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IMPACT OF FISHING ALONG THE WEST COAST OF INDIA DURING SOUTHWEST MONSOON PERIOD ON THE FINFISH AND SHELLFISH RESOURCES AND THE ASSOCIATED MANAGEMENT CONSIDERATIONS

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Abstract

Based on the informations presented in the preceding sections on oceanography, productivity of the eastern Arabian Sea and the fisheries and biological characteristics of the resources along the west coast of India during different seasons particularly in the monsoon and the informations collected by CMFRI over the period of 45 years; the impact of fishing during monsoon months on (i) the fishery resources, (ii) interaction between the artisanal and the mechanised fishing sectors exploiting the resources, (iii) complexities of multispecies - multigear fisheries in the inshore waters and (iv) their possible resource management options are analysed critically, discussed and recommendations suggested/ formulated.

It is clearly found that the management of fisheries cannot be considered only a matter concerning administration or biology or resource assessment, but as an integrated approach taking into account sociological, economical and developmental objectives and priorities as well.

The papers presented in the preceding sections have dealt with the oceanographic and productivity features of the continental shelf waters of the eastern Arabian Sea and the fisheries and biological characteristics of the important species/ groups exploited during different seasons along the west coast with particular reference to the monsoon season. In this section the impact of fishing during monsoon months on the resources, interaction between the artisanal and the mechanised fishing sectors exploiting the resources, complexities of multispecies - multigear fisheries in the inshore waters and their possible resource management options are discussed.

The west coast of India with a coastline of about 3400 km and covering an area of 0.86 million square kilometres of the Exclusive Economic Zone, contributes to 1.29 million tonnes of marine fish production out of the total estimated all India marine fish production of 1.78 million t (1985-89). In consideration of the general topographical features, physical nature of the sea, nature of the sea bottom, distribution pattern of the species, their abundance and fishery characteristics, the coast can be broadly divided into two : the northwest coast comprising of the maritime States of Gujarat and Maharashtra and the southwest coast covering Goa, Karnataka, Kerala and west coast of Tamil Nadu. The continental shelf of the northwest coast particularly off Gujarat slopes gradually and very much wider than the Maharashtra Coast. In the southwest coast the shelf is relatively narrow. Nevertheless, some of the most productive fishing grounds supporting the rich fisheries of Indian mackerel, oilsardine and penaeid prawns are located here.

Evolution of the marine fisheries of the west coast of India

The evolution of marine fisheries of the west coast of India is well documented (Chopra, 1951; Jones, 1958; Rao, 1973; Alagaraja *et al.*, 1982; Alagaraja, 1987; Silas *et al.*, 1976, 1986; Jacob *et al.*, 1987; Kurup *et al.*, 1987; Srinath *et al.*, 1987; Balan *et al.*, 1987) and during this process four periods are distinguished. Prior to Independence and immediately after that upto about 1950, the fishing was carried out at subsistence level with the indigenous craft employing gears such as cast nets, small seines and traps operated rather close to the shore. The production was low and was mainly used for daily subsistence. No real fish markets existed.

In the second period from about 1950 to 1970, along with the traditional fishery, small mechanised vessels with bottom trawl nets were introduced. The establishment of an export market for

shrimps and its accelerated expansion gave a fillip to progressive addition of mechanised vessels and popularisation of bottom trawling, although, initially, the traditional fishermen were hesitant to accept the mechanised fishing. Another noteworthy development during the period was the introduction of synthetic gear material replacing the cotton fibre. As these new gears and new boats were fishing almost in the same area, the fisheries resources became one of common property exploited both by traditional and mechanised sectors. The marine fish production during this period increased from 292,071 t in 1950 to 811,940 t in 1970.

