ISSN 0254-380 X

No. 214
October-December 2012

Marine Fisheries Information Service

Technical and Extension Series

Central Marine Fisheries Research Institute
(Indian Council of Agricultural Research)
Post Box No. 1603, Cochin - 682 018
www.cmfri.org.in

Marine Fisheries Information Service

No. 214 * October-December, 2012

Abbreviation - *Mar. Fish. Infor. Serv., T & E Ser.*

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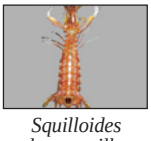

Squilloides leptosquilla

Black pomfret juveniles

The Marine Fisheries Information Service : Technical and Extension Series envisages dissemination of information on marine fishery resources based on research results to the planners, industry and fish farmers, and transfer of technology from laboratory to field.

Marine fisheries of the north-west coast of India during 2009-2010

J. Jayasankar, T. M. Najmudeen, S. Haja Najeemudeen, K. Ramani, M. R. Beena, M. B. Seynudeen, K. Anandan and Lata Khambadkar
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The north-west region consists of two important coastal states of India *viz*., Maharashtra, Gujarat and the Union Territory, Daman & Diu. The total length of the north*west coastal region is about 2,320 km which is nearly 29% of the nation's total coastal length. This region consists of 714 marine fishing villages and 278 landing centres. As per the 2010 marine fisheries census, the total marine fishermen population in Gujarat, it is 3,36,181, in Maharashtra is 3,86,259 and in Daman & Diu, it is 40,016, which put together account for 19.07% of the all India fishermen population. The marine fish production of the north-west region for 2009 was 8,80,312 t and for 2010 was 8,51,521 t accounting for 27.49% and 25.44% respectively of the total marine fish production from the country.

Sector-wise contribution

The contribution from mechanised sector has increased from 89.9% in 2009 to 93.6% in 2010, but the contribution of motorised and non-motorised sectors have shown a decline in 2010. Trawlers, gillnetters, dolnetters and purseseiners were the major contributors among mechanised gears. Sectorwise contribution of marine fish landings in the north-west region for 2009 and 2010 is shown in Fig. 1.

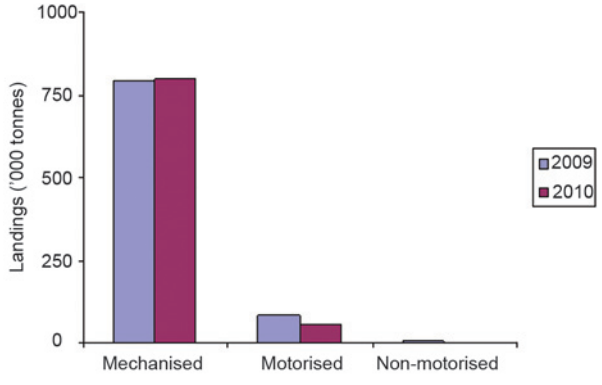

Fig. 1. Sector-wise contribution in north-west region

Marine fish production from north-west region mostly centered on landing centres with large concentration of mechanised crafts *viz*., single centres, like Sassoon Docks, New Ferry Wharf and Versova in Maharashtra and Veraval, Mangrol, Okha/ Salaya, and Jakhau along with the three Bombayduck landing centres *viz*., Nawabandar, Rajpara and Jafrabad in Gujarat. Quarter-wise marine fish landings of important groups for 2009 and 2010 are given in Table 1.

Although landings of groups like cephalopods, ribbonfishes, penaeid prawns, clupeids, tunnies and Indian mackerel increased in 2010, there was an overall decrease of about 28,790 t. A major decline was noticed in the landings of non-penaeid prawns and catfishes. From Table 1, it can be seen that the first and fourth quarters were more productive seasons as compared to second and third quarters in the region. The lean period was the third quarter as there was no fishing during monsoon period. The governments of Gujarat and Maharashtra states, imposed fishing ban from June 10 to August 15 every year to protect the resources during their breeding season.

Assemblages profile

The extent of contribution attributable to major assemblages of north-west region is depicted in Fig. 2 Nearly 67 % of the catch was from pelagic and demersal resources in both the years. The important crustacean group was slightly behind with 26 % and molluscan contribution was only 7%.

Gear-wise scenario

Among the gears operated in this region, mechanised trawl nets and dolnets were the dominant gears which accounted for 80% of north-west landings in both the years. During 2009, the contribution of single day trawlers was 9.92% and in 2010, it was reduced to 5.02%. But in the case of multiday trawlers, the landings increased

Table 1. Quarter-wise marine fish landings (t) of north-west region

Resource	2009					2010				
	1QR	2QR	3QR	4QR	TOTAL	1QR	2QR	3QR	4QR	TOTAL
Non-penaeid prawns	26845	60687	7438	41464	136434	36160	26140	4814	35476	102591
Croakers	25219	14368	13202	28882	81671	25820	13055	8200	35921	82996
Penaeid prawns	13837	10215	16971	24358	65381	17525	10205	10637	24397	62763
Ribbonfishes	14933	7453	14387	27632	64405	20637	9460	10984	33729	74809
Bombayduck	14241	9462	6446	30077	60226	14439	9965	5862	36845	67110
Catfishes	17838	8650	6368	23703	56559	15109	7956	3223	13314	39603
Threadfin breams	15356	9776	4511	14980	44622	14369	9389	3621	17853	45233
Clupeids	15776	7116	6820	24439	54151	16415	5356	4105	18085	43961
Cephalopods	16570	7665	7975	24144	56354	25138	12225	5148	32160	74670
Carangids	5625	4768	5822	11600	27815	7182	2724	3641	14609	28156
Other perches	6294	2450	2508	9646	20898	5119	2515	1862	11704	21200
Crabs	6173	2487	2261	6956	17877	7399	4996	1259	8766	22420
Elasmobranchs	5518	2971	1755	6355	16599	4559	2948	2303	8092	17903
Tunnies	3265	1687	2153	8501	15605	2925	515	1526	8246	13213
Indian mackerel	4144	728	268	10347	15486	5126	517	621	27409	33673
Pomfrets	2013	1263	7147	3131	13554	2570	1817	5338	4400	14125
Seerfishes	2885	781	1948	6983	12597	3471	2044	1237	7234	13987
Flatfishes	4263	1513	811	4600	11187	2049	1528	579	5974	10130
Others	27597	12532	12721	56038	108891	22962	11499	8701	39819	82978
Total	228392	166572	121512	363836	880312	248974	134854	83661	384033	851521

from 46.15% in 2009 to 54.61% in 2010. The unit operations of single day trawlers show a reduction of 18,971 units whereas unit operations of multi-day trawlers increased by 17,600 units which implies trips of multi-day trawlers are more than single day trawlers. The average catch per hour of single day trawler declined from 64 kg in 2009 to 41 kg in 2010 but in the case of multi-day trawlers, catch per hour was almost the same in both the years. While considering the catch per unit effort of trawlers, it was noticed that catch per unit effort of single day trawlers reduced from 613 kg in 2009 to 346 kg in 2010 whereas the multi-day trawlers consistently maintained the same during both the years (3550 kg). The other major gear, mechanised dolnets contributed 23.02% and 21.45% during 2009 and 2010 respectively. The catch per hour decreased from 58 kg in 2009 to 55 kg in 2010 whereas the catch per unit effort increased from 523 kg in 2009 to 669 kg in 2010. Mechanised gillnets contributed to the tune of 6.15 % and 6.60 % respectively during 2009 and 2010. The contribution of mechanised hooks & lines was very meagre compared to all other mechanised gears. Mechanised purseseines and bagnets were operating in Maharashtra and their contribution was less than 5%. Outboard gillnetters which include set gillnets, driftnets and gillnets contributed 6.29 % and 5.59 % in 2009 and 2010 respectively. In the non-motorised sector, which involves the crafts bereft of mechanical propulsion, the gears operated were gillnet, stakenet, castnet, boxinet, shoreseine, dolnet and hooks & lines and their contribution got reduced from 0.74% in 2009 to 0.14% in 2010. Detailed breakup of the percentage contribution of different gears for the years 2009 and 2010 attributed to north-west region is given in Table 2.

