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ORIGINAL ARTICLE

SOCIO-ECONOMIC STUDY OF MARINE FISHERMAN OF DIGHA COASTAL REGION, WEST BENGAL, INDIA

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Abstract:

Digha in West Bengal is a small place on the shores of Bay of Bengal. It is really hard to lead life for fishermen of this area. Fishing activities in this zone provide economic sustenance and a source of livelihood to a cross-section of people who, in turn support the flourishing trade in this lower Ganga deltaic region. Digha is located in the West Midnapore district of the State of West Bengal of Eastern India and lies in the southern most part of the state on the bank of Bay of Bengal. With the introduction of diesel using powerboats, deep-sea fishing and mechanization in fishing is taking an upturn. It has been observed in Digha coastal areas, that total marine fish landing mainly consists of sardine, hilsa, coila, pomphret, croakers, Bombay duck, catfish, ribbon fish, shark, shankar, prawn etc. Thus total 37 varieties of fish are found here. Prawn culture is also an important mean of livelihood of the fisherman of this area. Acquiring their livelihood by fishing, sometimes it leads to loss of marine biodiversity by killing of some endangered and endemic species. For example, overexploitation of shark by these fishermen leads to the extinction of them. Already 18 species of sharks have been listed as endangered by the International Union for the Conservation of Nature (IUCN). So, economic biodiversity conservation is in conflict with profitability of the fishery. There is high requirement of developing and adopting economically and socially sound measures that act as for the conservation and sustainable use of components of biological diversity incentives.

KEY WORD:

Over-exploitation, economic biodiversity, ecological biodiversity, Shark exploitation.

INTRODUCTION

Digha is a seaside resort town in the state of West Bengal, India. It lies in East Midnapore district and at the northern end of the Bay of Bengal. It is the most popular sea resort in the West Bengal. Renowned for its beaches, Digha is visited by thousands of tourists every year. Digha is the nearest and most popular sea resort of West Bengal. It is mostly famous as a weekend destination for Kolkatans. Though many people of Digha depend on the tourism business but a large part of them (people of Digha) depends upon fishing and fishery industry.

Fishing is one of the traditional livelihoods of the people in Digha and thus it plays a major role for the development and maintenance of Socio-economic condition of this coastal region in West Bengal. But due to the increasement of unscientific fishing, marine ecosystem is hampered and many endangered species are knocking at the door of extinction day by day. A recent re-analysis of Food and Agricultural Organization (FAO) catches statistics documents progressive 'fishing down' of food chains as fishing

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effort responds to depletion of original target stocks where one species is exploited more than another their relative abundance changes, as in the North Atlantic (Sherman, 1990; Pauly et al., 1998). This is referred to in the literature as 'fishing down the food web'. Virtually all commercially valuable marine populations are now overexploited. Overexploitation diminishes species population and reduces economic return. As the most valuable species are overfished, they are quickly replaced by catches of less desirable ones. It is seen that a large share of today's global catch consists of previously unused, less valuable species. This type of phenomenon has been identified as 'fishing down the value chain' in the literature (Kasulo and Perrings, 2001). 'Fishing down the food web' implies that the value of fished stock decreases, but this may not be captured until they make it to the market. Whatever be the fishing sequence, demand or supply driven, it will have an impact on fish biodiversity with a change in composition and relative abundance of harvested species. So a desire to increase profits may hamper economic biodiversity conservation and thereby affect the value of the fishery.

STUDY AREA:

This study focuses on the Digha fishery in West Bengal on the eastern marine coast of India on the Bay of Bengal. Digha is a part of the coastal area of West Bengal. The total coastal area of West Bengal stretches between the mouths of rivers Herobhanga or Harinbhanga on the Indo-Bangladesh border in the east and Subanarekha in the west, the total length of which is about 220 kms. Quite naturally, fishing activities in this zone provide economic sustenance and a source of livelihood to a cross-section of people who, in turn support the flourishing trade in this lower Ganga deltaic region. The coastline of West Bengal spreads over two maritime districts- 24 Parganas (South) and East Midnapore. There are 13 marine fish landing centers in 24 Parganas and 27 in East Midnapore. The Contai coastal belt under the district of East Midnapore is considered to be highly potential in respect of marine fisheries activities. The coastline stretches from Digha under Ramnagar-I Block to Talpati Ghat under Khesuri-II Block and is about 60 km. in length. Digha is situated close to the Gangetic mouth on the east of India at latitude 210 36'N. and longitude 870 30'E. It is located in the West Midnapore district of the State of West Bengal of Eastern India and lies in the southern most part of the state on the bank of Bay of Bengal. Digha's old beach isn't as wide as it used to be due to heavy soil erosion. Big stones and concrete steps are use to hold together the beach. A new beach has been developed at New Digha which is about 2 km from the old beach. This new beach is not only bigger than the old one, but might be considered a better one. It is clean and well-maintained and is not surrounded by a congested locality like the older beach.

