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Research Paper

Exploitation of Marine Economically Important Clupoid Resources and Their Conservation for Sustainable Utilization Along The North-East Coast of India

Zoology

KEYWORDS : Clupoid fishes, seasonal abundance, north east coast.

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ABSTRACT

Artisanal and mechanized fishing practice along the coast exploits rich diversity of fish species which are most important coastal and marine living resources and is directly related with human health and wealth. Purchasing of marine Clupoid fishes as a food is a major sources of income for many coastal communities living along the coast. However, there is no adequate information on the quantative and qualitative trade of that particular fishes from these coast of India. So, a study was carried out on commercially important Clupoid resoueces and document the different way of exploitation of fishes in Shankarpur and Balaramgudi Fishing Harbour.

Introduction

The diversity of living resources within the marine ecosystem has a great importance in terms of the livelihood and the economic importance of the people living around it (Ramula & Gadgi 1996). Fish is one of the most important renewable resources of the coastal and marine ecosystem goods and services. With increasing fishing pressure, the only option left for the sustainability of fisheries is their rational management. Proper management is only possible through detailed knowledge regarding the dynamics of the fish stocks. The fish from family clupeidae is a member of the order Clupeiformes that are regarded as sardines, shads, herrings are one of the world's most important group of food fishes. All the clupeids are noted for their oily flesh. The group includes a broad variety of species that live in different habitat ranging from freshwater to marine. There are about 57 genera and 188 species worldwide under the family Clupeidae (Whitehead et al. 1985). Most of marine clupeids are of economic importance such as shads, sardines as it is a valuable resource of livelihood for a huge section of economically backward people (Goswami et al. 2012). The most tasteful and delicious fish *Tenulosa toli* is potentially cultured species and commercially important shads of estuary as well as marine in north –east part of India. The lack of information on the diversity of fishes along Digha and Balaramgudi area is a big handicap for popularizing little known fish variety from the locality. Thus a detail survey is required for the fish fauna associated with habitats which will help in different planning methods for their production and effective exploitation (Renjithkumar et al. 2011). Among Fishes, Clupeidae family mainly Shads i.e. *Hilsa (Hilsa) kelee* (Cuvier,1829), *Hilsa (Tenualosa) ilisa* (Hamilton-Buchanan,1822), *Hilsa (Tenualosa) toil* (Valenciennes,1847) belonging Alosinae subfamily and Sardines, Herrings i.e. *Escualosa thoracata* (Valenciennes,1847), *Herklotsichthys quadrimaculatus* (Ruppell,1837), *Sardinella brachysoma* Bleeker,1852 , *Sardinella fimbricata* (Valenciennes,1847), *Sardinella gibbosa* (Bleeker,1849) are one of the most economically important group of food fishes. Recent data regarding fish diversity, richness and abundance of these two main fishing harbours contribute a better knowledge and a tool for conservation planning of aquatic environments in these locations. Seasonal variations in population density have been studied by many workers from known regions of north-eastern coast of India. However, very little data is available from different harbour in these coast. So far for detailed study two harbour and Clupoid fishes were selected and dealed.

MATERIALS AND METHODS:

Study area: Considering the title and objectives of present project, two fishing harbour, Digha fishing harbour in the West Bengal and Balaramgudi fishing harbour in Odisha were selected. Continuous visit was carried out during the period of June, 2011 to May,2014. The selected areas were visited at peak level of each season i.e. July-September for monsoon, November –December for post monsoon and April-May for premonsoon.. A list of the commercially important species belonging Clupeidae on the basis of their food value, market price and composition in the catch were assessed by surveying at Digha fishing harbour and Balaramguri fishing harbor as well as the Digha market.

