# MARINE BIODIVERSITY CONSERVATION AND MANAGEMENT

*Edited by*

N.G. Menon and C.S.G. Pillai

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CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
INDIAN COUNCIL OF AGRICULTURAL RESEARCH
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# VIII. THE DESTRUCTION OF YOUNG FISH AND ITS IMPACT ON INSHORE FISHERIES

N.G. MENON AND N.G.K. PILLAI
Central Marine Fisheries Research Institute, Cochin-682 014

*The annual average loss of catfish due to eggs and larvae destruction is estimated at an alarming 5250t valued at Rs. 4.12 crores*

## INTRODUCTION

The coastal marine fishery has made remarkable growth since machanisation started in early sixties. Consequently, the fishing pressure by the sector has also increased often beyond the rational limits of sustenance of the target resources and the by-catch species. Species succession and replacements after heavy fishing by the mechanised crafts, especially by trawlers have been noticed. Since the tropical fish populations are multispecies and the gear being non-selective, the effect of exploitation is felt not only on the target groups but also on other vulnerable resources. Further, the small mesh size of the mass harvesting gears like trawl net and purse seine has also not spare the juvenile and sub-adult population, which are abundant in the shallow feeding and nursing grounds.

The coastal traditional fishery has also made rapid changes by the motorisation of country crafts, and wide use of innovative gears, in line with mass harvesting technologies. Motorisation of country crafts began in eighties and fishing gears like boat seine, gill net, hooks and line, ring seine and mini trawl are operated from the motorised traditional crafts. In Kerala alone the motorised sector's fish production has steeply increased from 23,000 tonnes (1981) to 400,000 tonnes (1989) forming 8.3% and 61.8% respectively of the total landing. The motorised ring seine, a mini purse seine of the size 150-800 m long, 30-90 m deep and mesh of 7-22 mm, has contributed to 5.8% in 1986 (effort 29,000 units) and 41.8% in 1989 (323,000 units) of the total catch of Kerala. About 2,260 ring seines operate within 10-50 m depth zone off Kerala.

This gear alone has contributed 91.5% of the total oil sardine catch, 54.1% of mackerel, 63.5% of whitebait and 56.7% of carangids in 1992. Invariably, a large proportion of the catch belongs to young ones of sardine, mackerel, anchovy, carangid, sciaenid, silverbelly etc. Hectic fishing is continuing in very shallow grounds of less than 10 meters off Alleppey by OB mini trawl and the gear has contributed to 0.4-2.0% of the total landings of Kerala. The composition of the catch includes flat fishes, penaeid prawns, other miscellaneous fishes and benthic organisms, a major portion of the former two groups belong to juvenile and young ones. The introduction of a large number of purse seiners, although augmented the production of many pelagics and demersals, especially cat fishes, has brought in indiscriminate harvest of spawners and egg carrying male brooders of cat fishes.

## ARTISANAL GEARS

A quantitative estimation of young fish/prawn destroyed by artisanal gears from all along Indian waters was not possible because of the regional variations in the fishing methods, fluctuations in seasonal abundance of juveniles in the landings etc. However studies conducted by the CMFR Institute from selected centres provided quantitative estimations of young fishes and juvenile prawn caught by various gears operated from the centres during selected periods of time.

At Cochin and Calicut, crafts fitted with outboard motor using ring seines with a mesh size of 7-10 mm landed juvenile oil sardine and mackerel in large quantities during the monsoon and post monsoon months, every year. The juvenile oil sardine landing by this gear at Calicut during 1988 was estimated to be 118 t. Similarly the OBM fitted crafts using mini trawls (cod end mesh of 10-20 mm) in coastal waters upto 10 m off Central Kerala coast caught juvenile prawn, *Parapenaeopsis stylifera* and young fishes. This destructive fishing is, though local in nature, also harmful to fish stocks and ultimately lead to recruitment overfishing.

The boat seines and shore seines (6-8 mm mesh) operated along Trivandrum coast, caught an average 11 tonnes of young fishes every year. They belonged to anchovies, *Decapterus* spp., *Sardinella* spp.,

*Sillago* sp., *Scomberomorus* spp., barracudas etc. in addition to about 90 species of post larval fishes. Large quantities of the young ones, post-larvae of fishes are landed during March-April, July-August and October-December. Generally this type of juvenile fishing by the artisanal gears are known locally as 'nonnavu' fishery. In the Vizhinjam area during November to May season a special gear called 'nonnavu madi' with a mesh size of 3-4 mm at the cod end was operated for mass harvest of juvenile fishes and post-larvae. A moderate estimate shows about 180 t of post-larvel fishes are sometimes caught in a single day from the "nonnavu" fishery zone. The dol net fishery of Bombay is yet another matter of regional interest. During 1986-87 period this gear landed about 290 t of young ones of Bombay duck (45-60 mm size) particularly in May.