The third period from about 1970 to 1980 witnessed rapid expansion of the fishery in the inshore waters. Besides, purse seines for the exploitation of pelagic fishes were introduced on the southwest coast. The introduction of this gear resulted not only in the abandonment of the large beach seines the *Rampan* nets along the Karnataka Coast, but also increasing competition between the traditional and purse seine operators for the exploitation of pelagic resources, the main stay of fisheries of this region. The pattern of fishing also changed from single day fishing to stay over fishing for more than a day, the cod end mesh size of the trawl nets was reduced to catch relatively smaller sized prawns, fishing during monsoon with gears such as gill nets and small purse seines in addition to trawlers came into practice. This increasing fishing effort resulted in the catch fluctuating at a level about the maximum catch. And at certain centres where large number of trawlers and fishing activity are concentrated, the prawn fishery showed a declining trend indicating the sign of overexploitation of the stocks. As more fishing units are employed in the fishery and with improved processing and marketing facilities, the average annual production increased from 584,420 t during 1960-69 to 924,850 t during 1970-79 decade.

The major development in the marine fisheries sector during the period 1980-90 has been the rapid increase of motorisation of country craft which was first started in Gujarat, but soon became popular and extended to the southern States of Kerala and Karnataka. Employing these crafts, a new gear simulating a smaller version of the purse seine with local modification and called variously as *Mattabala* in Karnataka, the ring seine in Kerala and disco net in some other places was introduced into the capture fisheries to catch fishes in the columnar and surface waters. These units were employed initially during the monsoon season when trawl nets and purse seines were not operated in large scale. Becoming popular, their number increased rapidly as exemplified in Kerala where the ring seines increased from a mere 748 in 1986 to 2400 in 1989. These developments and the continued fishing effort although helped to increase the production from 855,000 t in 1980 to 1,700,000 t in 1987, the traditional fishery was affected.

Reasons for conflicts between traditional and mechanised fishing sectors

As elsewhere in the world, the exploitation of the marine fishery resources in India, is carried out on a common property basis there being no restrictions or limitation on the entry of fishing units. In the earlier phase, the mechanised fishery soon after its introduction and the traditional fishery co-existed for some time exploiting the resources from almost the same ground without much problem. With the discovery of lucrative fishing grounds for prawns, growing export trade and attracted by the higher profitability on investment, more and more numbers were added year after year taking advantages of institutional credit and liberal subsidies extended to the sector. This rapid expansion gradually lead to a struggle for the control of the inshore fishing grounds by the different sectors. Srivastava *et al.* (1986) made an excellent study on the impact of mechanisation on small fishermen and the salient features of their observations are :

1. the pattern of mechanisation and its pace were different in different States;
2. the ownership of mechanised craft between the actual fishermen and non-fishermen was also varying from State to State (for example in Gujarat the share of non-fishermen owning mechanised craft was 15.21% while in Karnataka, it was 46.51% (1980). Here a large number of mechanised boats were on partnership basis).
3. the introduction of purse seine in Karnataka has resulted in the disappearance of the *Rampan* nets and in the total shift in the catch composition, employment pattern and income;

4. in general, the fish production accelerated due to mechanisation, the growth rate of production increased from 1.50% during premechanisation (1956-69) to 2.32% during post-mechanisation period;

5. mechanisation has helped to enhance the demersal fish production, but in the case of pelagics there has not been appreciable increase and in certain cases, the production has decelerated or shown negative growth rate;

6. the mechanisation has contributed to reduction in seasonal variation in total landings in Gujarat or reduced fluctuations in the catch as in Karnataka;

7. as the purse seines are operated mainly for pelagics and since several of the traditional gears such as boat-seines, gillnets and shore-seines are also employed to catch these resources, it is observed that purse seines are competing, but the trawlers are complimentary with occasional conflicts whenever they operate in shallow waters causing damages to nets and boats of traditional fishermen;

8. in the socio-economic front, while the mechanisation of craft has not resulted in higher education or literacy rate, mechanised boat owners, as could be expected, possess assets of higher value than the non-mechanised groups and live in extended household with larger family size. Similarly, the crew in mechanised craft earned much higher income than those in the non-mechanised sector and greater disparity in income and ownership is observed as per capita per household is higher.