PRESENT SCENARIO OF FISHING IN DIGHA:

In the year 1993-1994 fishing was not much mechanized in Digha due to which fishermen there used to catch fish by using country boats or non-mechanised fishing boats. Naturally the cost of fishing at that time was not as high. Due to lack of mechanized trawlers the fishermen at that time were unable to enter deep sea as a result of which they used to sell more or less similar type of fish species in the market. This situation is specific for the local markets near Digha. Apart from this, fish marketing in Digha was not as much developed as we find in present day situation. All these factors led to not much fish price per species variation along with its low price. Hence it can be argued that during year 1993-1994, the difference between ecological and economic biodiversity indices was not much prominent. But, with the introduction of diesel using powerboats, deep-sea fishing and mechanization in fishing is taking an upturn. It has been observed in Digha coastal areas that total marine fish landing mainly consists of sardine (Sardinella gibbosa), hilsa (Hilsa Tenualosa ilisha) , coila, silver pomphret (Pampus argenteus), black pomfret (Parastromateus niger), croakers (Johnius belangerii), Bombay duck (Harpadon nehereus), catfish (Arius jella Day), ribbon fish (Eupleurogrammus muticus), shark (Carcharhinus limbatus), mackerels (Rastrelliger kanagurta), prawn etc. Thus, total 37 varieties of fish are found here. These varieties have been divided into five groups considering their importance from the viewpoint of their demand and price. Among them contribution of hilsa in total catch per trip was found to be maximum in Digha. It was followed by two types of pomfret: Chinese and Silver pomfret being one variety and the other being Black pomfret. Mainly four varieties of marine fish dominate the Digha fishing industry in terms of both prices and quantity. They are Hilsa, Chinese and Silver Pomfret, Black Pomfret and Prawn. More than 50% of the total value of catch was contributed by these four species. Individual contributions of other 33 species in terms of value are not very significant. Also these other 33 varieties of fish such as (in local vocabulary) sardine, mackreal, chela, para and American bhetki have a very low price range in the market.

In Digha, the fish harvested is not only sold locally but also has a large regional and export market and so fishing gears are adjusted accordingly. Market plays a strong role in the harvest from the fishery.

Digha fishery, in recent years, has seen a shift in fish species harvested towards catches of fish species of very low local value (ranging between Indian Rs. 35– Rs.75 per kg.) consisting of sardine, chela and kaante. This transition in fish catch from high valued to low valued species points to the role of the market and the effects of economic forces in loss of biodiversity. The decline in the dominance of hilsa in total catch reflects not only a decline in the trophic level of fishes but can also be associated with its economic value. The total landing of hilsa has declined to 1% in 2002- 2003 whereas its contribution was 34% in 1993-1994. In contrast, the total landing of the species such as sardine, chhela and kaante has increased from 43% in 1993-94 to 75% in 2002-2003. It is interesting to note in this context that hilsa, which is a very popular traditional fish, has a high average price of Rs.130.18 per kg. while chela, sardine and kaante are valued at very low average prices of Rs. 42.77 per kg. The market price in this case reflects people's preference and is one of the reasons for the over-exploitation of hilsa. So, not only is there a shift in relative dominance of fish species in total catch, it also reflects exploitation from valuable to less valuable species. A comparative analysis of the unweighted and weighted Simpson indices is carried out by using the data on catch per species for the fishery of Digha. The Simpson economic biodiversity is constructed by weighting the simple ecological Simpson's index by average prices so as to capture fluctuations in value. It will capture any shift that may occur in fish value resulting from the over-exploitation of high-valued species. Data shows that a comparison between the Simpson unweighted and weighted indices, we find the value of the weighted index is lower than that of the unweighted index. It is because of the differences in the value of the species caught that the differences in the two indices occur. The lower values of the weighted indices in comparison with the unweighted index reflect that on average catches are dominated by less valuable species. If catches had been dominated by valuable species, price weighting would increase their dominance even further and the weighted indices would have higher values than unweighted indices (Kasulo and Perrings, 2001).

But now a day it is observed that catching of the low valued fish is more profitable than the capturing of high valued fish. It can be demonstrated by the following table-

Table 1 : Impact of perturbations of the discount rate on Net Productive Value (NPV) of profit.