Another classical example of juvenile prawn devastation from the nursery grounds in Palk Bay by indigenously developed trawl like bottom net (5-25 mm mesh in cod end) was brought to light by C.M.F.R. Institute and clearly emphasised the need to control such indiscriminate destruction. This fishing is carried out by both non-mechanised and OBM fitted boats throughout the year. In the process of this indigenous trawling juveniles of *Penaeus semisulcatus* of the size 45-70 mm length is harvested to the tune of 2-10 kg/day/unit along with sea grass and sea weeds (5 kg/day). The seagrass ecosystem is the nursery ground for *P. semisulcatus*. About 2500 units operate in the shallow 0-4 m depth zone of Palk Bay and the total estimated annual juvenile *P. semisulcatus* landing was about 4800 t. The catch is sold at the rate of Rs. 15/- kg. If the stock is allowed to grow and harvested at the marketable size this would have yielded about 72000 t of adult prawns, valuing about Rs. 57.6 crores (Sampson Manickam *et.al* 1989).

## PURSE SEINE

Marine catfishes of the family Tachysuridae formed only a marginal fishery along Karnataka till 1978, with an annual average production of 3049 t (1971-'78) forming only 3.1% in the total marine landing of the State (Anon, 1987). In this eight year period the yield was almost steady, supported by the catches of mechanised trawlers

and non-mechanised drift gill nets, Rampan, Yendi, hooks and line etc. The production has almost doubled in the years 1979-1987, which is solely due to intensive purse seine operations. The average annual yield in the nine year period was 6286 t, more than 60% of which was contributed by purse seine with a share of 3772 t. In the total catfish production of Karnataka, Mangalore contributed 32%. The average annual landings at Mangalore in this span of 9 years amounts to 2013 t with a contribution of 68% by purse seine, 19.7% by trawl net and 12.3% by drift net. The landings in general showed an increasing trend in the first five years (1979-1983) and thereafter declined. Though, there were fluctuation in the landings of all the gears, the rise and fall was significant in case of purse seine. This multi-species resource was chiefly supported by *Tachysurus dussumieri, T. tenuispinis, T. serratus* and *T. thalassinus*. The purse seine catches mostly included only two species namely *T. dussumieri* and *T. tenuispinis* and more than 73% of the catfish landings of this gear was realised during September-March period, when the fishes migrated into the shallow fishing zones for breeding (James *et.al.* 1989).

The yield registered sudden hike in 1979, to the tune of 9920 t as against 2831 t in 1978. This rise reached its culmination in 1982 with an yield of 10253 t. Though 1983 also recorded good catch (7273 t), the production showed a downward trend thereafter. During this 5 year period (1979-'83) the annual average catch was 8061 t forming 6.1% in the total marine fish catch of the State. Because of the marked spurt in the landings of pelagic fish and catfishes, people received purse seine with great jubiliation, resulting in disproportionate increase in effort input. This situation however was ephimeral and gradually the irrational exploitation resulted in serious damages to our coastal fishery. One of the disquieting aspects of the gear noted along Karnataka coast was the bulk removal of ripe running oil sardine during the first week of June 1979 and the catastrophic destruction of brooders of marine catfishes, during September-October 1980. Similar mass harvest of brooders was repeated in every year during February-March and September-October. Quite interestingly about 64% of the purse seine catfish catch was composed of gestating males of *T. dussumieri* and

*T. tenuispinis* with annual average (1979-1987) landings of 502 and 1905 t respectively.

The catfish production was at its ebb during the period 1984-87. During this period the production declined considerably with an annual average landing of 4068 t, which formed only 2.5% in the total marine fish production of Karnataka and the extent of damage suffered by the fishery was so severe that the catfish production had fallen below the level of pre-purse seine period. An overview on the catch data of purse seines in Karnataka from 1979-1987 showed that more than 60% of the total catfish catch of the State was supplied by purse seiners with an annual average landings of 3772 t contributed mostly by *T. dussumieri* in December-March and *T. tenuispinis* in September-November. Though, the percentage contribution of catfishes by purse seines is only 5.2% in the total fish yield of the gear, the impact on the resource was tremendous. This is largely due to mass removal of gestating males during the two peak seasons of December-March and September-November (Silas *et.al*, 1980) which correspondingly represent the period of spawning of *T. dussumieri* and *T. tenuispinis*.

All species of marine catfishes have a well evolved parental care of oral incubation, to compensate for the low fecundity (40 to 180 per fish). Large shoals of them migrate to coastal waters for breeding and also for feeding their young ones. The breeding of *T. dussumieri* usually takes place during December-March period and that of *T. tenuispinis* in September-November, once every year along the shallow coastal waters of less than 30 m depth, former spawns when it attains 5 years (570 mm) and the latter 2 years (300 mm). Catfish shoals exhibit both vertical and horizontal migrations. Though, there is no direct evidence about their seasonal horizontal migrations to North and South, there are indications that they migrate in the Northward or Southward direction depending on the prevailing surface drift. There is a general trend of southward shift during April till August and in the reverse direction during September-January period.

