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Responsible marine fisheries: Reflections from Maharashtra

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Introduction

With average annual marine fish landings of 3.6 lakh t during 2001-10, Maharashtra is one of the major fish producing states ranking 4th in the country. The annual marine fishery potential of the State in the Exclusive Economic Zone (EEZ) is estimated at 6.5 lakh t (Ministry of Agriculture, 1993) while long term potential yield (LTPY) based on the maximum annual landings up to 90 m depth during 2001-2010 is estimated at 5.2 lakh t (CMFRI, 2010). The annual landings valued at about Rs 2,322 Crores contributed 0.5% to the GDP of the state.

The marine fishery along the coast of Maharashtra is multi-species, supported by tropical species with relatively smaller size, fast growth, almost continuous breeding and low volume (biomass) nature with rapid turnovers. Owing to multi-species nature of the fishery resources, the marine fisheries of the state are typically recognized by the gears rather than species, excepting for Bombay duck which is characteristic of the northwest coast of the country. The major traditional fisheries in Maharashtra are bag net ('*dol* net'), drift gill net ('*Tarti*' or '*Daldi*'), bottom set gill net ('*Budi*'), long line ('*Khanda*') and shore seine ('*Rampani*'). In addition, there are variants of these nets and a multitude of local indigenous gears and contrivances which are used in inshore and nearshore waters.

With rapid mechanization that commenced in late 1960, trawling has emerged as the dominant fishing practice with capital base provided by institutional and government support. Trawling targets shrimps, cephalopods and demersal fin fishes that cater to the processing and export industries. The traditional *dol* net and gill net fisheries are well organized by the co-operatives and undergone massive mechanization and motorization as a result major fish landings in the state are contributed by the mechanized and motorized sector and barely 1-2% by the non-mechanized traditional fisheries. The traditional artisanal fishing practiced in inshore areas of the state is unorganized and largely marginalized like subsistence level fishing. In the past decade, purse seine fishery has gained prominence in the state owing to increased abundance of mackerel and oil sardine but at the same time shore seine and long line fisheries though supported by the co-operatives, have significantly

declined and marginalized. The trawlers and purse seiners land large quantity of bycatch (60-65%) comprising of enormous quantity of juvenile, undersized fishes and inedible biota which is discarded at sea and mostly goes unreported. The bycatch and 'discards' have adversely affected the non-mechanized traditional fisheries greatly in the state.

Fishery resources

Maharashtra has 720 km long coastline stretched across five maritime districts, namely Thane, Greater Mumbai, Raigad, Ratnagiri and Sindhudurg. The northern coastal waters along Thane, greater Mumbai and Raigad districts are rich in fish resources of Bombay duck, non-penaeid prawns, golden anchovy, silver pomfret, eels, lobster, ribbon fish, horse mackerel, large sized croakers (*Ghol* and *Koth*) and threadfins (*Rawas* and *Dhara*), some of which are very characteristic of the region. They are mainly exploited by bag nets, surface drift and bottom set gill nets, large trammel gill nets introduced recently and hooks and long lines. The southern coastal waters of Maharashtra along Ratnagiri and Sindhudurg districts abound with the mackerel and sardines in addition to penaeid prawn, seer fish, black pomfret and catfish resources which are caught by shore seines (*Rampani*), gill nets and hooks and lines.

The major fishery resources landed in the state in the past decade were mainly pelagic (34.7%) and demersal (30.2) finfishes, crustaceans (29.8%) and molluscs (5.4%). A decadal comparison showed that excepting for pelagic resources which improved by 9.6%, the rest declined; the demersals by 29.5%, mollusks by 30.4% and crustaceans by 17.6% as against previous decade. The major fishery resources and their contribution to total fish landings are shown in Fig 2.

Gear-wise landings: The estimated landing by different fishing gears is shown Fig 3. It is seen that almost the entire marine fish catch in Maharashtra was landed by mechanized boats (99%) and merely 1% by the non-mechanized crafts in the past decade. The mechanized trawlers had the largest share of 47% of the total catch followed by *dol* netters (29%), purse seiners (11.9%), gill netters (11.3%), hooks and lines (0.3%) and non-mechanized boats landed 0.5%.