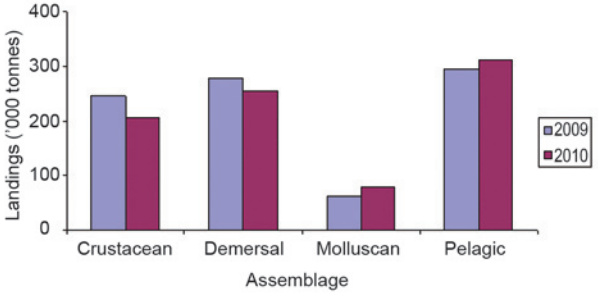

Fig. 2. Assemblage-wise contribution to marine fish landings in north-west region of India

Table 2. Percentage contribution of different gears

Gear	2009	2010
Mechanised trawl net	56	59.63
Mechanised dolnet	23.02	21.45
Mechanised gillnet	6.15	6.60
Mechanised hooks & lines	0.10	0.02
Mechanised bagnet	0.87	1.21
Mechanised purseseine	3.68	4.62
Outboard gillnet	6.29	5.59
Outboard bagnet (dolnet)	2.05	0.46
Outboard hooks & lines	0.99	0.19
Non-motorised	0.74	0.14

Major resources

During 2009, in Maharashtra there were about 252 species landed of which 98 species come under pelagic group, 88 species under demersal, 53 species under crustaceans and 13 species under molluscs. While considering the 2009 landings, non-penaeid prawns and penaeid prawns were dominant groups with 11 species and 23 species respectively. Among penaeid prawns, *Solenocera crassicornis* (3,381 t), *Metapenaeus affinis* (8,318 t), *Metapenaeus brevicornis* (1,063 t), *Metapenaeus monoceros* (3,875 t), *Parapenaeopsis sculptilis* (1,255t) and *Parapenaeopsis stylifera* (16,603 t) were the major contributors whereas *Acetes indicus* (45,442 t) and *Nematopalaemon tenuipes* (10,564 t) were the major contributors among non-penaeid group. There were 245 species landed in Maharashtra during 2010, whose assemblage-wise breakup was the same as in 2009 with marginal difference. The major group landed was mackerels mainly by mechanised purseseiners and gillnetters (31,484 t) and Sassoon Docks was the major contributor of Indian mackerel with 14,788 t and during 2009, it was only 3,873 t. Non-penaeid prawns with 11 species and penaeid prawns with 27 species ranked second and third during 2010. Among penaeid group, *Parapenaeopsis stylifera* (10,254 t), *Metapenaeus affinis* (5,079 t), *M. monoceros* (3,114 t), and *Solenocera crassicornis* (1,456 t), were the dominant species landed in 2010. *Acetes indicus* (20,584 t) and *Nematopalaemon tenuipes* (7,249 t) were the major contributors among non-penaeid group wherein drastic reduction was noticed during 2010.

In Gujarat, 200 and 189 species were landed respectively during the years 2009 and 2010. During 2009, among 200 species, 76 species came under pelagic, 68 species under demersals, 48 species under crustaceans and 8 species under molluscs. The position of assemblages was found to be the same level especially for pelagics and demersals and a slight decrease was noticed in crustaceans in 2010. Among the variety of groups in 2009, non-penaeid prawns were the major group landed with 13.25% and it got reduced to 11.72% in 2010. *A. indicus* (14,303 t) and *N. tenuipes* (9,848 t) was the species landed among non-penaeid group in 2009 which was 6,093 t and 11,452 t in 2010. The landings of croakers was stable with 9.81% and 9.84% recorded during 2009 and 2010 respectively. In the case of ribbonfish, a slight increase was noticed in 2010. The landings of catfish recorded reduction from 42,703 t in 2009 to 32,875 t in 2010. The landings of penaeid prawns increased from 26,290 t in 2009 to 35,489 t in 2010.

The landing of north-west region was attributable primarily to mechanised units which operated in single centers like Sassoon Docks, New Ferry Wharf and Versova in Maharashtra and Veraval, Porbander and Mangrol in Gujarat. Veraval Harbour in Gujarat contributes to nearly one fourth of annual landings of Gujarat. In the case of Maharashtra, New Ferry Wharf matches the status of Veraval Harbour. Sassoon Docks contributed 18.4% and 23.72% respectively during the years 2009 and 2010. Contribution of Mangrol in Gujarat and Versova in Maharashtra were less than 10%. Though the landing centers, namely Jafrabad, Nawabander and Rajpara, where Bombayduck landings take place in a large scale, are not harbours, they play a vital role in the landings of Gujarat and their combined contribution has been 19% in both the years.

Table 3. Percentage contribution of major harbours in north-west region

State	Harbour	2009	2010
Gujarat	Veraval	24.14	25.55
	Mangrol	7.30	5.65
	Porbander	13.72	13.71
Maharashtra	New Ferry Wharf	23.03	27.44
	Sassoon Docks	18.40	23.72
	Versova	3.74	4.62

Marine fisheries of the south-west coast of India during 2009-2010

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The south-west coast of India has been the major contributor of the country's fish production with a coastline of 994 km along the maritime states of Kerala, Karnataka and Goa. In this region, 2.79 lakh fishermen are directly or indirectly involved in marine fisheries sector. The marine fish landings in this coast continued to grow, rising from 8.75 lakh t to 10.83 lakh t, contributing 27.3% and 32.4% to the national fish production in 2009 and 2010 respectively. The region experienced a noticeable hike in landings of about 2.09 lakh t during 2010 when compared to 2009. Kerala, with a coastline of 590 km and 187 fish landing centres contributes more than half of the marine fish landings in this region.

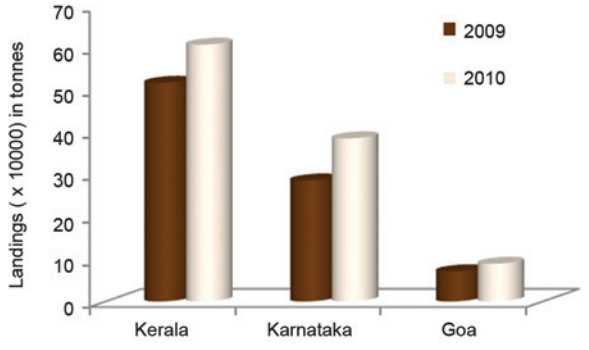

Fig. 1. Estimated marine fish landings (t) in different states of the south-west region during 2009-10

Over the previous year, the marine fish landings in Kerala increased from 5.18 lakh t to 6.08 lakh t in 2010. Karnataka's coastline, dotted with 96 fish landing centres, extends over a length of 300 km and shares one-third of the annual landings of the region. With an increase of 35% over the previous year, the annual marine fish landings in Karnataka reached 3.86 lakh t during 2010, which is the highest on record. Goa, sharing 8% of the landings also experienced an increase in landings from 0.7 lakh t to 0.9 lakh t during this period.

Marine fish landings - major resources

The marine fish landings during 2010 has been on the rise with marked increase in catches of the five major resources *viz*., oilsardine, mackerel, cephalopods, *Stolephorous* and ribbonfishes. Oilsardine and mackerel, together account for about 50% of the marine fish landings in the south-west region. The other major resources which contributed to the landings were threadfin breams (5.9%), cephalopods (5.7%), carangids (5.7%) penaeid prawns (4.9%), *Stolephorus* sp. (4.6%), ribbonfish (3.3%), scads (2.5%), flatfish (2.2%), lizardfish (2.2%) and tunnies (1.5%). Compared to 2009, a minor decrease was noticed in the landings of threadfin breams, penaeid prawns, scads and lizardfishes.

