

It could be inferred that the bioactivity potential of the sponge in culture conditions is determined by the survival and growth, which are influenced by the farming environment. This view is supported by the fact that only *C. subarmigera* could survive and produce bioactive metabolites, as the species was collected from the Vizhinjam coast as well as cultured in the nearby vicinity. The other two species could not survive for long as they were collected and transported from elsewhere. Thus the marine environment influences the biosynthesis and yield of target metabolite. However, it may be too early to conclude about the survival of different species of sponges in culture conditions based on the results of present set of experiments as repeated seasonal trials are yet to be made. Hence, further elaborate

culture trials in the open sea conditions are essential along with repeated harvests and their impact on bioactivity pattern. For these, sponges having different bioactivity patterns are to be collected from different locations and cultured in different depths of a select marine habitat. The preliminary studies also made it clear that in order to achieve the maximum production of specific metabolites or molecules from marine sponges or any other organism with bioactivity potentials, it is essential to devise and develop novel culture methods with considerable flexibility. It is also important to develop efficient economic farming technologies before sponge metabolites are needed in commercial qualities and quantities for drug production, thereby ensuring sustained supply.

## An overview of marine fish landings in India during 2005 - 2006

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The estimated all India total marine fish landings during the year 2006 was 2.71 million t compared to 2.30 million t in 2005 which showed 18.1% increase. The sector-wise contributions in 2005 were, 69.5%, 25.9% and 4.6% by the mechanised, motorised and non-motorised sectors respectively and in 2006 it was 71.1%, 24.1% and 4.8% respectively (Table 1). Trawl nets, gillnets, dol/bagnets and seine nets are the important gears operating along the Indian coasts.

During 2005, south-west region comprising of Kerala, Karnataka and Goa contributed 36% of the total landings, north-west region comprising

Maharashtra and Gujarat 31%, south-east region comprising of Andhra Pradesh, Tamil Nadu and Puducherry (Pondicherry) 20% and north-east region comprising of West Bengal and Orissa contributed 13%. During 2006, the contributions from the above regions were 35%, 33%, 22% and 10% respectively (Fig. 1).

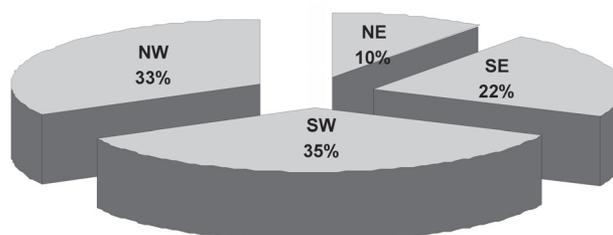


Fig. 1. Region-wise fish production in India during 2006

Table 1. All India marine fish landings during 2005 and 2006

Sector	Catch / Effort	2005	2006
Mechanised	Landings ('000 t)	1595	1928
	Units (x 000)	2389	2664
Motorised	Landings ('000 t)	594	652
	Units (x 000)	4650	5547
Traditional	Landings ('000 t)	106	130
	Units (x 000)	3161	3025
Total	Landings ('000 t)	2295	2711
	Units (x 000)	10199	11236

Oilsardine contributed 14.6% each, ribbonfish 8.7% and 5%, Indian mackerel 5.2% and 5.5%, penaeid prawns 6.4% and 7.5%, non-penaeid prawns 6.3% and 5.3%, Bombayduck 4.4% and 5.3%, croakers 4.4% and 5%, threadfin brems 4.1% and 3.9%, cephalopods 5% and 4.2% respectively

towards the total marine fish landings of the years 2006 and 2005 (Table 2; Fig. 2). Trawl landings from north-west, south-west, south-east and north-east regions were 18%, 13%, 9% and 4% respectively during 2005 while the same during 2006 were 19%, 13%, 9% and 3% of the total landings. Ring seine and purse seine are the two important gears operating in the south-west region in addition to trawl net and gillnet. Ring seine landings in this region were nearly 14% in 2005 and 10.4% in 2006 and purse-seine landings 4.8% and 5.7% in 2005 and 2006 respectively. Dolnet is an important gear operating in the north-west region in addition to trawl nets. The contribution of dolnet was 8.5% during 2005 and 9.7% during 2006. Fourth quarter was the most productive period with contribution of 40% and 36% of the all India landings during 2005 and 2006, respectively.