Collection of the fish samples:

Fish samples were collected from various sampling sites and other valuable information were collected from the local fisherman and resident adjacent to the sites of these two fishing harbour. The samples were photographed immediately prior to preservation. After collecting the fish, they were directly placed in a wide mouth glass jar having 2l capacity with 8% formalin solution (Bagra 2010). The preserved specimen was kept in separated jar to identify in the laboratory. The samples were identified based on the keys for fishes of the Indian subcontinent (Talwar & Jhingram,1991; Dey 1996).

DISCUSSION:

The earlier reports also suggest that the animal fish landing from sea varied from 1,098 to 2,038 tones during 1930-1945 (Mitra 1946), from 2,859 to 3,324 tones during 1948-1952 (Devasundaram 1951) and from 5,169-8,823 tones during 1972-1982 as reported by Mahapatra & Parija (1986). However, Krishnayya (1980) observed that the catches of clupeids were maximum during December and January in Pulicat Lake of India. Similar findings were also reported by Sakthivel (2000).The greater densities of fish occur in the wet season rather than dry season was reported by Robertson & Blaber (1992). The seasonal variations in the landing composition and maximum catch during rainy season is supported by similar findings by different authors (Patra et al. 2005). The total fish production during the year 2011-2012 was about 90,000 mt and during the year 2012-2013 was 92,000 mt as Digha Fishermen and Fish Trader's Association stated. On the monthwise basis, maximum landing were recorded in December, January. Month-wise frequency of occurrence of species from the trawl collection showed that mainly 6-8 commercial clupeid were seen invariably in all the months. Monthly variation in the occurrence of different potential clupeid fishes were observed during the present study (Table-1& Table-2). Among these fishing harbour Shankarpur, Digha Mohona had the highest clupeid catch with 2717.8, 2726.1 and 2710.2 MT respectively during 2011-2012, 2012-2013,2013-2014 (Table-3). The Balaramguri fishing harbour had the lowest catch with only 920.8 MT during 2013-2014, 926.9 MT during 2012-2013 and highest catch with 927.7 MT during 2011-2012 (Table-4). Con-

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siderable quantity of small sized *Sardinella gibbosa, Anodontostoma chachunda, Escualosa thoracata ,Sardinella fimbriata ,Sardinella chachunda* was encountered in August, September and November. Among Clupeidae,Genus *sardinella* contributed the major share. Then, Genus *Anodontostoma, Escualosa* formed the second dominant contributor according to abundance. In the month of July to September, large landing of *Hilsa (Hilsa) kelee, Hilsa (Tenualosa) ilisa, Hilsa (Tenualosa) toil* weighing about 37-40 mt /month coasting Rs.700-800/kg. The demand for Hilsa fishes has risen during this season.This high mass landing recording is still extending into the month of October, after that the production of this species is very much reduced. The Clupeid fishes particularly oil Sardine, the Genus *Sardinella* more specifically known as the Indian oil Sardine contribute much in northeastern part of India. Mass landing of *Sardinella brachysoma, Sardinella fimbricata , Sardinella gibbosa* measuring between 10-16c.m were observed along these coast weighing approximately 60 t / month and coasting Rs.25/kg. The harvest was utilized by both local and large scale fisheries. These species are so abundant throughout the year and common in distribution that they are made into cattle and poultry feed also.

CONCLUSION

Present work proposed that detailed study is required to prepare a database of various information which should be inserted into the fishery policies of the Government through various Govt. & Non Govt. organizations for the conservation of fish resources and also for increasing the fish yield in marine ecosystem. There is also a need to increase the awareness amongst coastal community and give then scientific knowledge. The proper use of indigenous fishing gears which are ecofriendly as well as sustainable need to be encouraged instead of modern gears (Shinde et al. 2009).

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Table-1 : Monthly occurrence of clupeid fishes in the Shankarpur, Digha mohona fishing harbour during 2011-2014.
* =Value presented here are the average of observations from 15 trawlers in Shankarpur,Digha mohona fishing harbour.