Table 1. Marine fish landings - major resources landed during 2009 and 2010

Resources	2009	2010
Oilsardine	252760	352357
Mackerel	112350	184492
Threadfin breams	66442	63798
Cephalopods	39448	61884
Carangids	60677	61297
Penaeid prawns	58597	52545
Stolephorus	34242	49894
Ribbonfish	18076	35675
Scads	30370	27120
Flatfish	19879	23915
Lizardfish	29010	23909
Tunnies	20392	16772

In the south-west region, pelagics were the most abundant category, contributing about 7.7 lakh t in 2010. This accounted for 71% percent of the total fish landings, a slightly higher proportion than that reported in 2009. Although the pelagic fish landings in the south-west region comprised 100 different

species, nearly half of the landings in this group was constituted by oilsardine during both the years.

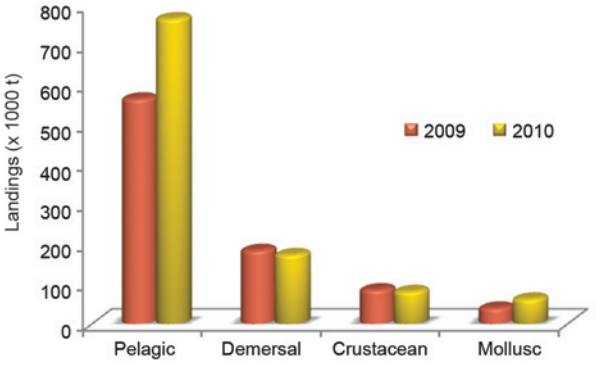

Fig. 2. Marine fish landings- major components

The other important contributors to the pelagic landings in 2009 and 2010 include mackerel, carangids, *Stolephorus*, tunnies and ribbonfishes. The major resources contributing to the landings of demersal resources are threadfin breams, flatfishes, lizardfishes, rock cods and croakers. Demersal resources provided about 1.73 lakh t, decreasing the proportional contribution from 21% in 2009 to 16% in 2010. The landings of crustaceans also decreased to 7% from 10% while a marginal increase was noticed in the landings of molluscs during 2010. The single, most important group representing nearly one-third of the crustacean landings is penaeid prawns. Cephalopods formed bulk of the molluscan landings in this region. In 2010, the region as a whole has 310 different number of species caught, with 134 demersal, 44 crustacean and 20 molluscan species. The contributions from Cochin, Munambum, Sakthikulangara and Neendakara Fishing Harbours form major part of the marine fish landings in Kerala (Fig. 3). Similarly, Mangalore and Malpe are the major harbours that play vital role in the fish landings of Karnataka.

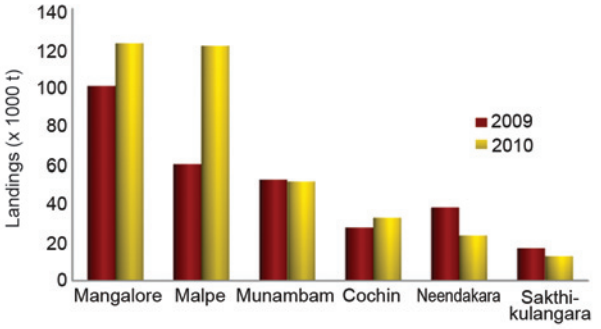

Fig. 3. Marine fish landings- contribution from major harbours

Marine fish landings - seasonal variations

The peak season in the south-west region was October-December, contributing 39% of the total catch during 2010 which showed an increase in the landings of about 1.83 lakh t compared to that in the corresponding period during 2009 (Fig. 4).

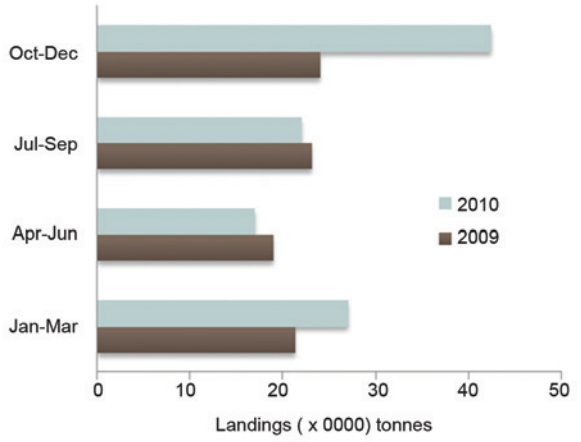

Fig. 4. Seasonal variations in marine fish landings of south-west coast during 2009 and 2010

Though the landings during Jan-Mar formed almost one-fourth of the total landings for both the years, in terms of quantity, the landings during 2010 showed an increase of 0.56 lakh t. A marginal decline in the landings was noticed during April-June and July-September in 2010.

Sector-wise contribution

The catch from mechanised sector showed an upward trend accounting about three-fourth of the total landings during 2010. The proportion of landings in motorised sector fell from 28% in 2009 to 25% in 2010. Sector-wise marine fish landings of south-west region during 2010 is depicted in Fig. 5.

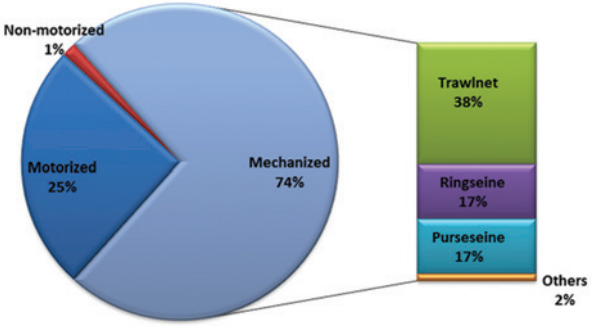

Fig. 5. Marine fish landings - sector-wise contribution during 2010

Among the mechanised sector, the bulk of the landings were by trawlers, purseseiners and ringseiners whereas ringseiners and gillnetters were the major contributors in the motorised sector during 2009 and 2010.

Major gears

Major gears which contributed to the landings in this region were trawl nets, seinenets and gillnets. Mechanised trawlers fitted with chinese engines were in operation along the coast especially in Mangalore Fisheries Harbour. Multi-day trawl landings accounted for 3.38 lakh t during 2010 which was about 66,660 more than that during 2009. The catch per hour (CPH) of the multi-day trawlers was 46.5 kg h^{-1} which has not changed substantially during 2009 and 2010. The major resources caught in trawl net were threadfin breams, penaeid prawns, cephalopods, lizardfishes and ribbonfishes.

Ringseine units contributed both in mechanised and motorised sectors. Oilsardine and mackerel were the major contributors in the mechanised sector. The unit operations of the mechanised ringseine increased from 50,768 in 2009 to 68,577 during 2010 thus showing an increase of CPUE from 2100 kg in 2009 to 2660 kg in 2010. Similarly the unit operations of the mechanised purseseine also increased from 50,768 to 68,577 showing an increase in CPUE from 2,149 kg in 2009 to 2,769 kg in 2010.