State of the fish stocks

The marine fishery in Maharashtra is facing crisis since late nineties owing to overfishing, urbanization, domestic and industrial pollution and habitat degradation. Among the commercially important resources Bombayduck, silver pomfret, elasmobranchs and lobster resources have declined significantly while vulnerable resources such as sand lobster (*Thenus orientalis*), Indian halibut (*Psettodes erumei*) and Karakara (*Pomadasys hasta*) have almost disappeared and thread fin (*Rawas* and *Dhara*) and jew fish (*Ghol*) are facing severe depletion. Although landings of penaeid prawns increased in late 1990s due to extension of trawling grounds to 90 m depth, the species composition has changed; small sized, low value species of *Solenocera* and *Metapeneopsis* are dominating the prawn landings in recent years which fetch much lower returns to the fishers.

The assessment of stocks of marine fishery resources in Maharashtra using 3 different approaches shows that:

- Decadal compounded annual growth rate (CAGR) of marine fish landings despite increasing annual growth rate of 3.2% from 1961 to 1990 slowed down to 0.41% during 1991-2000 and recorded negative growth rate (-4.7%) during past decade (2001-2010). The contribution of the state to total marine fish landings of India also declined from 19.6% in 1971-80 to 12.6% during 2001-10 and its rank in the total fish production slipped from 2nd to 5th in the country in 2012.
- Rapid assessment of 25 stocks in Maharashtra showed that barely 8% were abundant, 28% less abundant, 56% declining, 4% depleted and 4% in collapsed state.
- Length based stock assessment of 36 species of commercially important finfishes, elasmobranchs, crustaceans and cephalopods by analytical methods showed that 60% of the stocks are over-exploited.

Perceptions of fishing community

At individual and also at community level the total fish landing or production jargon is perplexing and largely incomprehensible to fishers. They understand catch and the money earned per day or per trip by the individuals. The fishers' perception is that the catch rates of important fishery resources have declined considerably which has largely affected the traditional fishers.

Generally, traditional fishermen attribute dwindling catches to newly introduced fishing methods, largely due to catching efficiency and quantum of catch. Although mechanization of traditional fishing crafts in the state commenced in 1960s, it was largely for propelling the crafts (largely motorization) that enabled speedy transport of the catch rather than operation of the bag nets and gill nets which are passive gears targeting mainly pelagic resources. Introduction of trawl nets in the same period was initially resisted but later acknowledged by the traditional fishing sector primarily due to absence of appropriate gear targeting demersal resources in general and prawns in particular. Moreover, the mechanized trawlers did not compete for the fishing area as well as the resources caught by the traditional fishing gears. On the other hand, purse seine fishing targeted overwhelmingly large volume of the pelagic fishes (1.5-2 t/trip) as compared to the catch of traditional gill nets and '*rampani*' nets. Besides, bulk landings by the purse seiner caused glut at the landing centres, crashing the prices and affecting the profitability of traditionally operated non-mechanized gill net and '*rampani*' net. The purse seiners invariably encroach the productive nearshore fishing grounds, which are largely reserved for the traditional fishing operations.

Off late, oil and natural gas exploration surveys and non-fishing zones around the oil wells in the traditional '*dol*' and gill net areas have been creating discontent among the fishers of northern Thane district. The fishing area of about 2000 sq km shelf area off Thane district is prohibited for fishing.

Impact of mechanized fishing

In Maharashtra, until early 1980s fishing by traditional '*dol*' nets, gill nets, '*rampani*' and hooks and line dominated the landings, but intensive shrimp trawling with multi-day fishing, introduction of purse seines in the late eighties enhanced the overall fishing effort by more than three folds. Such excessive increase in fishing effort has led to over-exploitation of the resources, as a result catch rates of most of the commercially important resources have declined. Besides, rising fuel costs, early cessation (shortening) of fishing season, reduced availability of quality fishes and subsequent declining profitability and

sometimes loss are the issues of the crisis. A study (Anon, 2012) carried out in the state showed that mechanized fishing in general and trawling and purse seining in particular, has indeed impacted the non-mechanized fishing adversely. The study also showed that although trawling did not compete with the traditional fishing for the fish resources, the impact was more significant than purse seines.

Traditional practices for regulation

Prior to mechanization, fishing in the state had two distinct phases, an intense fishing phase immediately following monsoon which used to last for 4-5 months, and after 1-2 months of lull during February-March, a second phase in pre-monsoon period during April-May. In monsoon there is complete cessation of fishing from June to end of August for nearly 3 months. The coastal population including fishers refrain from eating fish in monsoon, particularly in holy month of '*Sravana*' in Hindu calendar that occurs in monsoon. Such abstinence from eating fish in monsoon may have roots in conservation.