## Region-wise landings

### North-east

North-east region with a coastal length of about 638 km has 101 landing centres, 987 fishing villages, 1.40 lakh fishermen families and 7.20 lakh fisherfolk population (Marine Fisheries Census, 2005). The estimated marine fish landings of this region was 2.99 lakh t during 2005. In 2006, the estimated marine fish landings was 2.73 lakh t registering 8.5% decrease compared to 2005 (Table 3). The most productive season was fourth quarter with a landings of 1.72 lakh t during 2005 whereas the first quarter with 1.04 lakh t was the most productive season during 2006. Second quarter landings showed a decrease of about 122 thousand t and third quarter showed an increase of about 59.7 thousand t during 2006 as compared to 2005. Bombayduck, catfishes,

Table 2. Landings of the major resources (in tonnes) in India during 2005 and 2006

Group	2005					2006				
	1 QR	2 QR	3 QR	4 QR	Total	1 QR	2 QR	3 QR	4 QR	Total
Oilsardine	80477	51492	75819	127074	334862	96219	83976	72862	141541	394598
Penaeid prawns	45402	29664	44999	52034	172099	52168	36503	27016	56773	172460
Indian mackerel	19717	24494	38884	42329	125424	32140	27488	33940	48350	141918
Bombayduck	25691	9992	12569	74101	122353	39016	10121	23314	46056	118507
Non-penaeid prawns	33888	23432	5428	58359	121107	50953	45415	10186	64233	170787
Croakers	31424	15434	18021	50658	115537	32946	19699	17973	48787	119405
Ribbonfishes	20821	8427	8247	76620	114115	35341	17919	55845	125940	235045
Cephalopods	18742	20978	20116	37233	97069	28252	23062	39435	45292	136041
Threadfin breams	23767	33094	14373	17133	88367	29924	23452	30569	27372	111317
Silverbellies	8570	12034	22443	15799	58846	16729	10450	17559	19888	64626
Carangids	17304	33489	44333	47830	142956	24953	28974	32550	35459	121936
Others	184765	136153	158940	322897	802755	282657	148040	186982	306669	924348
Total	510568	398683	464172	922067	2295490	721298	475099	548231	966360	2710988

QR: Quarter

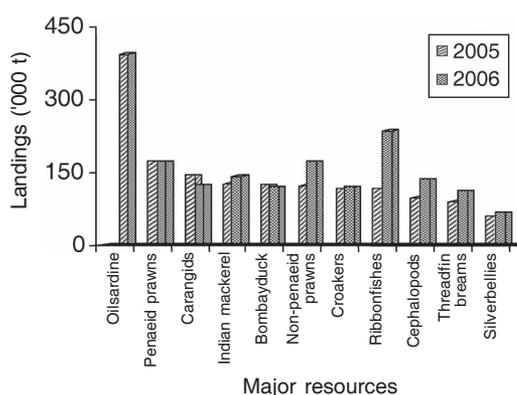


Fig. 2. Landings of major fishery resources in India during 2005 and 2006

other clupeids such as *Hilsa* spp., croakers, prawns, carangids, ribbonfishes, pomfrets and anchovies were the important resources. Except catfishes and hilsa shads, other resources showed a decrease in the landings during the year 2006 (Fig. 3). Seventy two percentage of the landings was by mechanised sector, 24% by motorised sector and 4% by traditional sector during the year 2005 and it was 70%, 26% and 4% respectively during 2006. Gillnet landings in this region dominated with 44%, followed by trawl net with 43.5% of the mechanised landings during 2005. It was 43.3% and 38.6% respectively during the year 2006 (Table 4). Catch per unit effort (CPUE) for mechanised trawl net (MTN) was 2377 (kg/unit) with