Marine fisheries of the south-east coast of India during 2009 - 2010

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The south-east region consisting of Andhra Pradesh, Tamil Nadu and Puducherry is spread over a coastal length of 2,050 km and as per the Marine Fisheries Census 2010, this region has 785 landing centres, 1,168 marine fishing villages, 3.7 lakh fishermen families and 14.63 lakh fisher folk. The estimate of total marine fish landings in 2009 for the south-east region was 8,05,295 t accounting for 25.1% of the total marine fish landings in the country. The contribution from Tamil Nadu was 5,33,965 t (66.3%) followed by 2,58,695 t (32.1%) from Andhra Pradesh and 12,635 t (1.6%) from Puducherry. In 2010, the contribution from south-east region was 7,61,328 t showing a reduction of 43,967 t (5.5%). The percentage contribution by this region in 2010 towards total landings in the country was 22.8% in which the contribution by Tamil Nadu was 5,09,025 t (66.9%), Andhra Pradesh 2,41,439 t (31.7%) and Puducherry 10,864 t (1.4%). The resources that showed reduction in landings in 2010 compared to 2009 were oilsardine by 20,251 t, pig-face breams by 8,887 t, scads by 6,350 t, seerfishes by 4,420 t, Indian mackerel by 3,880 t and miscellaneous group by 27,464 t. Resource groups that have shown increase in landings were, *Stolephorus* by 7,767 t, goat fishes by 3,856 t, silverbellies by 9,785 t, squids by 4,157 t and cuttlefish by 3,344 t.

The important resources that contributed maximum towards total landings in the south-east region in 2009 were oilsardine 1,54,795 t (19.22%), lessersardines 72,379 t (9.0%), silverbellies 49,674 t (6.2%), penaeid prawns 45,448 t (5.6%) and Indian mackerel 41,881 t (5.2%). In 2009, Tamil Nadu contributed 87.4% of oilsardine landings, 62.1% of lesser sardine landings and 80.8% of silverbellies landings in the south-east region where as Andhra Pradesh contributed 54.9% of penaeid prawn landings and 55.1% of Indian mackerel landings. The percentage contribution from south-east region towards total landings of oilsardine, lesser sardine, silverbellies, penaeid prawns and Indian mackerel in the country were 37.3%, 71.6%, 72.5%, 18.5% and 22.5% respectively. In 2010 also, the resources that contributed maximum were the same namely oilsardine 1,34,544 t (17.7%), lesser sardines 65,208 t (8.6%), silverbellies 59,459 t (7.8%), penaeid prawns 48,217 t (6.3%) and Indian mackerel 38,001 t (5%). In 2010, Tamil Nadu contributed

89.6% of oilsardine landings, 64.3% of lesser sardine landings and 85.7% of silverbellies landings in the south-east region where as Andhra Pradesh contributed 56.8% of penaeid prawn landings and 51.5% of Indian mackerel landings. The percentage contribution from south-east region in 2010 towards total landings of oilsardine, lesser sardine, silverbellies, penaeid prawns and Indian mackerel in the country were 27.6%, 71.8%, 78.7%, 18.5% and 14.2% respectively. Landings of important resources in south-east region for 2009 and 2010 are shown in Fig. 1.

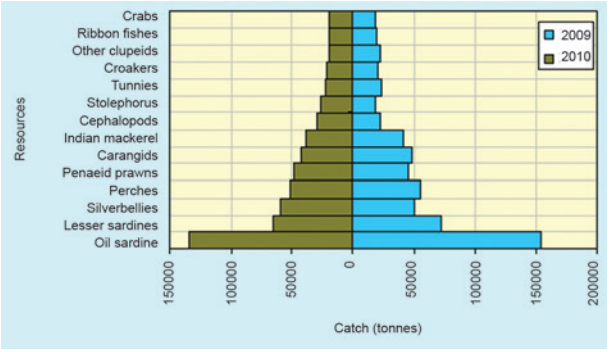

Fig. 1. Landings of important resource groups in south-east region for 2009 and 2010

The pelagic and demersal resources showed a decrease of 9.8% and 1.3% respectively in 2010 as compared to 2009 whereas the landings of molluscan resources increased by 29.3%. In the first quarter of 2010, there was 3.8% increase in the landings compared to 2009 whereas the landings showed decrease by 9.2%, 4.3% and 16.9% respectively during the second, third and fourth quarters. The contribution by the three sectors in 2010 were 4,84,163 t (63.6%) by mechanised sector, 2,36,339 t (31%) by motorised sector and 40,839 t (5.4%) by the non-mechanised sector whereas in 2009 contribution by these sectors were 4,77,646 t (59.3%)

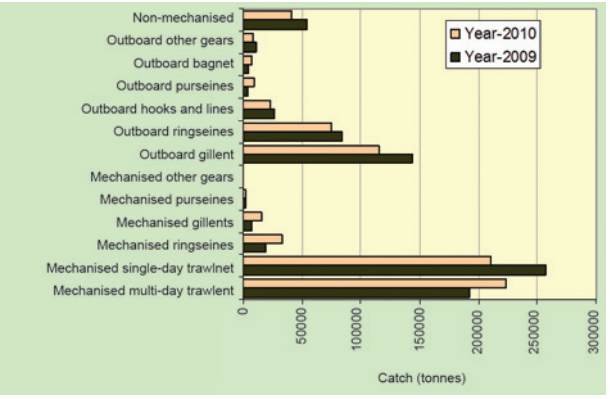

Fig. 2. Contribution by different gears towards the landings in south-east region for 2009 and 2010

by mechanised, 2,73,336 t (33.9%) by motorised and 54,314 t (6.7%) by non-mechanised sectors. Contribution by different gears towards landings in south-east region during 2009 and 2010 are shown in Fig. 2. Percentage contribution of the four categories of resources in the landings of south-east region in 2009 and 2010 are shown in Fig. 3.

The overall per boat and per hour catch (CPUE) combining all the gears for 2010 for the south-east region were 189 kg and 24 kg respectively and the same for 2009 were 177 kg and 26 kg respectively. Sector-wise CPUE for the region in 2010 were 1028 kg boat^{-1} and 43 kg h^{-1} for the mechanised sector, 88 kg boat^{-1} and 14 kg h^{-1} for the motorised sector and 47 kg boat^{-1} and 11 kg h^{-1} for the non-mechanised sector. Sector-wise CPUE for the region in 2009 were 1158 kg boat^{-1} and 50 kg h^{-1} for the mechanised sector, 88 kg boat^{-1} and 16 kg h^{-1} for the motorised sector and 53 kg boat^{-1} and 12 kg h^{-1} for the non-mechanised sector. Among different gears operated in the region in 2010, the maximum per boat catch observed was 3787 kg for mechanised ringseines followed by 1684 kg for mechanised

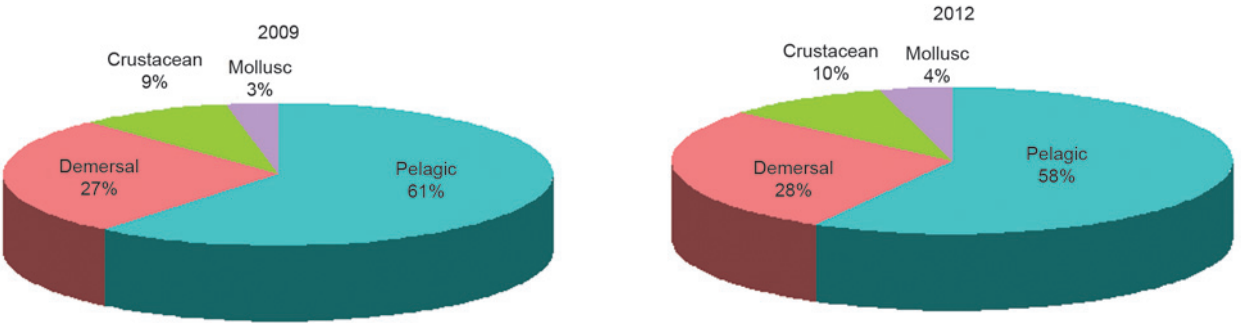

Fig. 3. Percentage contribution of the four categories of resources in landings for south-east region in 2009 and 2010

purseine, 1578 kg for mechanised gillnets, 1471 kg for mechanised multi-day trawlnets, 1040 kg for outboard purseines, 874 kg for outboard ringseines, 774 kg for mechanised hooks and lines and 703 kg for mechanised single-day trawl nets. The gears that had high per boat catch in 2009 for the south-east region were mechanised ringseines 3038 kg, mechanised purseines 1534 kg, mechanised multi-day trawlnets 1130 kg, mechanised single-day trawlnets 1127 kg, mechanised gillnets 1079 kg, outboard purseines 1030 kg and outboard ringseines 885 kg. In 2010, the gears that had high per hour catch for the region were mechanised ringseines 972 kg, mechanised purseines 406 kg, outboard ringseine 351 kg, outboard purseines 344 kg and outboard bagnets 137 kg. The gears with high per hour catch for 2009 in the region were mechanised ringseines 860 kg, mechanised purseines 462 kg, outboard purseines 419 kg, outboard ringseines 342 kg and outboard bagnets 107 kg.