Besides the above, the impact of mechanisation is also observed on the indebtedenss of traditional fishermen more on boat onwers to tide over the difficult days, price realisation of the catch and disappearance of certain village industries like that producing cotton yarns for the nets.

Therefore, the major factors for bringing about the conflicts between the two groups are (1) for the control of fishing grounds and (2) widening social and economic disparity. These were futher made use of by certain vested interests for their advantage. Thus the introduction of modern technologies of fishing was not inappropriate *per se*, but has unwittingly lead to social conflicts and economic disruption of traditional fishing community.

The studies carried out by the Central Marine Fisheries Research Institute have shown that the fishing effort by small mechanised vessels has increased appreciably over the years contributing to 262,954, 113,809, 32,400, 286,496 and 205,586 tonnes in Kerala, Karnataka, Goa, Maharashtra and Gujarat respectively in 1984 as against the contribution from the nonmechanised sectors respectively at 129,939, 13,187, 4100, 19,789 and 45,004 tonnes. Further the results of stock assessment studies at the Institute on the major exploited resources have shown that the present production has reached near MSY levels or in some cases, crossed the MSY level in the present fishing grounds. This, together with the problem of availability of opportunities for equitable and sustainable harvest for the different groups can also bring about conflicts among them.

Monsoon fisheries

While the conflicts due to the above factors have been occurring occasionally and resolved amicably at the local level, the fishing during monsoon, in recent years, has assumed great controversy requiring its resolution at the State level. It is feared that sooner or later it may even assume a nation level problem. This controversy stems principally from the encroachment of the territorial waters demarcated for traditional fishermen, by the mechanised fishing vessel operators to catch prawns and fishes that occur in the area. Due to the rough sea conditions during monsoon period the fishing activities of traditional fishermen are restricted to close to the shore. Further, with less efficient craft and gear they could harvest the resources that are fishable by these units. Consequently their income from fishing occupation gets reduced considerable and thus they get caught in a poor economic trap. At the same time, the mechanised fishing operators are able to harvest the resource with the efficient trawl net and increase their wealth. Further, in the context of fluctuating trend of fish production, the traditional fishermen believe that continuous sweeping of fishing grounds by the trawl nets disturbs the bottom habitat of fishes. They also believe that trawling during monsoon results in the destruction of spawning

populations of commercially important resources, thus adversely affecting the subsequent recruitment. This undue resource sharing, sociological and economical manifestations have brought about the conflict between the artisanal and mechanised sectors.

While the resource papers in Chapter 4 have dealt with the characteristics of the fisheries and resources during different seasons, certain important features of the monsoon fishing along the west coast are discussed here.

The monsoon fishery is carried out at present at a significant level in Kerala, at a moderate level in Karnataka and to a lesser extent in Goa, Maharashtra and Gujarat. In Gujarat there is no trawling during monsoon; the principal gear used in this season is the gillnet and the catch is mainly composed of elasmobranchs, wolf herring, shad, croakers, penaeid prawns, seerfish and others. The average production from the monsoon fishery is 5300 t as against 223,000 t during other seasons during 1984-1988. Over the years, the share of monsoon fish landings in the total landings of the State has been varying from 5 to 8.5%. As the exploitation during monsoon period in this State is not significant, there does not seem to be any cause for concern on the possible ill effects of fishing during monsoon on the resources.

The monsoon fishery of Maharashtra contributes to about 5-10% of the annual marine fish production of the State and over the years, the share of monsoon landings in the total landings has been showing an increasing trend. The principal gears employed in the monsoon fishery are trawlnets, Gill net and dol net. The trawling effort during the period is very poor, forming about 12% of the total annual trawling effort. The important species contributing to the fishery are penaeid prawns, Bombay-duck, non-penaeid prawns and croakers. As in Gujarat, no detrimental effect on the resources due to fishing during monsoon has been observed.