An estimate on the quantum of destruction of eggs/embryos/larvae, indicated that on an average every year, within a period of two

months (September-October), 8.2 million eggs/embryos/larvae of *T. tenuispinis* are destroyed, which is equivalent to 13.4 tonnes eggs during the period 1980-86. In the total purse seine catch of this species, more than 50% are gestating males. Normally this species is fully vulnerable to purse seine at age 2 and above, when it reaches 300 mm in length with a mean weight of 375 gms. Scientific estimate on the eggs/larval mortality of species of catfishes are not available. However, because of the habit of oral incubation, egg/larval natural mortality is expected to be minimal. Assuming a 10% natural mortality, the loss due to destruction of *T. tenuispinis* brooders, egg/larval fishing mortality was estimated to be around 2930 t roughly valued at Rs. 1.46 crores every year. The future recruitment of this species is very much handicapped by this destruction as evidenced by the poor recruitment in 1986 and 1987. Since the age at first spawning is at 2 years, the impact in the recruitment was felt only after two years.

*T. dussumieri,* a large member of the family with a life span of 8-10 years, is fully vulnerable to purse seine at the age 5, when the species first spawn. The peak catches of this species are from January-March and the gestating males form about 14% in the total *T. dussumieri* harvest of the gear. The estimated eggs/embryos/larval destruction was almost 5 t every year which amounts to 1.6 million egg/embryo/larvae during the period 1982-1987. The entire destruction took place in January-March. The age of exploitation of gestating males of *T. dussumieri* being 5 years with a mean weight of 3 kgs. and assuming a larval natural mortality of 10%, the loss by way of larval destruction amounts to 3320 t (=Rs. 2.66 crores) every year. As the age at first spawning is 5 years and with a life span of 8-10 years, the impact on the recruitment would be felt only after 4 or 5 years.

The heavy loss of eggs/embryos of catfishes by fishing mortality is, difficult to compensate, because of the low fecundity and single spawning of these fishes. The eggs/embryos landed have to be discarded owing to lack of demand and the gestating males have only a low flesh-bone ratio due to starvation during the period of gestation of about 2 months. This only adds to less economic output by exploit-

Ring seine operation - Valanjavazhi, Alleppey

Mini trawlers at Valanjavazhi, Alleppey

Purse-seine catch of eggs/embryos of *Lactarius lactarius* at Mangalore

Purse-seine landing of male parents of catfishes

ing shoals of gestating males over and above the destruction of eggs/ embryos/larvae. From the above observations it is evident that the wanton destruction of catfish eggs/larvae is not only economically wasteful, but also biologically harmful to future recruitment (Bensam and Menon, 1994). This situation of high fishing mortality of fertilised eggs/embryos along Karnataka coastal water caused by purse seine warrants immediate attention to conserve the resource. This resource being migratory, the impact of low recruitment in Karnataka is also felt in neighbouring States.

For increasing production, the use of modern technology is imperative but should not be at the cost of resource itself. Appropriate conservation measures should however be implemented to curb the resource being over exploited and to prevent egg/larval mortality by fishing. In view of the economic objective and the socio-economic conditions of the fishing community rigid measures, such as closure of fishing during breeding season, limited entry to selected gear, mesh regulation etc. may not be practicable solution. The only feasible solution is a willful avoidance of shoals of catfishes, which the skilled fishermen can easily identify even from distance, especially during the peak breeding season of January-March and September-October. Again, any more effort inputs by purse seine should also be discouraged. Operational limits for purse seine may be strictly enforced in order to allow the brooding stock to frequent the nursery ground and to complete the incubation of the eggs and subsequent release of young ones in the nearshore waters, thereby allowing the juveniles to grow and maintain the population strength. A detailed report on the subject was sent to Govt. of Karnataka to frame suitable remedial measures to protect and conserve the resource.

## REGULATION MEASURES

The C.M.F.R. Institute's relentless effort in the direction over several years, thus created an awareness among the State Government and the people, that the coastal waters has to be exploited rationally with a view to protecting and conserving the resources and the environment. This led to enactment of regulations and framed rules by various maritime

States delimiting areas of operation by trawlers and traditional sector (explained elsewhere in this publication). The implementation of these rules was difficult and very often led to clandestine operation in shallow waters, when the grounds were rich with shoreward migrating valuable prawns. Often this has created friction among the mechanised trawler operators and the artisanal fisherfolk, the latter group completely depend on the coastal waters for their livelihood. Further the cost of enforcement may make it impossible to implement management measures particularly when there is a large number of resource users. A more feasible solution to the problem is to educate and create awareness among the coastal beneficiaries besides implementation of an overall National Marine Fishing Regulation Policy by Government of India.