In 2010, oilsardines were caught mainly by outboard ringseines (27%), mechanised ringseines (22%), mechanised trawlnets (27%), outboard gillnets (7%) and mechanised gillnets (6%), lesser sardines were caught mainly by mechanised trawlnets (40%), outboard gillnets (25%), non-mechanised gears (25%) and outboard ringseines (7%); silverbellies were caught by mechanised trawlnets (87%), outboard ringseines (6%) and outboard gillnets (5%), perches were caught by mechanised trawlnets (74%), outboard gillnets (11%) and outboard hooks and lines (11%) and penaeid prawns were caught by mechanised trawlnets (90%) and outboard gillnets (4%).

In 2009, oilsardines were caught by outboard ringseines (20%), mechanised ringseines (11%), mechanised trawlnets (51%) and outboard gillnets (9%); lesser sardines were caught by mechanised trawlnet (20%), outboard gillnets (27%), non-mechanised gears (15%) and outboard ringseines (36%); silverbellies were caught by mechanised trawlnets (83%), outboard ringseines (8%) and outboard gillnets (6%); perches were caught by mechanised trawlnets (60%), outboard gillnets (23%) and outboard hooks and lines (14%) and penaeid prawns were caught by mechanised trawlnets (85%) and outboard gillnets (5%).

In 2010 in the south-east region, 102 pelagic species, 161 demersal species, 42 species of crustaceans and 17 species of molluscs were landed whereas in 2009, about 111 pelagic, 194 demersal, 43 crustacean and 19 mollusc species were landed.

Marine fisheries of the north-east coast of India during 2009-2010

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The states of Odisha and West Bengal constituting the north-east coast of India has a coastline of 638 km. The coastal area is cyclone-prone and is worst affected during the south-west monsoon. The total number of marine fish landing centres in north-east coast is 132, of which 73 belonged to Odisha. According to Marine Fisheries Census 2010, there are 3.95 lakh fisherfolk directly engaged in actual fishing, fish seed collection and fishing allied activities in this coast.

The estimated marine fish landings in this coast was 6.44 and 6.50 lakh t for 2009 and 2010 respectively, contributing about 15% of national marine fish production. There is a quantum jump in the landings over the past decade from 2000 onwards and reached its peak in 2010 (Fig. 1), though the rate of increase was negligible during 2010, as compared to 2009. This increase can be attributed to the high efficiency fishing craft and gear together with the increase in number and size of crafts, introduction of multiday fishing and extension of fishing grounds.

West Bengal with an estimated landings of 3.59 lakh t had a share of 55% in the total marine fish

landings in this coast during 2010. The landing was fairly stable between 2009 and 2010. In Odisha, the estimated landings was 2.87 lakh t in 2009 which showed a slight increase of about 4000 t in 2010. Paradeep Fishing Harbour contributed nearly 70% of Odisha's total landings during this period.

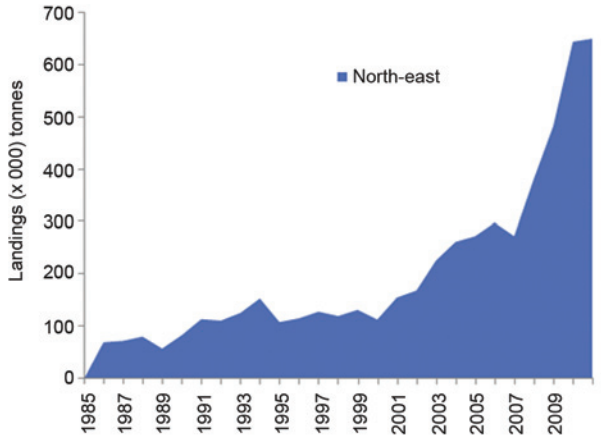

Fig. 1. Marine fish landings of the North-east coast during 1985- 2010

Major resources

Almost 74% of the landings from north-east coast during 2010 was accounted by the ten species/group *viz*., penaeid prawns (14.9%), hilsa shad (12.9%), croakers (11.8%), Bombayduck (6.2%), ribbonfishes (6.2%), carangids (5.4%), anchovies (5.0%), catfishes (4.6%), pomfrets (4.0%) and non-penaeid prawns (2.9%) (Fig. 2). The dominant species in the marine fish landings were the same during 2009 and 2010. Only a few changes in the ranking occurred in 2010. Penaeid prawns landings reached about 97,000 in 2010, growing by 3.1% in relation to 2009. Hilsa shad landings also increased by 5% compared

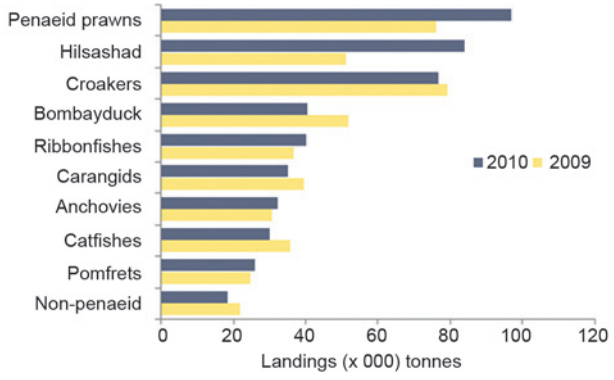

Fig. 2. Dominant species/ groups landed in north-east coast

with previous year. In 2010, hilsa shad landings amounted to 84,000 t representing an increase of 5% as that of 2009. Bombayduck, carangids, catfishes and non-penaeid prawns landings have showed slight decrease during 2010.

Pelagic fishes remained the largest contributor (50%) in the region, with production of about 3.2 lakh t in 2009 and 2010 with hilsa shad from West Bengal being the major resource. Demersal fishes contributed 33% of total landings in this coast, accounting for 2.1 lakh t in 2009, and showed a decline of 2% in 2010. During 2009 and 2010, crustacean landings made up 1.0 and 1.2 lakh t respectively of the total landings of the coast. As in 2008, molluscs contribution to the total landings of the north-east region remained at the level of 5000 t (1%) in 2009 and 2010 (Fig. 3). A total of 195 species were landed in the coast, out of which 86 species come under demersal and 74 under pelagic group.

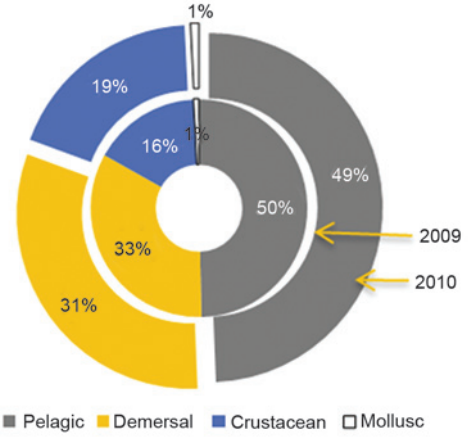

Fig. 3. Major components in marine fish landings of north-east coast

Contribution by sectors

Druing 2009 and 2010, the mechanised sector contributed the lion's share of 84 and 86% respectively to the marine fish landings. The motorised sector accounted for about 12.5% during both the years. In the case of non-motorised sector, the share was only 1.5% in 2010 , compared with 3.3% in 2009. Among different types of gears operated along the coast during 2009-10, more than three fourth of the landings was by trawl nets and gillnets. The major share to the landings was by multiday trawlers contributing about 3.6 lakh t to the total landings in 2010. The percentage contribution of various gears for theYear 2010 is given in Fig. 4.