Scientific name	June (No.of fishes / trawler/day)	July (No.of fishes / trawler/ day)	Aug (No.of fishes /trawler/ day)	Sep (No.of fishes / trawler/day)	Oct (No.of fishes / trawler/day)	Nov (No.of fishes /trawler/ day)	Dec (No.of fishes / trawler/day)	Jan (No.of fishes /trawler/ day)	Feb (No.of fishes / trawler/day)	Mar (No.of fishes /trawler/ day)	Apr (No.of fishes /trawler/ day)	May (No.of fishes / trawler/ day)
***Dussumieria acuta* Cuvier & Valenciennes)**	*20	28	32	25	19	10	9	8	7	15	12	17
***Dussumieria hasselti* Blkr.**	12	9	9	4	5	7	3	4	5	5	3	10
***Corica soborna* (Hamilton-Buchanan,1822)**	3	5	2	0	2	1	0	2	1	3	2	4
***Sardinella brachysoma* Bleeker,1852**	12	14	11	15	13	9	7	8	10	12	15	17
***Sardinella fimbricata* (Valenciennes,1847)**	18	29	35	20	25	21	20	19	15	17	21	23
***Sardinella gibbosa*(Bleeker,1849)**	29	33	30	29	22	40	38	37	25	29	32	44
***Herklotsichthys quadrimaculatus*(Ruppell,1837)**	4	3	5	2	1	0	2	2	3	1	3	4
***Escualosa thoracata* (Valenciennes,1847)**	22	20	24	32	30	32	27	25	20	22	23	27
***Anodontostoma chacunda*(Hamilton-Buchanan,1822)**	18	19	15	17	14	15	13	14	18	20	22	21
***Anodontostoma thailandiae* Wongratana**	9	8	7	5	6	8	6	9	5	4	6	7
***Nematolosa galatheae* Nelson & Rothman**	10	9	7	11	12	15	17	19	20	20	18	16
***Nematolosa nasus* (Bloch,1975)**	20	24	26	16	12	11	10	9	8	7	6	25
***Gadusia chapra* (Hamilton-Buchanan,1822)**	12	15	10	12	13	9	7	11	12	15	19	21
***Gonialosa manmina* (Hamilton-Buchanan,1822)**	9	7	6	5	9	8	10	11	14	10	9	7
***Hilsa (Hilsa) kelee* (Cuvier,1829)**	13	27	35	25	10	9	8	6	5	3	8	6
***Hilsa* (*Tenualosa*) *ilisa* (Hamilton-Buchanan,1822)**	15	30	37	20	18	11	12	10	7	9	8	6
***Hilsa* (*Tenualosa*) *toil* (Valenciennes,1847)**	10	22	32	30	21	20	25	15	11	9	8	7

Table- 2: Monthly occurrence of clupeid fishes in the Balaramguri fishing harbour during 2011-2014.