Table 3. Landings of the major resources (in tonnes) in the north-east region during 2005 and 2006

Group	2005					2006				
	1 QR	2 QR	3 QR	4 QR	Total	1 QR	2 QR	3 QR	4 QR	Total
Bombayduck	11126	1014	7044	18734	37918	15240	913	6781	13875	36809
Hilsa shad	723	4645	7363	18513	31244	4955	341	29316	2110	36722
Other clupeids	6024	1212	3439	19861	30536	10548	1157	3979	10052	25736
Croakers	5706	1259	5753	16571	29289	7831	1439	3323	11668	24261
Non-penaeid prawns	8930	33	600	13162	22725	14442	410	136	7470	22458
Pomfrets	2727	561	4033	14428	21749	8576	577	1926	5085	16164
Penaeid prawns	4433	875	5610	9511	20429	4279	1174	1747	8493	15693
Ribbonfishes	3328	277	1265	11760	16630	5677	416	1150	8968	16211
Catfishes	3367	705	3432	8200	15704	6460	799	3772	5177	16208
Carangids	2423	519	4250	7611	14803	4184	859	1133	4069	10245
Anchovies	3101	1240	1322	8288	13951	4485	1379	501	5124	11489
Others	9180	1534	7988	25244	43946	17234	2769	5893	15511	41407
Total	61068	13874	52099	171883	298924	103911	12233	59657	97602	273403

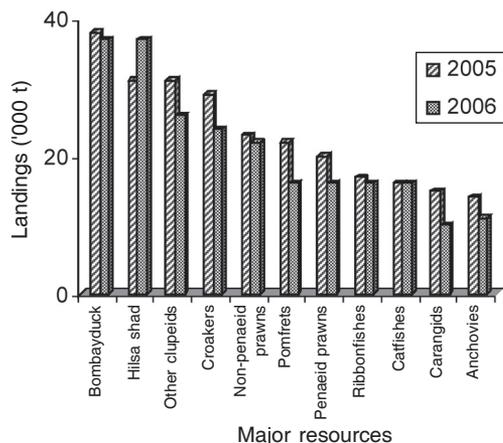


Fig. 3. Landings of major resources in the north-east region during 2005 and 2006

catch per hour (CPH) 39 kg/h during 2005 and the same was 2496 kg/unit and 48 kg/h respectively during 2006. CPH was more with 46 kg/h and 57 kg/h in the landings of mechanised bag net (MBN) during 2005 and 2006 respectively.

### South-east region

This region spreads over a coastal length of 2050 km and has 649 landing centres, 1107 fishing villages, 3.33 lakh fishermen families and 13.43 lakh fisher folk population. The estimated marine fish landings of this region was 4.50 lakh t during 2005. The landings during 2006 showed an increase of 31.7% with 5.93 lakh t. Except the second quarter, the landings of the other three quarters recorded an increase in the fish landings during the year 2006 when compared to 2005, with more productive seasons in first and fourth quarters. Oilsardine, other sardines, silverbellies, ribbonfishes, croakers, carangids, mackerels and penaeid prawns were the major exploited resources in this region (Table 5; Fig. 4). Oilsardine and other sardines landings showed an increase of about 37,000 t during 2006 compared to 2005. Silverbellies landings was about 51,000 t which showed an increase of about 9,000 t during 2006. Other resources also showed reasonable

Table 4. Marine fish landings of major gears of different sectors with catch rates in the north-east region during 2005 and 2006

Sector	Gear	2005				2006					
		Total (landings '000 t)	Effort (x000) Units AFH		CPUE (kg/unit)	CPH (kg/h)	Total (landings '000 t)	Effort (x000) Units AFH		CPUE (kg/unit)	CPH (kg/h)
Mechanised	MTN	93	39	2410	2377	39	74	30	1538	2496	48
	MGN	95	125	5671	762	17	83	91	4229	916	20
	MBN	25	60	532	410	46	34	61	589	548	57
Motorised	OBBN	38	350	1279	108	29	37	324	1363	115	27
	OBBN	31	105	555	295	55	23	117	605	199	39
Traditional	NM	12	292	972	42	13	12	266	954	43	12