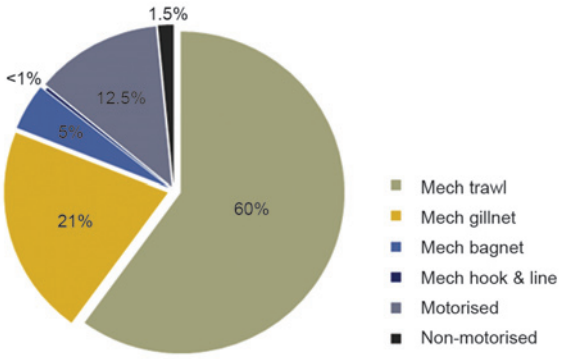

Fig. 4. Contribution of various gears during 2010

The trawl landings was mainly constituted by penaeid prawns followed by croakers, ribbonfishes and carangids during this period (Fig. 5). The penaeid prawn landings increased both in terms of quantity (0.66 to 0.89 lakh t) and percentage contribution (19% to 25%) to the trawl landings. The other three groups contributed about 16%, 8% and 7% respectively during both the years. The important gear next to trawl net was gillnet. The contribution by gillnet landings was 28% during both the years. About half of the landings was represented by hilsa shad in 2010 followed by pomfrets, catfishes, croakers, Bombayduck, other clupeids, other sardines and wolf herring. Bagnets contributed 9% towards the total landings during both the years, represented mainly by Bombayduck followed by non-penaeid prawns, penaeid prawns, croakers, *Coilia* sp. and crabs.

In the north-east coast, a major share of gillnet landings occured along the coast of West Bengal, while major share of trawl landings occured along the coast of Odisha. The gillnet and trawl net landings made up 44% and 38% respectively of total landings of West Bengal during the period. The gillnetters and trawlers do multiday operations along West Bengal coast. Crafts with length ranging from 100 to 170 m and engine power varying between 90 and 120 hp operated at a depth range of 20 to 40 m. The catch per hour of trawl net was about 36 kg during both the years. In the case of mechanised gillnet, the catch per unit effort has gone up by 576 kg in 2010 as compared to 1353 kg in 2009.

The motorised crafts in West Bengal are fitted with inboard engines. The catch per unit effort by inboard gillnet also increased from 232 kg to 363 kg during the same period. In the case of Odisha, the largest contributor was trawl net (86%) and the rest was made up by gillnet, bagnet and hooks and lines. Ring seine operations occured in Ganjam District of Odisha.

Fishing seasons

As in the past, significant variations have been noticed in the season-wise fish landings of this region. Fishing starts from July and ends in February. With reference to the landings, the most productive season identified was October-December and the period April-June was observed as the lean period (Fig. 6).

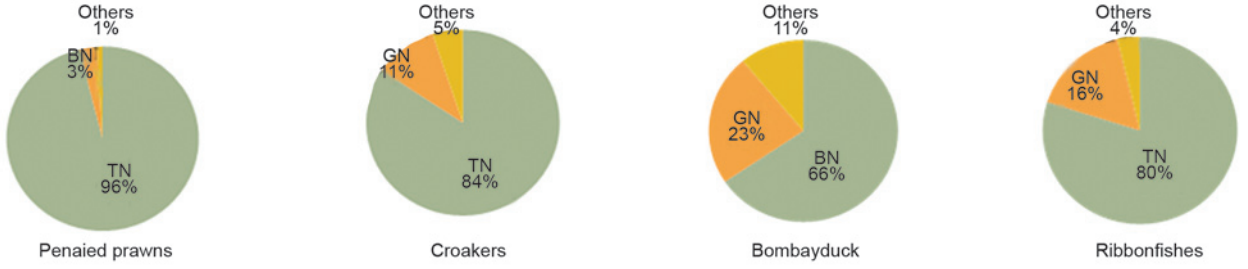

Fig. 5. Major resources caught and gearwise breakup during 2010

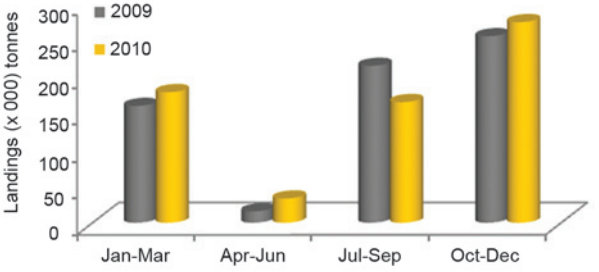

Fig. 6. Season-wise marine fish landings along north-east coast of India

During the period January-March, 12% increase in 2010 was noticed as far as landings for 2009 was concerned. The landings for 2010 showed an increase of 8% compared to 2009 landings for the period from October-December. The landings for July-September showed a decrease of 23% in 2010 from the landings for the same period in 2009.

Culture of the soft coral, *Lobophytum pauciflorum* (Family: Alcyoniidae) under captive conditions at Kochi, India

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India is bestowed with rich marine biodiversity with coral reefs accounting for a substantial share. Coral reefs make up less than 2% of the world's oceanic habitats, yet they comprise about 25% of known marine biodiversity. Among corals, soft corals are of interest to several researchers as some of the highly useful bioactive compounds are being isolated from them. Many of the coral reef ecosystems have now been noticed to be under threat due to over-exploitation, pollution and climate change. Hence there is an urgent need to conserve the corals and related bioresources. Development of suitable culture practices for transplantation of corals in the wild has been considered as one of the options for replenishing the damaged soft coral communities. Culture of soft corals is being practised in many parts of the world, mainly for aquarium trade and for the extraction of useful compounds. In many countries, there are restrictions to collect soft coral specimens from the wild due to uncontrolled anthropogenic activities. Also, there is an increasing global awareness in recent years on the over-exploitation of coral reef resources throughout the tropics and this attitude created a market for cultured reef animals while offering an economically viable alternative to wild specimen collection. The genus, *Lobophytum* is one of the hardy and frequently cultured species among the soft corals. *Lobophytum pauciflorum* (Ehrenberg, 1834) is widely distributed in the Indo-west Pacific region and in the Andaman and Lakshadweep Islands. In India, the genus *Lobophytum* has been studied for isolation of bioactive compounds, as well as chemical composition. However, so far there is no report available on the culture of soft corals in India. Hence, an attempt was made to study the different aspects of culture of *Lobophytum pauciflorum* in captivity.

Colony of *L. pauciflorum* was collected by snorkeling from the reef areas of the Palk Bay and brought alive to the marine hatchery of the Central Marine Fisheries Research Institute (CMFRI), at Cochin (Fig. 1).

Fig.1. Colony of *Lobophytum pauciflorum* (Ehrenberg, 1834)

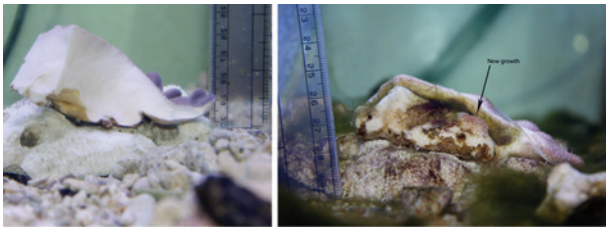
The live colonies were acclimatised to the hatchery conditions in aquarium tanks holding seawater at 34 ppt salinity, for about 2 weeks. The colonies were then cut into fragments of about 6 cm length and immediately placed in the experimental tanks. Each tank was provided with one fragment, placed on dead coral stone or dry oyster shell. The experiment was conducted in a set of nine tanks (Fig. 2)

Fig. 2. Experimental set-up for soft coral culture

The experimental tanks with 125 l of seawater in each were arranged on a platform. The tanks were provided with sand bed, canister filter, aeration and 10 light hours per day, uniformly. Feeding trials were carried out using *Nannochloropsis occulata* and a liquid food available in the market (*Rainbow*, seawater series, Golden Rainbow Aquarium Co., Ltd.) for invertebrates. The whole experiment on feeding was carried out in triplicate. Feeding schedule included supply of 1 ml of invertebrate feed and 250 ml of 8-9 million cells ml^{-1} of *N. occulata* twice a week to the respective tanks. (invertebrate feed in tanks 2A, 2B, 2C and *N. occulata* ino tanks 3A, 3B & 3C). No feeding was done in the control tanks (1A, 1B and 1C). About 20% water exchange was done once a week.