Scientific name	June (No.of fishes / trawl-er/day)	July (No.of fishes / trawler/ day)	Aug (No.of fishes / trawler/ day)	Sep (No.of fishes / trawler/ day)	Oct (No.of fishes / trawler/ day)	Nov (No.of fishes / trawl-er/day)	Dec (No.of fishes /trawl-er/ day)	Jan (No.of fishes /trawl-er/ day)	Feb (No.of fishes /trawl-er/ day)	Mar (No.of fishes /trawl-er/ day)	Apr (No.of fishes /trawl-er/ day)	May (No.of fishes /trawl-er/ day)
***Dussumieria acuta* Cuvier & Valenciennes)**	*10	12	16	17	13	11	10	8	5	3	7	11
***Dussumieria hasselti* Blkr.**	3	2	4	2	3	3	4	5	4	3	4	2
***Corica soborna* (Hamilton-Buchanan,1822)**	1	2	0	0	1	1	0	1	1	2	3	2
***Sardinella brachysoma* Bleeker,1852**	10	9	8	11	12	13	10	7	5	6	8	12
***Sardinella fimbricata* (Valen-ciennes,1847)**	11	12	10	9	8	10	10	12	11	11	9	7
***Sardinella gibbosa*(Bleeker,1849)**	10	9	7	8	10	12	11	10	9	7	8	7
***Herklotsichthys quadrimacu-latus* (Ruppell,1837)**	3	2	2	3	1	0	1	3	2	2	1	0
***Escualosa thoracata* (Valen-ciennes,1847)**	12	14	15	17	12	13	15	16	14	13	10	11
***Anodontostoma chacunda*(Hamilton-Bu-chanan,1822)**	11	13	12	10	12	11	11	9	10	11	11	10
***Anodontostoma thailandiae* Wongratana**	5	7	4	3	4	5	4	3	2	4	1	2
***Nematolosa galatheae* Nelson & Rothman**	9	5	6	3	5	7	9	8	10	7	6	4
***Nematolosa nasus* (Bloch,1975)**	3	5	7	4	3	5	7	7	8	9	5	6
***Gadusia chapra* (Hamilton-Buchanan,1822)**	9	11	12	13	10	11	20	15	17	18	13	11
***Gonialosa manmina* (Hamil-ton-Buchanan,1822)**	9	8	10	9	8	11	12	14	9	8	10	11
***Hilsa (Hilsa) kelee* (Cu-vier,1829)**	10	13	15	14	10	7	8	5	4	3	2	5
***Hilsa* (*Tenualosa*) *ilisa* (Hamilton-Buchanan,1822)**	7	10	15	14	10	9	7	4	3	2	3	4
***Hilsa* (*Tenualosa) toil* (Valen-ciennes,1847)**	6	11	12	14	12	6	3	3	5	3	2	3

Value are the average of observations from 15 trawlers in the Balaramguri fishing harbour (Odisha).

Table-3: Percentage composition of clupeid fishes in the total landing (MT) in Shankarpur & Digha mohona fishing harbour during 2011-2013.

	2011-2012		2012-2013		2013-2014	
Genus	Landing MT	% composition	Landing MT	% composition	Landing MT	% composition
Sardinella	790.5	29.86	815.2	29.9	803.5	29.6
Anodontostoma	395.3	14.54	380.5	13.95	350.5	12.93
Escualosa	275.2	10.12	315.3	11.56	320.3	11.81
Nematolosa	220.5	8.11	230.7	8.46	200.8	7.4
Herklotsichthys	115.1	4.23	110.2	4.04	119.2	4.39
Hilsa	305.2	11.22	301.1	11.04	320.3	11.81
Dussumieria	240.1	8.83	205.6	7.54	220.6	8.13
Corica	125.2	4.6	107.2	3.93	110.1	4.06
Gadusia	250.7	9.22	260.3	9.54	265.2	9.78
Total	2717.8		2726.1		2710.2	

Source: Digha Fishermen and Fish Trader's Association

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Table-4: Percentage composition of clupeid fishes in the total landing (MT) in Chandipur –Balaramdudi fishing harbour during 2011-2013.

	2011-2012		2012-2013		2013-2014	
Genus	Landing MT	% composition	Landing MT	% composition	Landing MT	% composition
Sardinella	250.3	26.98	270.5	29.18	273.2	29.6
Anodontostoma	115.7	12.47	119.2	12.86	117.1	12.7
Escualosa	95.2	10.26	90.1	9.72	93.2	10.12
Nematolosa	75.1	8.09	70.1	7.56	72.1	7.8
Herklotsichthys	70.2	7.5	72.3	7.80	75.1	8.15
Hilsa	110.2	11.87	105.2	11.34	102.3	11.1
Dussumieria	95.7	10.31	92.2	9.94	90.1	9.78
Corica	70.1	7.55	67.1	7.23	62.5	6.78
Gadusia	45.2	4.87	40.2	4.33	35.2	3.82
Total	927.7		926.9		920.8	

Source: Balaramgudi Fishermen and Fish Trader's Association

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