In Goa, of about 53,000 t landed annually (1984-88) the monsoon period contributes about 3000 t. Although there is not much of information on the biology of the resources exploited off this coast, adverse effect of monsoon fishing is not reported.

In Karnataka fishing by mechanised vessels and purse seiners is suspended from June to August. The principal gear used in the monsoon fishery are *Mattabala*, shore seines and gillnets. The *Mattabala* in the fishery started from mid-eighties and are operated using the motorised craft. The number of these units has been progressively increasing since 1986. Penaeid prawns constitute the principal species group caught by this net. The marine fish production in the monsoon period in the State accounts for about 2.7% of annual fish catch. The relatively low catches during the monsoon period and the available biological information on major constituent species indicate that the present monsoon fishing does not affect the stocks adversely.

The monsoon fishery of Kerala has been the subject matter of considerable discussion in view of the serious conflicts occurring between the traditional and mechanised sector for the past few years. The different Committees/Commissions appointed by the Government of Kerala to examine and report the marine fisheries problems including fishing during monsoon have analysed the characteristics of the resources exploited during the monsoon season and have endeavoured to discuss its impact on the resources. As mentioned earlier, monsoon fishing is carried out more vigorously in this State than in other States of the west coast. The share of fish production produced during the monsoon season amounts to 30% of the total annual fish production in this State. The monsoon fishery is mainly contributed by the landings of trawl nets, drift gill nets and ring seines. The major component in the State's catch during monsoon is penaeid prawns, which form about 50% of the annual penaeid prawn catch. Among finfishes, perches (mainly threadfin-bream), sciaenids, lizardfish, ribbonfish and in some years, catfish and whitebait are the important components in the catch during the third quarter.

At Sakthikulangara, the trawlers land maximum catch in the third quarter which forms over 50% of the year's catch by this gear. The dominant groups contributing to the fishery are penaeid prawns (mainly *P. stylifera*), perches, lizardfishes and flatfishes. At Cochin also the peak landings forming 50% of the total annual catch by trawlers are obtained in third quarter; the dominant groups during this period are perches, lizardfish and penaeid prawns.

This unique nature of heavy landings during monsoon period along the Kerala Coast, though there is no proportional or significant increase in the effort during this period, is mainly governed by the movement in large concentrations of certain resources into and beyond the fishing grounds. During premonsoon and postmonsoon periods, the commercially important demersal finfishes and shrimps are distributed in the area upto 50 m depth zone. Certain fishes such as threadfin-breams, however, are more abundant in depth beyond 50 m particularly in the 100-150 m depth zone. During the monsoon period, due to the influence of upwelling, some portions of populations of certain demersal finfishes and shrimps (*Metapenaeus dobsoni*) move to nearshore waters, while some others (*Parapenaeopsis stylifera* among shrimps) move to relatively deeper waters of 35-60 m depth range. Similarly, the threadfin breams move into relatively shallower areas of 35-40 m depth range during monsoon. The monsoon fishery of Kerala thus appears to depend upon the above mentioned movements of certain populations. Although there has been substantial overall increase in recent years in the landings of exploited finfish resources and a declining trend in the landings of *P. stylifera* during the monsoon periods, the year to year fluctuations in production appear to be dependent on the intensity of upwelling and consequent movement of the constituent populations into and beyond the fishing grounds.

One of the most important biological characteristics which determines the success of a fishery in a particular year is spawning and corollary recruitment. It is therefore highly relevant to have an adequate understanding of this phenomenon to appreciate the dynamics of the exploited populations and their management. It is well known that the environment plays a significant role in triggering the maturation and spawning. In tropical marine finfishes and shellfishes, spawning is generally protracted and fractional spawning is common. It appears to be true in respect of the commercial finfishes and prawns of the west coast of India on the basis of available information (Table 1). While most of the species spawn during monsoon months they also spawn during other periods of the year with varied intensities. Though the occurrence of one of the peak periods of spawning during monsoon months appears to be a matter of concern, the fact that the spawning is continuous over longer periods and that fractional spawning occurs, suggest that the apprehensions that exploitation during monsoon period adversely affects spawning and consequent recruitment do not appear to be well-founded. In fact, this positive feature of continuous spawning coupled with faster growth rate appears to be a built-in mechanism against over exploitation in tropical marine fishes like those of India.