Water quality parameters such as temperature and pH were recorded daily and average values were calculated with respect to each set. During the experiment, the salinity was maintained at 34±1 ppt., pH at 8±0.2 and temperature between 24.5 and 29.5 °C. The experiment was conducted for a period of 3 months.

In the experimental tanks, the fragments were found attached firmly to the substratum by about two weeks of fragmentation and new polyps were clearly visible on the cut portion by the 25th day, in both the treatments and the control. The growth on the cut portion of the fragments at the end of three months when fed with the invertebrate feed, with *N. occulata* and in control along with their respective freshly cut fragments (initial) are shown in Fig. 3, 4 and 5 respectively. In the treatment tanks, where invertebrate feed was used, a maximum of 7 mm growth was attained on the cut portion of the fragment by the end of 3rd month.



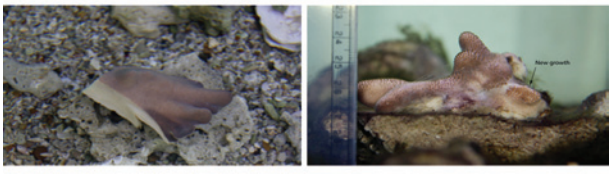
a. Initial b. Final

Fig. 3. Growth on the fragment of *L. pauciflorum* fed with invertebrate feed

In the treatment in which feeding was done with *N. occulata,* growth on the cut portion was gradual reaching a maximum of 7 mm by the end of 3rd month.

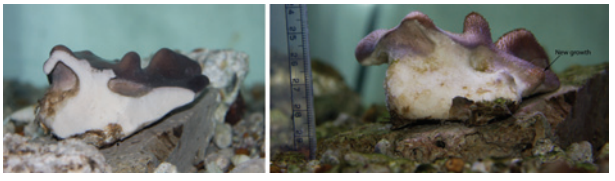
In the fragments of *L. pauciflorum* in the control tanks, though the growth was gradual, a maximum of 8 mm was recorded on the cut surface at the end of 3rd month.

In all the three sets of experiments, apart from the growth on the cut portion of the fragments, visible growth was also observed on other parts of the fragments as evident from Fig. 3, 4 and 5. The growth recorded on the cut portion of the fragments in all the 3 sets of treatments was almost the same, indicating that the feeds given had no impact on the growth. It is not clear whether the dosage of feed had been too low to show any visible change. Hence, it is necessary to conduct further experimental studies to arrive at definite conclusions. As this is a pioneering work, this can be treated as a baseline



a. Initial b. Final

Fig. 4. Growth on the fragment of *L. pauciflorum* fed with *N. occulata*



a. Initial b. Final

Fig. 5. Growth on the fragment of *L. pauciflorum* in the control tank

information and further studies on soft coral cultivation can be attempted. The fact that soft coral fragments have successfully got attached to the substratum and shown growth of numerous polyps within a short span of one month under laboratory conditions points to the possibility of transplanting them in the wild as a first step towards conservative mariculture. This may ultimately lead to appropriate strategies for conservation and sustainable utilisation of the resource.

Fishery of stomatopods - an undervalued and unappreciated fishery resource off Chennai

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**Research Centre of CMFRI, Chennai*

Stomatopods are a neglected fishery resource among the crustaceans, though it is a common bycatch in trawl fishing. They are commercially exploited in certain countries, but in India, they find market only as a raw material for preparation of fish meal and poultry feed. In Japan, *Orataria orataria* (de Haan, 1844) and in mediterranean countries, *Squilla mantis* (Linnaeus, 1758) form a good fishery and are relished as human food. They also find export market in some Asian countries such as Japan, Taiwan, Hong Kong and China. They are generally known as the 'mantis shrimp' because of their large raptorial appendages. This report is based on the data from the low value by-catch in trawl collected once a week from the Chennai Fisheries Harbour, during 2005 - 2008. Stomatopods were sorted species-wise from a sample of 2-3 kg and their total weight in the sample and individual length in 'mm' was recorded.

During 2005-08, the low value by-catch formed 14% of the total marine trawl landings. Stomatopods constituted 112 t during 2005, 129 t in 2006 (11%) and 129 t in 2007 (13.96%). In 2008, the catch of stomatopods increased to 423 t (21.16%) (Fig. 1).

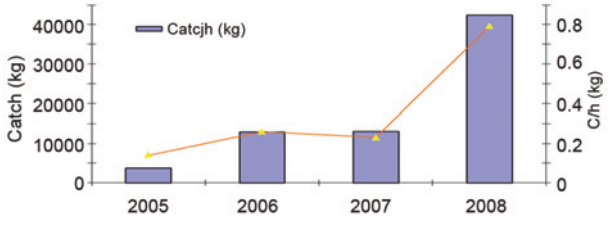

Fig. 1. Stomatopod landing during 2005- 2008 at Chennai Fisheries Harbour

Nine species belonging to three genera namely *Oratosquilla*, *Harpiosquilla* and *Lysiosquilla* were observed in the trawl fishery during the period. *Oratosquilla nepa* dominated by contributing 42% followed by *Oratosquilla woodmasoni* (16%), *Harpiosquilla harpax* (16%), *Oratosquilla gonyptes* (9%), *Oratosquilla holochista* (7%), *Harpiosquilla annandeli* (5%), *Harpiosquilla raphidae* (3%) and *Oratosquilla quinquidentata* (2%) (Fig. 2). Table 1 gives the year-wise species composition of stomatopods landed at Chennai Fisheries Harbour during 2005-08. *Lysiosquilla tredecimdentata* was rare and highly seasonal in their occurrence. Juveniles of *O. nepa* occurred in large number during 2005-08 forming 80%, followed by *O. holochista* 15%, *O. gonyptes* 8%, *H. harpax* 4%, *H. annandeli* 2%, and *H. woodmasoni* 1%. *O. nepa* ranged in total length from 40-120 mm, *O. woodmasoni* 46-130 mm, *O. gonyptes* 55-125 mm, *O. holochista* 48-202 mm, *H. harpax* 45-135 mm, and *H. raphidae* 73-129 mm.

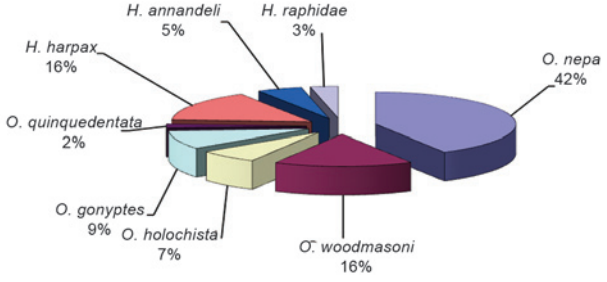

Fig. 2. Species composition of stomatopods landed at Chennai Fisheries Harbour

Table 1. Species composition of stomatopods landed at Chennai Fisheries Harbour

Species/Year	2005	2006	2007	2008
O. nepa	55.5	39.6	38	31.5
O. gonyptes	4.5	12.7	5.3	11.2
O. quinquedentata	9.5	3.8	1.6	2.5
O. woodmasoni	9.1	13.5	20.7	19
O. holochista	4.8	6.8	6.8	8.6
H. harpax	11.6	15.8	17	17.5
H. annandeli	4	3	7.1	6.2
H. raphidae	1	4.8	3.5	3.5

O. nepa, is available throughout the year, peak months being October-December. Similarly, *O. holoschista* and *O. woodmasoni* are found all the year round, maximum occurrence being in the month of February and August. *O. quinquedentata* is present in the landings from November-February, peak months being from November to December. *O. gonyptes* occurs in the fishery during January to March, June, July, September, November and December. They are abundant during January to March. *H. harpax* and *H. annandeli* are available throughout the year, peak season being September and October respectively. *H. raphidea* was observed only during July-December, maximum being in October.