MTN: Mechanised trawl net; MGN: Mechanised gillnet; MBN: Mechanised bag net; OBBN: Outboard bag net; NM: Non-mechanised, AFH: Actual fishing hours

increase in the landings during 2006. The mechanised sector contributed 48% and motorised sector 35% to the total landings of the year 2005. In 2006, the contributions were 44% and 40% respectively (Table 6). The major gears operating in this region were trawl nets, gillnets and hooks and line. Trawl net contributed 94.5% and 92% of the total landings in the mechanised sector during 2005 and 2006 respectively. Motorised sector in this region contributed 35% and 41 % during the years 2005 and 2006 respectively. The maximum contribution of 77% by the motorised sector landings was from outboard driftnet/gillnets. Traditional sector contributed 17% and 15% respectively during the year 2005 and 2006.

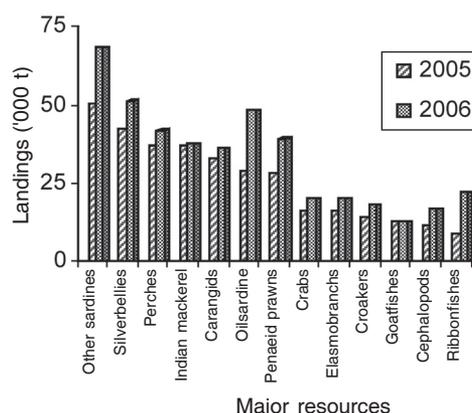


Fig. 4. Landings of major resources in the south-east region during 2005 and 2006

Table 5. Landings of the major resources (in tonnes) in the south-east region during 2005 and 2006

Group	2005					2006				
	1 QR	2 QR	3 QR	4 QR	Total	1 QR	2 QR	3 QR	4 QR	Total
Other sardines	9392	10191	9834	20787	50204	27713	10509	9132	21072	68426
Silverbellies	6241	9810	14486	11875	42412	13092	6932	16305	14930	51259
Perches	5491	10679	9985	10711	36866	10582	7488	12390	11456	41916
Indian mackerel	9039	12700	8718	6105	36562	12105	9461	9410	6780	37756
Carangids	5599	8809	9320	8801	32529	9063	5693	12642	8652	36050
Oilsardine	1587	5427	8134	13706	28854	6296	13204	15266	13354	48120
Penaeid prawns	5399	6022	7825	8744	27990	9808	7364	10462	11565	39199
Crabs	2860	3689	4567	4708	15824	4502	4931	4951	5787	20171
Elasmobranchs	3553	3591	4023	4553	15720	6733	2694	5389	5047	19863
Croakers	2363	2363	3698	5807	14231	5646	2863	3464	5817	17790
Goatfishes	1612	4440	3407	2981	12440	3734	1971	3435	3448	12588
Cephalopods	1190	2432	5425	2004	11051	2393	3007	7065	4463	16928
Ribbonfishes	851	476	1598	5670	8595	6190	1033	3703	10997	21923
Others	24113	24034	32292	36744	117183	50332	23441	42848	44736	161357
Total	79290	104663	123312	143196	450461	168189	100591	156462	168104	593346

Table 6. Marine fish landings of major gears of different sectors with catch rates during 2005 and 2006 in the south-east region

Sector	Gear	2005					2006				
		Total (landings '000 t)	Effort (x000)		CPUE (kg/unit)	CPH (kg/h)	Total (landings '000 t)	Effort (x000)		CPUE (kg/unit)	CPH (kg/h)
			Units	AFH				Units	AFH		
Mechanised	MTN	205	416	6890	494	30	241	432	8224	558	29
	MGN	9	104	620	84	14	16	210	1213	75	13
Motorised	OBGN	121	1989	8743	61	14	184	2685	13048	68	14
	OBHL	15	252	1146	60	13	21	326	1950	63	11
Traditional	NM	77	2077	10380	37	7	92	1922	9347	48	10