The progressive decline in the mean length of exploited species is one of the indications of overexploitation. In the context of management of exploited resources controls on indiscriminate exploitation of juveniles assume significance because, if proper controls/regulatory measures are not undertaken, the fishery is likely to face the problem of growth overfishing. In the present context of monsoon fishery along the west coast, the data on various resources show that juveniles are caught not only during monsoon period, but also in other periods. Therefore, the exploitation of juveniles is not restricted to monsoon period only.

As stated above, the protracted spawning and recruitment in different pulses help in the protection of the stock from being overexploited. However, the studies on stock assessment in most cases reveal that the lengths at first capture of most of the exploited stocks are smaller and most cases smaller than lengths at first maturity. This is particularly the result of reduction in the cod end mesh size of trawl nets. The maximum sustainable yield in several species corresponds to larger values of lengths at first capture. Therefore, to ensure MSY of the exploited stocks, juvenile exploitation should be restricted. Further, it is known that the nearshore waters serve as nursery grounds for majority of fish and prawn species and it is essential to regulate fishing particularly with least selective dynamic gears such as trawls and ring seines in these areas.

Management considerations

The management of fisheries in India is governed by the rules and regulations formulated under the Indian Fisheries Act 1897 and later under the Marine Fishing Resolution Bill demarcating the fishing zones in 1978. The Government of India in 1977 enacted the Exclusive Economic Zone Act extending her rights to explore, exploit and utilize the living and non-living resources available in