Along the northwest coast, as winter sets in by December the abundance of fish declines in February-March; the fishing becomes uneconomical and most of the fishers reduce fishing intensity in these months. Oceanographic studies along northwest coast (Banse, 1968) have shown that February-March is a transitional period when coastal currents reverse their flow from northwardly to southwardly direction. Between the reversals of currents, the shelf water is almost calm with very weak flow, as a result bag net operations which entirely depend on the force of tidal currents, cannot be sustained. The weak flow of water with tranquil condition gives generous opportunity for the young and newly hatched larvae of silver pomfret and Bombay duck to feed on zooplankton and epiplanktonic *Acetes*. In fact, these two fishes which have very poor swimming abilities and move only with the tidal oscillations, have attuned their life cycle to the season, so that they spawn intensively during December-February and their larvae hatch thereafter to get ample opportunity to feed during inter-reversal period. Such linking of life cycle the species to the natural oceanographic cycles, like seasonal cycles, ensure that the larvae are not carried away by the currents and their survival is maximized.

In the period of lull during February-March, Hindu fishermen observe festival of '*Holi*' while Christians have fast until '*Good Friday*' during which fishing is suspended for religious purpose for about one month. The traditional practice in this period is to have respite from the arduous fishing at sea and enjoy religious fervour and engage in less hectic repairing, mending and tanning of cotton and hemp fishing nets to get them ready for the next phase of fishing. Such linking of festivals with the seasonal changes in the sea that ensured conservation of the resources cannot be coincidental, but wisdom of ancestors for management and conservation.

Mitigation measures

On account of falling catch rates, increasing cost of fishing owing to rising fuel prices, shortening of fishing season, reduction in profit and sometimes loss, leading to laying off fishing has created crisis in the marine fisheries in Maharashtra. Therefore, reduction of fishing pressure on the fish stocks by observing closed fishing in certain seasons is advised as mitigation measure. This suggestion is welcomed by the fishing

community leaders and the state. Since southwest monsoon experiences inclement weather conditions from June to September, implementation of fishing ban during monsoon (60-65 days) has been welcomed by most of the fishers in the state. However, this ban is not uniformly observed in the neighbouring states as a result trawlers and purse seiners from southern states with shorter ban (45 days) encroached in the State's territorial waters and plundered fish resources, leaving the Maharashtra fishers in a helpless situation. Therefore, fishers in the state have been demanding uniform ban period all along the west coast. Within the state also, traditional fishers find that many trawlers and purse seiners continue fishing beyond 10th June and commence fishing well before the opening date, as a result they are deprived of fish when the ban is lifted. Reduction of trawling effort and strict compliance with marine fisheries act (MFRA, 1981) for the operation of purse seines are suggested by CMFRI for the sustenance of the traditional fisheries. But, economics of fishing operations have been overriding as a result multi-day trawling and purse seining is operational only when it is profitable, and cutting down fishing effort during unproductive idling period.

Incursions by trawlers in 'dol' net grounds for Bombayduck and targeting of silver pomfrets by modified 'Karli dol' netters in the nursery areas have created conflicts amongst trawlers, 'dol' netters and gill netters in the northern districts, while similar conflict was noticed for mackerel amongst 'rampani', purse seine and trawler operators in Ratnagiri and Sindhudurg districts. Since Bombayduck and silver pomfret are the economic strength of traditional 'dol' net and gill net fisheries, it is suggested by CMFRI to observe closure of 'dol' net fishing during February-March in the sea off Vasai-Arnala. This suggestion has also been taken up by the *Maharashtra Macchimar Kruti Samiti* in a positive note and in the past four years the fishermen have been closing the fishing season much before May. The early closer of 'dol' net fishing was rewarded with good catch of silver pomfret immediately after opening of the fishing season in September.

Although oil wells and natural gas explorations in the productive shelf (Bombay High) off Thane district spread over about 2000 sq km fishing area which is forbidden for fishing for security reasons, is in disguise acting as a recluse and serving as marine protected area (MPA) for many demersal fishes in general and silver pomfret and *ghol* in particular.

The fishing operations by multi-day trawlers, purse seiners and large gill netters have been far extended in the sea up to 100 m depth zone (20-50 nautical miles), while jurisdiction of Maharashtra Marine Fisheries Act (1981) is limited within territorial waters up to 12 nautical miles. Regulation and conservation of marine fisheries resources under this act is becoming increasingly difficult, therefore fishers are hoping for the state to bring amendments to the law or new bill for the Act that will be applicable to Exclusive Economic Zone (200 nautical miles) of the country and maritime states would be able to manage their resources.