MTN: Mechanised trawl net; MGN: Mechanised gillnet; OBGN: Outboard gillnet, OBHL: Outboard hook and line, NM: Non-mechanised

### South-west region

South-west region has a coastal length of 994 km, 300 landing centres, 417 fishing villages, 1.53 lakh fishermen families and 7.84 lakh fisherfolk population. This region ranks first in the fish

production with 9.38 lakh t and its contribution was 35% of the total fish production of India during the year 2006. The region recorded 11.5% increase in the landings during 2006 as compared to 2005, the estimated landings being 8.42 lakh t. Oilsardine formed major portion of the fish landings in this region

with 3.03 and 3.43 lakh t during 2005 and 2006 respectively. Oilsardine catch recorded an increase of 13% during 2006 compared to 2005. Fourth quarter was the most productive period in both the years. The major resources viz., mackerel, ribbonfishes,

threadfinbreams, cephalopods and stomatopods showed increase in the landings while the commercially important resources like penaeid prawns and carangids showed decrease in the landings during 2006 compared to 2005 (Table 7; Fig. 5).

Table 7. Landings of major resources (in tonnes) during 2005 and 2006 in the south-west region

Group	2005					2006				
	1 QR	2 QR	3 QR	4 QR	Total	1 QR	2 QR	3 QR	4 QR	Total
Oilsardine	77928	45267	67647	112808	303650	87503	70501	57396	127389	342789
Indian mackerel	7608	11062	29345	29036	77051	15715	16473	23408	26539	82135
Carangids	4313	20464	27697	18997	71471	5931	16293	15665	11497	49386
Perches	12726	25781	17554	6498	62559	18771	19147	18089	16584	72591
Penaeid prawns	15181	11267	20783	7333	54564	17556	17493	5629	11606	52284
Other clupeids	10512	7054	24203	12773	54542	12422	11073	4079	10177	37751
Cephalopods	5383	12228	12977	7882	38470	6194	10530	16398	14674	47796
Ribbonfishes	2918	1757	2089	24593	31357	6280	6135	35772	24822	73009
Soles	10857	4395	2986	8406	26644	8121	4275	3070	11260	26726
Tunnies	2420	2650	8277	9646	22993	4898	8691	9786	10126	33501
Others	22910	24666	20840	30140	98556	39954	26695	14520	39192	120361
Total	172756	166591	234398	268112	841857	223345	207306	203812	303866	938329

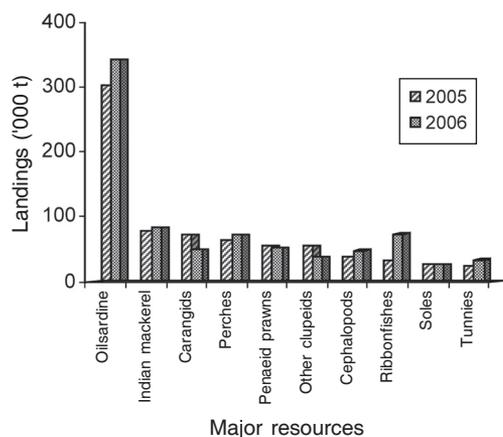


Fig. 5. Landings of major resources in the south-west region during 2005 and 2006

Mechanised sector contributed 60% and motorised sector 38% of the total landings in 2005 while their contribution was 68% and 30% respectively in 2006 (Table 8). Trawl nets contributed 57% and 53% of the landings of the mechanised sector during 2005 and 2006 respectively. Outboard ringseines (OBRS) contributed more, with 67% and 54% of the landings of the motorised sector during 2005 and 2006 respectively. Mechanised ringseines (MRS) showed higher CPUE of 2,646 kg/unit, CPH being 1,322 kg/h during 2005 while the CPUE of purseseines (MPS) was higher with 2,696 kg/unit and CPH with 1,204 kg/h during 2006. In the motorised sector the CPUE and CPH of ringseines were higher