TABLE 1. *Spawning seasons of marine finfish and shellfish along the west coast*

Species	Locality/Area	Spawing season
Rastrelliger kanagurta	West coast	June-Aug.; Oct.-Dec., Mar.-July; Oct.
Sardinella longiceps	West coast	June-Nov.
	"	June-Sep.
	Karwar	June-Dec.
	Mangalore	May-Oct.
	Calicut	May-Oct.
	Vizhinjam	May-Aug.
S. fimbrita	Karwar	Jan.-Apr.
Thrissocles mystax	Calicut	Feb.-May; Sep.-Jan.
Nematalosa nasus	Mangalore	Oct.-Nov.
Opisthopterus tardoore	Karwar	Feb.-Aug.
Auxis thazard	Vizhinjam	Apr.-Sep.
	Cochin	Oct.-Dec.
Euthynnus affinis	Vizhinjam	Apr.-Sep.
	Cochin	Oct.-Mar.
Katsuwonus pelamis	Minicoy	Feb.-July
Sarda orientalis	Vizhinjam	Apr.-Sep.
Nemipterus japonicus	Cochin	June-Jan.
	Mangalore	Nov.-Apr.
	Bombay	Jan.-Dec.
	Veraval	Feb.-May; Sep.-Jan.
N. mesoprion	Cochin	June-Jan.
	Bombay	Throughout the year peak : June-Aug.
	Veraval	Feb.-May; Sep.-Jan.
Cynoglossus semifaciatus	Calicut	Feb.-May; Oct.-Jan.
Psettodes erumei	Bombay	Sep.-Oct.
Leiognathus bindus	Calicut	Feb.-Apr.
Sillago sihama	Karwar	Aug.-Feb.
Saurida tumbil	Karwar	Oct.-Jan.
Harpadon nehereus	Bombay	Apr.-July; Nov.-Dec.
Caranx kalla	Calicut	May-June; Dec.-Jan.
Tachysurus thalassinus	Cochin	Sep.-Jan.
T. dussumieri	Cochin	Dec.-Feb.
	Calicut	"
	Mangalore	"
T. tenuispinis	Cochin	Sep.-May.
	Calicut	"
	Mangalore	"
	Veraval	Feb.-May.
T. serratus	Cochin	Sep.-Dec.
	Calicut	"
	Mangalore	"
T. caelatus	Veraval	Jan.-Apr.
Protonibea diacanthus	Bombay	June-Sep.
Otolithus argenteus	Mangalore	Oct.-Jan.
O. cuvieri	Cochin	Feb.-May; Sep.-Jan.
	Veraval	Feb.-May; Sep.-Jan.
	Bombay	May-July; Nov.-Dec.
Johnius glaucus	Veraval	Feb.-May; Sep.-Jan.
J. vogleri	Bombay	June-July; Nov.-Dec.
	Veraval	June-Aug.; Sep.-Jan.
J. sina	Cochin	Jan.-Dec.
J. macrorhynus	Bombay	June-July; Nov.-Dec.
K. axillaris	Cochin	Feb.-May; Sep.-Jan.
Pseudosciaena coibor	Calicut	May-Aug.
Polynemus heptadactylus	Bombay	Mar.-June; Aug.-Nov.
Penaeus indcus	SW coast	Throughout the year; peaks : Oct.-Nov.; May- June
Metapenaeus dobsoni	SW coast	Throughout the year; peaks : Oct.-Dec.; Apr.-May
M. affinis	NW coast	Throughout the year; peaks : Sep.-Jan.; Feb.-May
M. monoceros	SW coast	Throughout the year; peaks : July-Aug.; Nov.-Dec.
	NW coast	Throughout the year; peaks : Feb.-Aug.
Parapenaeopsis stylifera	SW coast	Throughout the year; peaks : Nov.-Dec.; Mar.-Apr.
	NW coast	Throughout the year; peaks : Feb.-May.
P. hardwickii	NW coast	Throughout the year; peaks : June-Aug.
Solenocera crassicornis	NW coast	Throughout the year; peaks : Sep.-Jan.

200 n. m zone from the shore. As the development of the marine fisheries in the territorial waters extending upto 12 n. m from the shore is a State subject, the different maritime States formulated their own rules and regulations for the management of the resources.

The regulatory measures formulated under the above Acts and Regulations, by and large, cover prohibition of destruction of resources by explosives and poisonous means and by destructive gears. The other regulatory measures include regulation of fishing in the nursery areas where juveniles are concentrated; indiscriminate fishing or catching of breeders in their migratory phase and leasing/licensing system of fishing rights, particularly in the inland waters. In the marine region, the regulatory measure that has been adopted as an administrative approach to the management of fisheries is the demarcation of fishing zones aimed at mainly safeguarding the interests of small-scale and medium-scale fisheries. The other management solutions discussed and advocated are : (1) regulation of fishing effort for exploiting the resources, particularly the shrimp resource which is a single critical resource and center of most of the controversies and conflicts in the country; (2) restriction of number of fishing gears which exploit the juvenile phase in the backwaters, estuaries and shallow inshore waters through licensing, (3) mesh size regulation, (4) minimum legal length for capture and (5) closed seasons and areas. Among these, although the licencing of fishing gears engaged in the juvenile fishery is in force through regulation as in Kerala, its implementation has not been successful mainly due to socio-economic constraints, particularly lack of alternative employment opportunities for fishermen. Similarly, mesh size regulation could not be enforced due to multispecies, multigear nature of the fisheries and again, the socio-economic reasons.

The crucial problem of conflicts in the monsoon fisheries of Kerala was discussed by several committees and commissions appointed for the purpose. After considerable deliberations and detailed analyses of the pattern of the fisheries, information available on the resources and other related social and economical implications, it was decided to ban trawling in the territorial waters of the State during June-August and this has been implemented since 1988 with relaxation in certain areas and varied total duration. One of the Commissions (Kalawar Commission) appointed to examine this issue recommended regulation of effort to 1145 trawling boats during this period with the trawl cod end mesh size not less than 35 mm. However, the arguments for banning of trawling and extending into total banning of fishing during this period and against this regulatory measure are being continued.

