Bull. Cent. Mar. Fish. Res. Inst., 1992, 45 : 1 - 3

INTRODUCTION

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The Asian summer monsoon, heralded in ballards, history and literature and eulogised by poets, is synonymous with the prosperity of the countries in South and East Asia. A bountiful rainfall in the region, where more than 60% of the world's population inhabit, favours high vegetative and animal production, influences the life and social pattern of the people, their fortunes and in turn, the economy of the Nation. Failure of the monsoon rains in any part of the area would adversely affect the land-based production, causes miseries and often with disastrous consequences. Naturally this unique phenomenon which brings either the boon or the bane, has attracted the attention of the people from all walks of life over the centuries.

Although the basic mechanism of monsoons has been described about 300 years ago, its complex mechanism, behaviour and forecasting are not yet fully understood. According to Dr. Colin Ramage of the University of Hawaii "the more observations we get, the more complex the monsoon gets. Some of us think, we may be dealing with an intractable problem". Basically, the monsoon is generated by an enormous cycle of air set in motion by temperature difference over land and sea. Influenced and directed by the tilt of the earth on its axis and the Corioli's force due to the earth's spin, the trade winds bringing the summer monsoon, in the Southern Hemisphere along with the intense low level Somali jet stream, cross the Equator, bent right by the Corioli's force and move into the updraft of the intertropical convergence zone. Here the winds of the south meet those of the north. As the Southern Hemisphere Trade wind crosses the Equator and enters the Arabian Sea, it branches into two. The Arabian Sea branch blows into the western ghats and brings the southwest monsoon in that region. The Bay of Bengal branch is forced west at the Himalayas onto the Gangetic plain. During the Northern Hemisphere winter, the sea is warmer than land and cold air surges across the Far East to replace the air rising above warm southern seas, causing the winter or the northeast monsoon. The different aspects of Indian monsoon, its onset, withdrawl, inter-seasonal and inter-annual variations, its vagaries and the endeavours made for its forecasting have comprehensively been reviewed by Subbaramayya and Subba Rao (1985).

That there exists a close link among the physical properties of the sea, atmospheric conditions and the monsoon is now well established. The works of Walker (1924), Walker and Bliss (1937), Troup (1965) and others have shown that the variation of sea level pressure between the East Pacific and the Indian Ocean (Southern Oscillation) has a good positive correlation with the intensity of Indian southwest monsoon. Similarly, it has been observed that the warm water off Peru Coast (El Nino) is closely associated with the low index phase of the Southern Oscillation and that the three phenomena - Indian summer monsoon, Southern Oscillation and El Nino - are physically interlinked.

The weather in our country, which presents wide variation and contrast, is profoundly influenced by the monsoons, particularly the southwest monsoon. The Indian climate may broadly be described as tropical monsoonal climate. It is divisible into four seasons, namely, the winter season (January-February), the warm summer season (March-May), the southwest monsoon rainy season (June-September) and the postmonsoon season (October-December) which is also the northeast monsoon period in the southern peninsula.

The monsoons play a significant role in the ecological cycle and productivity of the sea. Solar radiation which forms the primary source of energy and is essential for photosynthesis, is dependent on the intensity and the length of the day light and atmospheric conditions. The biomass production in the sea is thus dependent on this energy and the nutrient supply generated through the complex physical, chemical and biological processes taking

place in the dynamic marine environment and subsequently transmitted to aquatic organisms at different trophic levels. Similarly, the upwelling phenomenon which occurs seasonally, is due to the strong monsoon winds. This process is important for refertilising the impoverished surface layers and has a great bearing on fish production, its distribution and abundance pattern. Besides, the turbulance, eddy diffusion and thermal stratification caused by the interaction among the sea and atmospheric conditions and wind speed, play major role in the supply of nutrients which determined the productivity of the sea.

The influence of weather on fish populations and their behaviour in general and that of the southwest monsoon on the Indian marine fisheries in particular, have been recognised long back. Studies on this aspect were being carried out at the **Central Marine Fisheries Research Institute** almost from its inception. The important investigations in this direction have been to correlate the variation in the oilsardine catch of the west coast with the intensity of southwest monsoon; sea surface temperature with the mackerel fishery; upwelling occurring during the southwest monsoon on the distribution pattern and movement of fish and prawn stocks in the shelf waters; mud bank fisheries and the prawn fishery of the west coast in relation to hydrographical conditions in the shelf water during different seasons. Recently Longhurst and Wooster (1990) have correlated the abundance of oilsardine with the upwelling on the southwest coast of India and sea level as an indicator of intensity of the upwelling and consequently the oilsardine catch.

Several commercially important marine fishes and shellfishes, including the major groups such as oilsardine, Indian mackerel and penaeid prawns, are known to breed or to have one of their peak spawning seasons during the southwest monsoon months (June - September) on the west coast (Qasim, 1973). The environmental factors prevailing in the ecosystem during this period trigger this biological activity. This aspect as well as the immediate postmonsoonal effect on the biological productivity of the sea, particularly at meso- and micro levels and on the bioenergetics of fish larval development and their survival have attracted several studies of the hydrodynamic control of biological processes in the sea during this critical period(Legendre and Demus, 1984; Krishnan Kutty, 1985). In fact, great emphasis has been given in recent years to base the management of fisheries on the factors governing the spawning and fish larval survival success rather than on the concept of growth overfishing.