Table 8. Marine fish landings of major gears of different sectors with catch rates in the south-west region during 2005 and 2006

Sector	Gear	2005					2006				
		Total (landings '000 t)	Effort (x000)		CPUE (kg/unit)	CPH (kg/h)	Total (landings '000 t)	Effort (x000)		CPUE (kg/unit)	CPH (kg/h)
			Units	AFH				Units	AFH		
Mechanised	MTN	291	468	6647	622	44	344	515	7977	667	43
	MPS	109	68	323	1602	336	129	48	107	2696	1204
	MRS	102	39	77	2646	1322	155	75	326	2079	477
Motorised	OBN	74	685	3292	108	22	73	755	3798	97	19
	OBRS	215	196	363	1096	592	153	150	255	1017	600
Traditional	NM	13	613	1231	22	11	16	698	1298	24	13

MTN: Mechanised trawl net; MPS: Mechanised purseseine; MRS: Mechanised ringseine; OBN: Outboard gillnet; OBRS: Outboard ringseine; NM: Non-mechanised

with 1,096 kg/unit and 592 kg/h during 2005 and 1,017 kg/unit and 600 kg/h during 2006.

### North-west region

North-west region has 2320 km coastal length, 282 landing centres, 691 fishing villages, 1.30 lakh fishermen families and 6.72 lakh fisherfolk population. It ranked second in the fish production during 2006 with fish landings of 9.06 lakh t which showed an increase of 28.6% over the landings in 2005. Fourth quarter recorded the highest landings (44%) followed by first quarter (25%) and the least landings of 14% registered in the third quarter during the year 2006. Prawns, ribbonfishes, Bombayduck, cephalopods, croakers, threadfin breams and catfishes were the major exploited resources in this region (Table 9; Fig. 6).

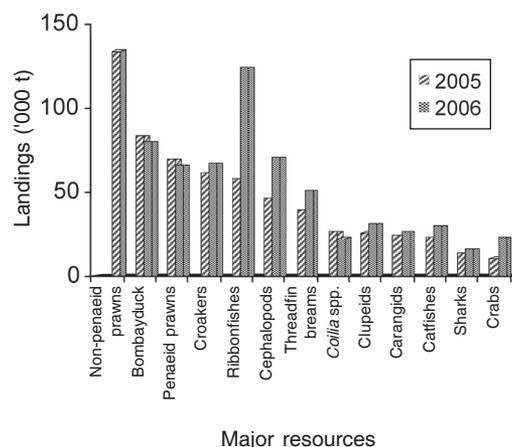


Fig. 6. Landings of major resources in the north-west region during 2005-2006

Table 9. Landings of major resources (in tonnes) in the north-west region during 2005 and 2006

Group	2005					2006				
	1 QR	2 QR	3 QR	4 QR	Total	1 QR	2 QR	3 QR	4 QR	Total
Non-penaeid prawns	23378	22322	2354	39369	87423	30251	44476	7762	51130	133619
Bombayduck	14334	8964	5241	54578	83117	22899	9133	16374	31470	79876
Penaeid prawns	20389	11500	10781	26446	69116	20525	10472	9178	25109	65284
Croakers	21202	9491	4520	26068	61281	17096	13430	8518	28166	67210
Ribbonfishes	13724	5917	3295	34597	57533	17194	10335	15220	81153	123902
Cephalopods	11702	6266	1030	26722	45720	19073	9470	15828	25542	69913
Threadfin breams	12952	11967	942	13509	39370	14157	8127	13134	15297	50715
Coilia spp.	10748	3924	1646	10303	26621	8455	3906	2515	7331	22207
Clupeids	9263	3754	1515	11291	25823	10286	4113	2857	13798	31054
Carangids	4969	3697	3066	12421	24153	5775	6129	3110	11241	26255
Catfishes	6743	4586	3005	8114	22448	7209	6885	2776	12821	29691
Sharks	4029	2751	1988	5067	13835	4992	2251	2545	6373	16161
Crabs	2896	2024	305	5477	10702	6633	7094	3902	5134	22763
Others	41125	16392	14675	64914	137106	41308	19148	24581	82223	167260
Total	197454	113555	54363	338876	704248	225853	154969	128300	396788	905910