	PROFIT-MAXIMISING SOLUTION(Dynamic framework)			
Alternative scenarios of economic biodiversity of the fishery	**Stock (kg.)**	**Harvest (kg./year)**	**Effort (fishing hours/years)**	**Productive Value of profit (Rs.)**
Situation 1: **High economic biodiversity**	3,37,867.74	2,64,913.46	12,903.42	39,91,152.55
Situation 2: **Average economic biodiversity**	3,25,940.71	2,70,780.52	6,618.47	40,16,415.89
Situation 3: **Low economic biodiversity**	3,15,648.21	2,77,360.45	2,638.39	43,13,563.35

From Table 1, we find that with progressively lower levels of biodiversity, stock size and effort decrease while fish harvest rises. This is evident when we look at Situation 1(catch: 2,64,913.46 kg./year; effort: 12,903.42 fishing hours/year) and compare it with Situation 2(catch: 2,70,780.52 kg./year; effort: 6,618.47fishing hours/year) and Situation 3 (catch: 2,77,360.45 kg./year; effort: 2,638.39 fishing hours/year). We also observe Net Productive Value of profit to increase with lower diversity (an increase from Rs. 39, 91,152.55/year in Situation 1 to Rs. 40, 16,415.89/year in Situation 2 and a further rise to Rs. 41, 13,563.35/year in Situation 3). So, economic diversity reduction is associated with a rising level of Net Productive Value of profit masking the existence of the potential threat of a loss of the valuable fish species

in the fishery (Gupta, 2009).

LIFE OF FISHERMAN IN DIGHA, WEST BENGAL:

The socio-economic impact of loss of fish biodiversity when associated with a shift from high valued to low valued species are generally negative. Most of the fishermen operating in Digha coastal area are socio-economically backward with average literacy rate, given by census 1991, at only 30.68%. According to Digha Development Authority, there are 600 countryboat owners, 100 motorboat owners and 400 trawler owners operating in the fishery. The average family size in Digha is 4.74 persons/family (census, 1991). The marine fishermen in Digha are mostly local people with negligible proportion of migrants, about 4% (Gupta, 2009). With respect to land holding, average land per fisherman is very small. The primary reason behind this is that they find fishing business more profitable than cultivation. They work full time in fishing and do not have practically any other source of income. The shift in fish catch from high-valued to low-valued species means lower profits for the fishing vessel owners and hence crew labourers hired on per trip basis run the risk of losing their jobs. The trawler owners invest large amount of capital on boat and net while the countryboat owners, having non-mechanized boats, invests the least. Since these fishermen have poor economic background, they mostly have to borrow mainly from cooperative banks and private sources such as moneylenders called the Aratdars and Mahajans. A loss in fish diversity (reflected through fall in value of catch) will reduce profits and will mean an additional pressure in repayment and a subsequent debt trap for them. On the other hand, the crew labourers running the risk of unemployment and having no alternative source of income becomes worse off. So it is the crew labourer fishermen who are likely to be hardest hit by the decline in fish diversity.

DIGHA FISH MARKET IN MOHONA:

The following guidelines will be helpful in developing fish marketing system in Digha, West Bengal

·Parallel development of the internal marketing system by improving infrastructure and supply chain in view of the increasing demand for fish.
·Cooperative marketing should be strengthened to protect producers interests since hardly 5 per cent of the fish in the internal marketing system is marketed by cooperatives and the rest is through private marketing agencies and traders.
·Thrust for value added products.
·Support price for commercially important varieties.
·Identifying and cataloguing of pharmaceutically important marine products.
·Utilisation of idle capacity of processing plans for internal marketing.

In Digha district, near mohona there is a large fish market where variety of fishes are available including sharks, jelly fish etc. There are also a large variety of prawns are found.

PRAWN CULTURE:

Digha play a major role in the prawn culture in West Bengal since 1980.A fisheries department official said mostly tiger prawns were farmed in the East Midnapore fisheries. “Every year, 15,000 tonnes of prawn are produced and much of it is exported to Japan. The entire business is worth Rs 1000 crore” (The Telegraph, 2012). Each year about Rs 1,000 crore, prawn and shrimps are exported to Japan, Europe and U.S.A. Out of these about 65% of prawns and shrimps are exported to Japan. But in the month of August,2012 Japan had refused to receive 21 containers, each one valued about 60 lacs, due to health issue. According to them with in prawns and shrimps, a high level of antioxidant, ethoxyquine is present and though it has no effect on the shrimps and prawns but it has a harmful effect on human body (Anandabazar Patrika, 2012). Due to this rejection fisherman of Digha coastal region faces a huge economic crisis which drastically affected their livelihood. Prices of prawns decrease from Rs. 400/kg to Rs.150/kg in the market.