The stomatopods are sorted by fisherwomen and sold for fish meal and poultry feed preparation at the rate of Rs. 4-5/kg. The growth and biology of these organisms need detailed studies and the resource should be provided a better market by value enhancement. The suitability of these organisms as a cheap source of protein food needs to be investigated as *Oratosquillina oratoria* is used for human consumption in Japan (Ahyong, 2001). Their exoskeleton is an important source for the extraction of chitin and chitosan as that of prawns and crabs. Stomatopods have been found to be useful bio-indicators of marine pollution stress on coral reefs. The colour pattern and sturdy nature also make them suitable candidates for aquarium keeping.

Squilloides leptosquilla, a deepsea stomatopod landed at Kalamukku Fishing Harbour, Kochi

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The mantis shrimp, *Squilloides leptosquilla* (Brooks, 1886) was obtained from deepsea trawl operations along with the deepsea shrimps, *Plesionika spinipes*, *Heterocarpus gibbosus* and *Metapenaeopsis andamanensis* from the Kalamukku Fishing Harbour during September, 2008. *Squilloides leptosquilla* earlier known as *Squilla leptosquilla* was first reported in India from the Arabian Sea during the deepsea exploratory survey by M. V. Kalava off Alleppey and later during the FORV *Sagar Sampada* expedition along the south-west coast of India. This mantis shrimp has a creamish body colour with orange carinations on the carapace and abdomen. The posterior extremity of the telson and uropod are also orange in colour. The dactylus of the raptorial claw is white in colour with four teeth. Another characterestic feature is the presence of an intermediate carina on the carapace. This species has brown spot on either side of the median carina of the telson. It measured 125 mm in total length and was obtained off Kochi. The FORV *Sagar Sampada* expedition reported a size range of 120-160 mm in total length. The species is found at a depth of 200-500 m and are distributed in the seas around India, Andaman and Nicobar Islands, Indonesia (type locality), the Philippines, Australia and Japan. In Japanese waters, *S. leptosquilla* is reported to feed voraciously on the deepsea penaeid shrimp *Solenocera melantho*.

Squilloides leptosquilla landed at Kochi

First record of grooved razor fish *Centriscus scutatus* Linnaeus, 1758 from Visakhapatnam waters

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One specimen of the grooved razor fish, *Centriscus scutatus* Linnaeus, 1758, was collected at Visakhapatnam Fisheries Harbour from the discards of single day trawler operated at 30 m depth on March 22nd, 2012. Occurrence of *Centriscus scutatus* (Fig. 1) is reported for the first time from the Visakhapatnam waters.

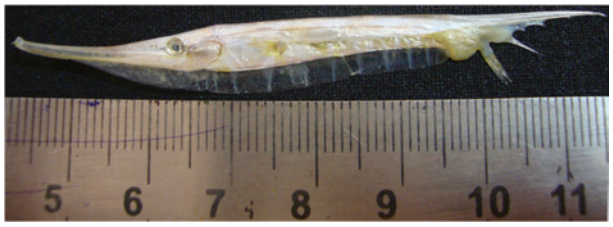

Fig. 1. *Centriscus scutatus* from Visakhapatnam

The species, one among the known two species of this genus belonging to the Centricidae family of the order Syngnathiformes, is easily distinguished by the sharp-edged belly and shrimp-like appearance. It has a straight, sleek, razor-like body with three dorsal spines, one long sharp spine displaced at the rear end of the body and two shorter spines, rest of the dorsal fin and the caudal fin present at the ventral side of the fish. The snout is long and narrow, and the small mouth at the end has no teeth. Lateral line is dusky, continuous and has no interruption. Eight silvery crossbars were observed on the ventral plates. The specimen was a juvenile. Morphometric measurements taken from the sample obtained is presented in Table 1. The specimen collected is deposited at the Marine Museum at Visakhapatnam Regional Centre of CMFRI.

Centriscus scutatus is widely distributed in coral reefs and inshore habitats throughout the tropical Indo-Pacific. The species has been first reported in India from the Gulf of Mannar, Mandapam during 1975 and from Lakshadweep Islands and from Kerala. Juveniles of 30 mm total length and longer are said to occur in the coral rich areas of lagoon reefs, particularly among live thickets of stag horn coral (*Acropora* sp.), in seagrass beds and murky outer reef areas with patch reefs. Adults are more common offshore than inshore, their presumed habitat being steep outer reef slopes and lagoon reefs. Typically they are solitary or paired, but have also been noted in groups of 3 - 7 individuals. Recently it has been recorded from off Singarayakonda, Andhra Pradesh coast, from a depth of 30 m.

Table 1. Morphometric measurements of *Centriscus scutatus*

Characters	Measurement (mm)
Total length	57
Standard length	54
Head length	26
Snout length	15
Eye diameter	2
Interorbital distance	2
Preorbital length	19
Gape of mouth	1
Dorsal fin base	1
Dorsal fin length	5
Pectoral fin length	5
Anal fin base	1.5
Anal fin length	5
Body depth	9
Weight (g)	0.2928

The grooved razor fish is remarkable for its strange body shape and swimming habits. Unlike other fishes, they swim vertically and in a synchronised manner with snout pointing downwards. They feed on small benthic/planktonic invertebrates, mainly crustaceans. Grooved razor fishes are not used as food but usually processed into fishmeal and also collected by aquarium hobbyists.

Bumper landing of juveniles of black pomfret *Parastromateus niger* at Visakhapatnam, Andhra Pradesh

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About 39.5 t of juvenile black pomfret, *Parastromateus niger* (Bloch, 1795), was landed (Fig. 1 and 2), by 46 ringseine units operated at 20 m depth, at Mangamaripeta and Lawsons Bay landing centers, which are about 15 km from Visakhapatnam, during 23rd - 26th May, 2012. Black pomfret is locally called as *nalla chanduva* in Andhra Pradesh. Fishery for the black pomfret starts from post-monsoon months and dominates the pomfret fishery with maximum landings during November-February. The black pomfrets were exploited by ring seines having 450-525 m length, 50-60 m height and 6-15 mm mesh size, locally called as "maipuvala", which mainly target oilsardine.

Biological investigations revealed all fishes to be immature, their length ranging from 91 to 204 mm with a weight range of 28 - 171 g and were with empty to half filled stomachs constituted mainly by squids, medusae and prawns in fully digested to partially digested state. The black pomfrets were sold at a rate of ₹ 50 – 60/kg at Mangamaripeta on the first day. On second and third days prices fell to ₹ 30/kg because of the unavailability of sufficient ice. Since the landings were during the fishing ban period, it was a boon to the fishermen.

Fig. 1. Landings of black pomfret juveniles at Visakhapatnam

Fig. 2. Trucks with pomfret juveniles at Visakhapatnam Fishing Harbour

Irrational and unhealthy fishing of juveniles demands immediate action. The situation is to be checked by conservation of early part of their life cycles by implementation of mesh size regulations for ringseine units or complete ban on usage of ringseine units along the Andhra coast during the fishing ban period.

Marine Fisheries Information Service

Experimental set-up for soft coral culture