The contribution of the mechanised sector were 93% and 92% during 2005 and 2006 respectively (Table 10). Trawlers contributed 63% and 61% in the mechanised sector landings during 2005 and 2006 respectively. Contribution of mechanised dolnet was also significant with 30% and 31% of the mechanised landings during 2005 and 2006 respectively. The contribution in the motorised sector were 6% and 7%

of the total landings during 2005 and 2006 respectively. In the motorised sector, the contribution from the outboard driftnet/gillnets was higher with 93% and 97% during 2005 and 2006 respectively. The CPUE of mechanised purseseine was higher with 2,314 kg/unit and CPH was 296 kg/h during 2005 while the CPUE and CPH were 2,396 kg/unit and 214 kg/h respectively during 2006.

Table 10. Marine fish landings of major gears of different sectors with catch rates in the north-west region during 2005 and 2006

Sector	Gear	2005					2006				
		Total	Effort (x000)		CPUE	CPH	Total	Effort (x000)		CPUE	CPH
		(landings '000 t)	Units	AFH	(kg/unit)	(kg/h)	(landings '000 t)	Units	AFH	(kg/unit)	(kg/h)
Mechanised	MTN	411	270	12025	1520	34	508	292	11786	1740	43
	MPS	9	4	31	2314	296	11	5	52	2396	214
	MDOL	194	542	5016	358	39	264	609	5653	434	47
	MGN	39	205	3717	189	10	50	223	3899	227	13
	MHL	2	8	110	305	21	0	2	64	141	5
Motorised	OBN	41	562	4364	72	9	56	487	3955	116	14
Traditional	NM	4	179	734	23	6	10	139	562	72	18

MTN: Mechanised trawl; MPH: Mechanised purse seine; MDOC: Mechanised dolnet; MGN: Mechanised gillnet  
MHL: Mechanised hook and line, OBN: Outboard gillnet; NM: Non-mechanised

## A report on swimbladder disorder in the honeycomb grouper, *Epinephelus merra*

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Swimbladder or airbladder is a thin layered epithelial sac filled with air, lying above the alimentary canal of bony fishes that regulates buoyancy of the fish so that the specific gravity of the fish always matches the depth at which it is swimming. Swimbladder disorder (SBD) is a condition caused by sudden temperature changes impacted stomach resulting from improper feeding or due to bacterial or viral infections of the bladder characterised by inability of the fish to keep a normal upright position in water. Normally gold fishes suffer from SBD due to their globoid body shape. Fish with SBD may float on their side or their back, swim in circles or take head-down posture.

A honeycomb grouper (*Epinephelus merra*) maintained at Marine Aquarium of Vizhinjam Research Centre of CMFRI was found to float with head-down position (Fig. 1). The fish was not feeding for two days. On careful examination, a swelling of about 2 cm diameter was found on the abdomen anterior to vent. Based on the signs, the condition was diagnosed as SBD which could have developed due to impacted

stomach pressing on the swimbladder. The fish was relieved of the ailment by inserting a 23 gauge sterile hypodermic needle fitted to a 2 ml syringe into the bladder and aspirating the gas by taking extreme care not to pierce the intestine or the kidneys. The suspected condition was relieved by injecting 1 ml of soap solution into the vent using a sterile tuberculin syringe without the needle. The fish showed normal movements within 30 min and started feeding after 24 h (Fig. 2).

The recommended treatment regime for SBD includes fasting for 2 or 3 days, increasing the tank temperature, avoiding dry floating feeds and deflating the swim bladder. SBD can be prevented by good tank husbandry. The reason for development of SBD in the present case can be attributed to impaction in the alimentary canal probably due to overfeeding. By aspirating the air, the swimbladder was deflated. A lavage with lubricant could break the impaction facilitating the exchange of gases making the fish move normally.