OVEREXPLOITATION OF FISHES AND ITS IMPACTS ON BIODIVERSITY:

The importance of biodiversity had long been recognized by ecologists and environmentalists. But the main focus came into being with the initiation of the Convention on Biological Diversity in 1992 (UNCED, 1992). The emphasis was on conserving biodiversity to achieve the sustainable use of its components and therefore to secure the fair and equitable sharing of the resources which that biodiversity

represents. So, not only socio-economic development of fisherman but also marine and other aquatic ecosystems, and the ecological complexes are also taken into consideration. Conservation of biodiversity is important in environmental management programs (Turner and Gardner, 1991; Reid and Miller, 1989). However, incorporation of biodiversity in a fisheries model is a difficult task. Due to mechanised fishing, fishermen are able to enter in deep sea, and for acquiring their livelihood by fishing, sometimes it leads to loss of marine biodiversity by killing of some endangered and endemic species. For example, overexploitation of shark by these fishermen leads to the extinction of them. Already 18 species of sharks have been listed as endangered by the International Union for the Conservation of Nature (IUCN). This difficulty arises from the lack of a single practical operational definition and measurement of biodiversity. Ecologically, it is acknowledged that when the major concern is about the uniqueness of species, then each different type of species should have equal inherent value. However, when economic considerations are taken into account, then different species are assumed to have different values. Biodiversity may take on different values depending on people's perception of the economic or ecological importance of species diversity to human welfare (Barbier et al., 1994).

SHARK POPULATION DESTRUCTION:

Sharks are endangered

Over 8,000 tons of shark fins are processed each year. The fins only amount to 4% of a shark's bodyweight. This means that some 200,000 tons of sharks are thrown back into the sea and discarded (EcoAméricas Centerpiece, 2003). Already 18 species of sharks have been listed as endangered by the International Union for the Conservation of Nature (IUCN). With 90% of the world's large shark populations already wiped out, sharks are being depleted faster than they can reproduce. This threatens the stability of marine ecosystems around the world. Sharks are vitally important apex predators. They have shaped marine life in the oceans for over 400 million years and are essential to the health of the planet, and ultimately to the survival of mankind (EcoAméricas Centerpiece, 2003).

REASON BEHIND SHARK DESTRUCTION

· Sharks are killed for their teeth and jaws, for shark leather for shoes and belts, for shark liver oil and for shark cartilage for pseudo cancer cures. Sharks are used in cosmetics, skin care products and in medicines.
· Sharks are killed for food, for sport, for their fins.
· The fins are highly prized. The fishermen catch the sharks and slice off the fins, unmindful whether the shark is alive or not. The bodies, most of them still alive, are tossed back into the sea to bleed to death or to be attacked by other sharks or fish.

STRATEGIES TAKEN FOR THE SUSTAINABLE DEVELOPMENT OF DIGHA FISHERY:

A fishing-up process has been observed whereby fish stocks are gradually depleted from large to small fishes, abundant to less abundant species and from easily caught to less easily caught species (Pauly et al., 1998).

Biodiversity plays an important role in the value of the fishery. This is especially true if the fishery is subjected to market forces where the market value of the species is taken into account. When a market for the fish opens up, some species are likely to be in more demand than others and this would create pressure on the valuable species.

Loss of biodiversity is linked to the development of the market in that it leads to over-exploitation of valuable species, which results in a reduction in aggregate fish biomass. So a reduction in the over-exploitation of the fishery will increase not only biodiversity but also the value of the fish catch.

Traditional fishery management strategies mostly involve gear restrictions, closed season and licensing. Gear restrictions involve prohibition of certain methods of fishing like mesh size restrictions. Enforcement of mesh size regulation is very difficult. Closed seasons aim at protecting fish stocks during critical stages like breeding.

Licensing is aimed at limiting entry into the fisheries. It seeks to control the amount of effort by directly regulating the number of fishermen.

If fishing costs are sufficiently high relative to the price of fish, the fishery will not be exploited.

A user tax may help to reduce fishing effort as the fishery owners will try to control the costs to maintain their level of profit.

The opportunity cost of fishing may be enhanced by creating better employment alternatives, raising the minimum wage and improving the availability of credit for small scale business.

Employment opportunities outside the fishing industry has to be created because controlling of fishing effort without creating alternative employment opportunities will mean increasing poverty. For sustainable development of the fishery community-based participatory approach must be explored and considered.

DISCUSSION:

Fisheries and aquaculture contribute significantly to food security and livelihoods. Fish provides essential nutrition for 3 billion people and at least 50% of animal protein and minerals to 400 million people from the poorest countries (World Fish Center, 2008). Over 500 million people in developing countries depend, directly or indirectly, on fisheries and aquaculture for their livelihoods - aquaculture is the world's fastest growing food production system, growing at 7% annually and fish products are among the most widely traded foods, with more than 37% (by volume) of world production traded internationally (FAO,2008). But in recent years due to unscientific fishing the marine ecosystem has heavily destroyed and many precious and endangered species are knocking at the door of extinction. So, there is need for the protection and propagation of those particular species if we want to protect our marine ecosystem; and there is only way to do so is the awareness and strict Goverment rules.

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