The main objective of regulatory management of fishery resources is to ensure maximum sustainable yield or maximum sustainable economic yield. However, while considering the regulatory management tools, it is essential to consider the socio-economic conditions and employment opportunities of fishermen belonging to different economic and ethnic groups so that these measures could be implemented ensuring maximum benefit and safeguarding their interest eventhough the total objective of that regulatory measure or the fishery output may suffer. In such a situation, the classical management tools such as limiting the effort, regulation of entry by gear type and closed seasons or areas may not be totally acceptable unless alternative opportunities for their livelihood and basic needs are ensured or created. The failure of the total implementation of the present regulatory measure of banning of trawling to the satisfaction of different sectors appears to center around this crucial point, although the data available on the resource exploitation and cognate argument of adverse effects of trawling on spawning population and juvenile exploitation do not advocate total banning of trawling in the fishing grounds. Nevertheless in consideration of the conservation of the resource and unrestricted exploitation of juveniles, it has become imperative to stress viable management measures. In this context, confining trawling to beyond territorial waters during monsoon and restriction of additions of ring seines with increased mesh sizes as recommended is strongly supported.

As the success of implementation of regulatory measures largely depends on the involvement of the fishermen, it is necessary to take this aspect into consideration. It is observed that the self regulation formulated by fihsermen themselves as in the case of management of purse seine operation in Karnataka, sharing of day and night fishing between the artisanal and mechanised sectors in Tamil Nadu have been successful in the conflict

management. Such a conflict management system with the total involvement of fishermen, adminstrators, politicians and others should work effectivley as against the exclusively administrative approach as being followed now. It is therefore clear that the management of fisheries cannot be considered only a matter concerning administration or biology or resource assessment, but as an integrated approach taking into account the sociological, economical and development objectives and priorities as well.

Suggestions and Recommendations

1. The monsoon fisheries of the west coast of India is dealt with in the background of its environment, resources exploited, interactions between different fisheries and fishing interests.

2. In the light of the data now available on the exploited resources and their characteristics, **it is observed that monsoon fishing, by and large, does not adversely affect any of the resources.** However, further information base is necessary for a comprehensive conclusion on this and therefore, continuous monitoring of the resources and directed research on the gaps in our knowledge on the distribution pattern, movements, effects of exploitation on the dominant groups such as *P. stylifera* and threadfin-breams supporting the monsoon fisheries are necessary.

3. At present the controversy is confined to bottom trawling during monsoon within the territorial waters. The rapid increase of ring seines and similar gears witnessed during the recent years would sooner or later assume the status of another controversy as the ill effects of exploitation by these gears during monsoon have greater deleterious effect on the resources than trawling. **It is therefore recommended that urgent steps should be taken to regulate the number of ring seines and their further entry into the fisheries.** As this gear catches appreciable quantities of young fish, **it is suggested to increase the mesh size to not less than 35 mm.**

4. In consideration of the urgent necessity of conservation of the resources and since there is no effective regulatory measure under operation to safeguard the resources in the sea and in the context of improvement of the habitat, **it is recommended that bottom trawling during monsoon is allowed strictly only beyond territorial waters all along the west coast.** As comprehensive and stringent regulation of monsoon fishery is not possible due to a number of socio-economic and political reasons, total ban of all fishing during monsoon may not be advocated.

5. The success of regulatory measures depend upon their effective implementation. To achieve this, the involvement of the fishermen, along with the political will is the prime requisite particularly in the background of socio-economic milieu prevailing in the country. Considering this vital aspect, **it is suggested that voluntary self regulation by the fishermen and other interested groups as successfully practised at present in the regulation of purse seine operation in Karnataka and mechanised fishing vessel operation in certain areas of Tamil Nadu may be adopted.**

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