The west coast of India, which principally receives the southwest monsoon rains, contributes to about 76% of the annual marine fish production of the country. Prior to Ninteen fifties, the fishing activities carried out by indigenous crafts and gears were confined to nearshore waters and this sector was the major contributor to the fish production of the country. From early fifties, expansion of the fisheries began with the introduction of mechanised fishing vessels, bottom trawling and synthetic gear material. This technological advancement and capabilities resulted in the extension of fishing operation from the nearshore waters to about 40-50 m depth zone on the continental shelf, increase of fishing effort and fish production. With further introduction of purse seiners in the seventies and due to intense fishing to meet the increasing demand for fish, the fishing pressure increased rapidly. Similarly, the motorization of country craft using outboard engines started in 1980 in Kerala soon became popular and helped not only to extend the area of operation and diversified/selective fishing, but also to increase the fish production and revenue to the fishermen. Consequently, the contribution from the mechanised sector enhanced considerably (66%) over that of the indigenous sector in the total marine fish landings of the country. Although the introduction of more efficient fishing technology and the expansion of the fishery were not inappropriate *per se*, the potential social and economical effects of these developments on the different fishing communities exploiting the resources were not visualised before hand. This led to the division of two social, economical and ethnic groups - one representing the artisanal or small-scale sector and the other, the mechanised fishing sector, both competing and exploiting the same resource in the inshore waters. In the meanwhile, realising the need for delimiting the areas of fishing by different types of vessels so as to avoid unfair competition among the larger vessels, small mechanised boats and country crafts, the Union Government prepared a draft Marine Fishing Regulation Bill and requested the maritime State Governments to adopt requisite regulations. Accordingly, several maritime State Governments formulated fishing regulations in the territorial sea

and in Kerala, the use of purse seines, ring seines, pelagic and midwater trawls in the territorial waters (22 km from the coastline) is prohibited. Similarly, fishing by mechanised vessels, except motorised country crafts, is prohibited within 20-30 m depth zone along the different sectors of the coastline of the State. However, the gradual widening in social and economic imbalance between the two groups and the increasing fishing competition in the inshore fishing grounds paved way to the conflict between them for the exploitation of the common property resource.

Prior to seventies, the fishing activities on the west coast of India used to be suspended during the southwest monsoon period from June to August. This practice was being followed traditionally since several years and this cessation of activities acted as a measure for the conservation of the fishery resources. However, the introduction of mechanised fishing vessels and more efficient gears, increasing demand for fish and enhanced value for the fish caught during the lean rainy season, made some of the enterprising mechanised fishing vessel operators to venture into fishing during this season also. This activity inflamed the conflict between the artisanal and mechanised fishing sectors, some times violently. This situation further aggrevated when apprehensions are expressed regarding overfishing of some of the stocks due to the increasing fishing effort, long term adverse effects of bottom trawling on the bottom ecosystem and in turn, the demersal fish resources, the biological needs of safe-guarding the spawning population and young fish in the nursery grounds of the inshore waters for management and conservation of the resources. The violent conflicts erupted on this problem made some of the maritime States, particularly Kerala, to constitute Expert Committees/Commissions to review the situation and recommend the course of action to be taken.

On careful consideration of the issues from the technical and socio-economic points of view, the Committees/Commissions appointed by the Government of Kerala recommended variously from reducing the number of mechanised fishing vessels in operation during the monsoon period to banning bottom trawling during June - August for varying periods within 22 km of territorial waters. Although these recommendations were being implemented by the Government, the conflict persisted and the controversy on the ban of fishing during monsoon period continued and challenged in the court of law. While those advocating banning put forward the argument of distruction of the resource and the urgent need for their conservation, those not favouring this regulation pointed out that the major portion of the catch realised during the monsoon season is accounted by the prawn *Parapenaeopsis s tylifera* and if this resource is not caught it would not only be a loss in the marine fish production front, but also the revenue by way of taxes and foreign exchange earnings, besides creating non-employment problems.

The management of monsoon fishery has thus become a problem of considerable magnitude. It needs careful consideration from the point of view of ensuring accessibility for the exploitation of the resource, but at the same time safeguarding its conservation for continued benefits and the interacting technological, economical and social situations prevailing in the two sectors. It is in this context, this publication presents the status of different stocks of fishes and shellfishes exploited in the inshore waters, particularly during the monsoon season and endeavours to provide an overview of the scope of management avenues available from the biological and fisheries considerations.

References

Krishnan Kutty, M. 1985. Recent advances in oceanography and new prospectives in fisheries management. *Mahasagar*, **18** (2) : 219-229.

Legendre, L. and S. Demus 1984. Towards dynamic biological oceanography and Limnology. *Can. J. Fish. Aquat. Sci.*, **41** : 2-19.

Longhurst, Alan R. and Warren S. Wooster 1990. Abundance of oilsardine (*Sardinella longiceps*) and upwelling on the southwest coast of India. *Ibid.*, **47** : 2407-2419.

Qasim, S. Z. 1973. An appraisal of studies on maturation and spawning in marine teleosts from the Indian waters. *Indian J. Fish.*, **20** (1) : 166-181.

Subbaramayya, I. and M. Subba Rao 1985. On the vagaries of the Indian southwest monsoon. *Mahasagar*, **18** (2) : 179-185.

Troup, A. J. 1965. The Southern Oscillation. *Quart. J. Roy Meteor. Soc.*, **91** : 491-506.

Walker, G. T. 1924. Correlations in seasonal variations of weather. XI. A further study of world weather. *Mem. Indian Meteor. Dept.*, **24** : 275-332.

Walker, G. T. and E. W. Buss 1937. World Weather. *Mem. Royal Meteor. Soc.*, **4** : 119-139.