF-GOK should introduce a system by which all fishing gears have a permanent DOF mark or stamp indicating its legal status following KMFRA. The license should be valid for 2 years and should be given only after inspection of gears possessed by the MEW. During implementation adequate consultations with the Fishermen Coordination Subcommittee should be done.
8. A registered fishing vessel can if necessary possess up to 2 licenses. For e.g., one for trawling and another for gillnetting. However no vessel should possess more than 9 licensed gears. Resource specific gears should be encouraged.
9. At present provisions exist for in KMFR Act for enforcing fine and forfeiting the vessels in case of violations. Provision for temporary cancellation of license may also be included in the KMFRA by making necessary amendments.
10. No new fishing vessels should be introduced without the permission of the DOF-GOK.
11. Registration and license for other states vessels should be restricted, and if given, should be at high cost (in order to discourage the practice) with the condition that catch is landed only in Kerala fish landing centres.

Fisheries Management Area & Governing Rules [page 46-47]

12. The coastal waters off Kerala, up to the legal jurisdictional limit, should be declared as Kerala Fisheries Management Area (KFMA). And, in the case of specific, characteristic and unique fisheries, such as clam fisheries in an estuarine system or the artisanal fisheries off

Thiruvananthapuram coast, specific management areas need to be set. Once the area is specified, the specific rules can become applicable to the management area. Thus fisheries management becomes more local and regional which is one of the basic tenets of the FAO's CCRF.

13. It is strongly recommended that the GOK urge the MoA-GOI to take necessary steps to correct the lack of rules and regulations in the area of sea from 12 to 200 nmi and to stop the LOPs issued by the MoA-GOI.
14. According to the FAO-CCRF, fisheries are best managed on a regional and local basis, and therefore, it is more pertinent to have the state manage and regulate the fisheries in the 12-200 nmi zone as well. The DOF-GOK may communicate this concept to the MoA-GOI.
15. The DOF-GOK may also communicate to the MOA-GOI the vehement opposition of the State's fishermen to the operation of LOP vessels in the 12-200 nmi zone.

Regulation on Destructive Gears [page 27/47]

16. Considering the objections with regard to stake net removal, this committee recommends that all unlicensed stake nets be removed by the DOF-GOK within one year. A compensation package maybe worked out based on the age of the gear. The minimum codend mesh size recommended by CIFT (24 mm) for all licensed stake nets should be strictly implemented. This should be done by periodic inspections by the backwater patrol of the DOF-GOK.
17. As per the CIFT recommendation implement banning of stake net operations during high tide by raising the net above water line during this time.
18. It is recommended that the DOF-GOK prohibit the operations of mini trawls in a phased manner. The DOF-GOK should formulate a registration and license buy-back scheme to help mini trawl fishermen take alternate avocations. This fishing practice should be phased out within the next 5 years (by December 2018). Existing licenses of mini-trawls should not be renewed.
19. Based on CMFRI's advice on the negative impacts, the Government of Karnataka has banned FAD based cuttlefish fishery in 2012. It is therefore imperative that the DOF-GOK also bans this type of destructive fishing method urgently to conserve this valuable resource.
20. The committee recommends that MPA, which is a very successful passive form of fisheries management, would become necessary in the future years. But first, the fishermen have to be made aware and educated with regard to the advantages of MPAs. Therefore, the DOF-GOK should initiate awareness campaigns in all coastal districts in the next 5 years such that MPAs can be introduced within the next 10 years.

Zonal Restrictions [page 49]

21. Implementation of zonal restrictions is possible only if the DOF-GOK implements the satellite based VMS as detailed in the surveillance section.
22. If the OBM and IBM ring seiners are using mechanized power to deploy and haul the nets, then they will lose their motorized status and will come under the status of mechanized, and therefore, the 20/30m zonal restriction will apply to them as well.

Fishing Vessel Specifications [page 49-50]

23. All multi-day mechanized fishing vessels with LOA 15m and above should possess toilets, kitchen (galley) and at least 5 sleeping berths.
24. The under-deck fish hold capacity of these vessels should not exceed 25% of the total volume of the vessel. Already registered vessels should get this modification done within the next 2 years, failing which their registrations should be cancelled.

25. All sea going fishing vessels should be fitted with appropriate lights and flags for signaling as per international maritime norms. They should also possess LSA and fire-fighting apparatus as per sea safety rules. These rules should be made effective immediately.
26. All identity card holding fishermen (both traditional and mechanized) of the state should undergo a 3-day course on navigation and sea safety. This course can be conducted by CIFNET who have the expertise and facilities to conduct such courses. The DOF-GOK should enter into a MOU with CIFNET for conducting this all-expense paid course. The entire exercise should be completed within the next 2 years and the fact that the fisherman has completed the course should be indicated in his/her identity card.
27. The drivers and serangs of vessels should undergo a more detailed 10-day course on navigation and other mechanical skills. This too can be made with a MOU with CIFNET and under conditions as given above. The rule that mechanized fishing vessels should be driven only by certified serang/drivers should be made a mandatory requirement within the next 5 years.
28. The fishing vessels are also lacking adequate communication facilities. All vessels capable of and carrying out operations outside the 12 nmi zone should possess not only VHF but also RT (radio telephone) communication facilities. The DOF-GOK should enter into dialogue with the Ministry of Communications for enabling all deep-sea going fishing vessels to be fitted with RT facilities on subsidized rates. This is an urgent sea safety requirement for which the DOF-GOK has to play an enabling or facilitating role.
29. Creation of a separate Fishing Vessels Act to address the above should be considered by the DOF-GOK in consultation with the legal cell.
30. This committee therefore recommends that the DOF-GOK take permission of the MMD to register fishing vessels up to 24m LOA with all safety and navigational features. The proposed Fishing Vessel Act can take these into consideration.

Legal mesh sizes and dimensions of nets [page 51]

31. The legal mesh sizes for different gears have been set out elsewhere in this document. This should be strictly implemented by the DOF-GOK by system of inspections. Use of illegal nets and mesh sizes in nets leads to IUU fishing.
32. Besides, government agencies supplying nets to fishers should not manufacture nor supply illegal mesh size nets to any party. Research institutions testing experimental fishing nets and gears can be exempted. The argument that if government agencies are not supplying, private net manufactures would supply does not hold, as the system of checks and punishments set out in this document would effectively stop the illegal practice in course of time.
33. Optimum mesh sizes have been determined for species targeted by gillnets by CIFT and are given in Table in page 50. Minimum mesh size is 33 mm and maximum mesh size 152 mm.
34. Mesh size for sardine/mackerel ring seines for both mechanized and OBM categories may be regulated at 22 mm or more in the bunt and main body and maximum dimension of the gear may be limited to <600 m hung length and <60 m hung depth, for all new and replacement ring seines.
35. Mesh size for anchovy ring seines may be regulated at 12 mm and maximum dimension of the gear may be limited to <250 m hung length and <50 m hung depth.

36. Codend mesh of 35 mm has been prescribed for trawl net in KMFRA. It is recommended that this be changed to 35 mm square mesh as studies by CIFT shows that it provides better opportunity for juveniles to escape.

Fishing Bans [page 52-54]

37. The tenure of the annual trawl ban should be extended from 47 days to 60 days (two months) in two periods, one during June-July and the second during October-November each of 30 days. The advantages of such an extension period should be reviewed after 3 years by a scientific committee.
38. The OBM and IBM ring seiners should be banned from operation for a period of 60 days from April 1 to May 30 (both days inclusive) to protect pelagic spawning stocks. This was not agreed by the Fishermen Coordination Subcommittee. The Expert Committee recommends further discussions and awareness campaigns with the concerned fishermen associations before taking up the matter again.
39. There should not be any seasonal fishing ban for non-motorized traditional vessels.
40. The DOF-GOK should provide adequate monetary relief (based on minimum wages) to fishermen during the ban periods.

Welfare measures [page 54-55]

41. The subsidy for fuel for all fishing crafts in the state shall be fixed at an appropriate and reasonable percent of fuel (diesel or kerosene) cost.
42. This subsidy should be given to only those registered and licensed vessels which are complying with all rules of the KMFRA. Since license is to be renewed every 2 years, the subsidy allowance should also be reviewed at this point.
43. Other welfare (housing, education, ration etc.) subsidies to fishermen should be quantified by the DOF-GOK as a database for future reviews and for applying the above management-motivation scheme.

Fleet Overcapacities [page 55-56]

44. In the light of the high overcapacity in some of the fishing fleets in Kerala, an immediate moratorium on new vessels has to be declared by the DOF-GOK.
45. Vessels older than 20 years should have their registration and license cancelled, and owners if they are fishermen, should have the right to construct a new vessel with the permission of the DOF-GOK. This replacement vessel will be strictly in the least over capacitated fishing fleet.
46. New vessel construction in boatyards should be begun only with permission from DOF-GOK; otherwise registration should not be given.
47. In order to reduce overcapacity and fishing effort, the DOF-GOK should formulate a scheme to buy-back vessel registration and license from owners with compensation at market prices. The DOF-GOK should earmark adequate finance in its budget to buy-back at least 20 vessels in a year. On demand, alternate avocation training should also be provided free of cost by DOF-GOK.

Surveillance [page 57-59]

48. The Marine Enforcement Wing of the DOF-GOK should be strengthened by the posting of an Additional Director under whose administrative and technical control the whole wing should function.
49. The Inspectors and Sub-inspectors of Fisheries in DOF-GOK should be fully deployed in surveillance and enforcement rather than in routine department work.

50. It is imperative that all staff in the MEW are seaworthy and should possess navigational skills. They should have a monthly schedule of patrols in the Arabian Sea off Kerala. During patrols they should inspect maximum number of vessels in a day and inspection reports in forms should be regularly filed. Inspections should not hinder fishing activity as far as possible.
51. The MEW staff should undergo training by the DOF such that they are knowledgeable on all aspects of KMFRA rules and regulations. They should be equipped with net gauges and tape measures to measure the size and codend of nets. These inspections should be carried out when the vessel is in landing centres.
52. A Central Operations Room (COR) should be formed at Vypin Fisheries Station which should house the VMS base unit and also have RT and VHF base stations. This unit should work 24x7 with adequate duty rotations.
53. The DOF-GOK may explore the possibility of drawing up an MOU with the Coast Guard (joint operations) to help in surveillance and enforcement of fishery regulations. This would help in stricter enforcement.
54. VMS base stations can be established from around INR 30 lakhs upwards, and onboard units run from INR 3-4 lakhs/unit. Funding for the latter should be subsidized by the DOF-GOK, and the entire funding should be sourced through centrally sponsored schemes of the MoA-GOI.
55. To aid better enforcement, the DOF-GOK should provide at subsidized rates RT units to all mechanized and motorized fishing units. This would roughly cost INR 2-3 lakhs/unit. This would also help in sea safety also.

Governance – Co-management [page 60-63]

56. This committee recommends that the DOF-GOK embrace the consultative mode of co-management immediately and then in later years move on to the cooperative mode of co-management as communities and governments take time to adjust and understand these new governance systems.
57. Under the consultative mode of co-management 3-tier fisheries councils should be formed immediately. At the lowest level should be the Fishing Village Council (FVC) and next should be the District Fisheries Council (DFC) and finally the State Fisheries Council (SFC). The council TORs should be very clearly set. The councils should have representation from panchayats/ district/state, Department of Fisheries, CMFRI, CIFT, NGO's working in the area and fishermen associations and societies. They should meet once in a quarter. The Council should have powers to debate and recommend rules as necessary for effective management of fisheries. The scientific inputs for management of fisheries should be taken from research institutes and universities.
58. The rules and regulations recommended by the FVC or DFC should ultimately be passed by the SFC within a period of one year and transmitted to DOF-GOK for implementation. The rule making power is vested with the Government.
59. At the FVC level separate councils can be formed for specific fishery commodities, such as for example clam fisheries. A village level clam fisheries council can exist separately and they should pass on their recommendations to the DFC.
60. The DOF-GOK should urgently promote the wide dissemination of KMFRA rules and regulations among fishermen, boat owners and other related stakeholders.

61. This booklet should also be compulsorily given to fishermen and boat owners when they are given identity cards, licenses and registration cards.
62. The KMFRA and its rules should be placed in the website of DOF-GOK.
63. The DOF-GOK should ensure that future evaluation and expert committees should have adequate representation from stakeholders.

Implementation Plan [page 65]

64. The Director of Fisheries, GOK should constitute an internal committee/ committees to examine the recommendations and suggest which of the recommendations would lead to amendments to the KMFR Act and which can be accommodated by changing the rules. This process should be completed at the earliest and should involve the Legal Officer.
65. The DOF-GOK should be strengthened with more technical personnel with fisheries background and should be made into a technical department.
66. The recommended administrative changes within the DOF-GOK, such as strengthening of the Marine Enforcement Wing should be completed within 3 months.

Disagreement Note

Some members of this expert committee belonging to the DOF-GOK have expressed disagreement on the following recommendations.

Recommendation 5

For data collection and compiling, DOF-GOK will also seek the scientific support and advice of CMFRI.

Recommendation 7

Stamping the gears with permanent marks is not practical in the present condition. However, the recommendation that, licensing of gears following legal mesh size and dimension is acceptable. For implementation, KMFR Act needs to be amended.

Recommendation 8

This can be implemented in future after making consensus with stakeholders, making necessary amendments in KMFRA and also equipping the DOF-GOK with required facilities.

Recommendation 26 & 27

Agency under DOF like NIFAM with the technical and infrastructure support of Fisheries Stations can also be entrusted this work.

Acknowledgements

The expert committee would like to place on record our sincere thanks to the stakeholders (fishermen of Kerala) and their representatives in the Fishermen Coordination Subcommittee for assisting the committee in all stakeholder meetings and for their cordiality and attitude of cooperation shown by them in all discussions. Many members of the informed public, NGOs, and experts in the field of fisheries also gave their comments on the draft report for which this committee is very grateful. The committee also thanks the Director of Fisheries, GOK and all staff of the department for the logistic support extended.

The expert committee is grateful to the Director of Central Marine Fisheries Research Institute (CMFRI), Kochi and the Director of Central Institute of Fisheries Technology (CIFT), Kochi for all the logistic support given.

Finally, the expert committee is very thankful to Shri. K. Babu, Honourable Minister of Fisheries and Ports of the Government of Kerala for interacting with the committee and stakeholders, and for championing a spirit of cooperation and goodwill among all participants.

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