



समुद्री मात्स्यकी सूचना सेवा MARINE FISHERIES INFORMATION SERVICE

No. 165 :

July, August, September 2000



तकनीकी एवं विस्तार अंकावली TECHNICAL AND EXTENSION SERIES

केन्द्रीय समुद्री मात्स्यकी अनुसंधान संस्थान कोचिन, भारत CENTRAL MARINE FISHERIES RESEARCH INSTITUTE COCHIN, INDIA

भारतीय कृषि अनुसंधान परिषद्
INDIAN COUNCIL OF AGRICULTURAL RESEARCH

941 'MARINEFISH-FAMINE' (?) IN KARNATAKA WITH PARTICULAR REFERENCE TO UDUPI DISTRICT DURING 1998-'99

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'Marinefish-famine' is an issue often raised by the fishermen of Karnataka over the past several years whenever, they are affected monetarily and there is a failure of major fisheries of the region like mackerel and oil sardine and the high-value resources like cuttlefishes, squids and prawns. In the beginning of the fishing season, September-October 1998, the mechanised sector complained of fish famine as they could not get the expected quantity of certain high priced fish varieties which they harvested in bountiful and got appreciable monetary benefit during the previous season. Because of this the fishermen's cry of 'fish famine' was little more pronounced during 1998.

During the decadal period of 1988-'97 the annual marine fish production of Karnataka varied between 1,42,369 t in 1993 and 2,51,012 t in 1989 with an annual average of 1,76,506 t (Table 1) (CMFRI). The production of 1,64,710 t in 1998 was 6.7% and 14.9% less than the average for the above 10 year period and the first five-year period (1988-'92) respectively, but 3.2% higher than the second five-year period of 1993-'97. The annual fluctuation in marine fish production of the state, as compared to the previous year during the last decade, varied from (—) 29% in 1990 (as compared to the previous year, 1989) to (+) 59.5% in 1986 (as compared to 1985). The decrease of 12.3% in production in 1998 as compared to 1997 is a normal fluctuation. However, the study on the landings of different categories of fish groups shows, (Table 2) that decline of high value fish resources like cephalopods (36.3%, — 4,345 t), ribbonfishes (65.7%—5,186 t), prawns (33.3%,

— 3,290 t), mackerel (25.0%, — 10,848 t) etc., had led to the loss of Rs.94.5 crores to the fishermen of Karnataka during 1998 as compared to 1997. The production deficit of 111 t of prawns, 4,352 t of mackerel and 1,700 t of cephalopods during September-October of 1998 in the Mangalore-Malpe area as compared to 1997 has resulted in a loss of Rs.19.4 crores to marine fishery sector. The fishermen had expected to harvest these high value resources similar to the same level as in the corresponding period of the previous year. Nevertheless, the reduced availability of these resources in 1998 especially during September-October made the fishermen to incur loss. This had led the fishermen to put forward several reasons as the causes for the production deficit in 1998 and finally to self-declare the year as 'fish famine' affected.

TABLE 1. *Marine fish landings in Karnataka during 1988-'98*

Year	Catch (tonnes)	+/- compared to previous year (%)
1988	2,12,411	—3.7
1989	2,51,012	18.2
1990	1,78,334	—29.0
1991	1,56,654	—12.2
1992	1,68,810	7.8
1993	1,42,369	—15.7
1994	1,49,699	5.1
1995	1,48,941	—0.5
1996	1,69,068	13.5
1997	1,87,758	11.1
1998	1,64,710	—12.3

TABLE 2. *Specieswise marine fish landings (tonnes) in Karnataka during 1997 and 1998*

Name of fish	1997	1998	Difference
Elasmobranchs	812	1,602	790
Catfishes	107	170	63
Oil sardine	9,854	13,944	4,090
Other sardines	8,122	7,721	-401
Anchovies	8,766	8,540	-226
Other clupeoids	1,568	3,592	2,024
Croakers	3,137	3,921	784
Whitefish	1,033	1,585	552
Flatfishes	8,619	6,531	-2,088
Threadfin breams	11,389	13,359	1,970
Ribbonfishes	7,890	2,704	-5,186
Carangids	16,893	16,234	-659
Silverbellies	1,654	2,514	860
Pomfrets	1,433	1,355	-78
Mackerel	43,466	32,618	-10,848
Seerfishes	2,491	2,160	-331
Tunas & billfishes	2,168	3,623	1,455
Prawns	9,890	6,600	-3,290
Crabs	2,296	797	-1,499
Squilla	20,587	12,435	-8,152
Cephalopods	11,977	7,632	-4,345
Lizardfishes	2,468	3,929	1,461
Barracudas	785	2,002	1,217
Groupers	2,125	1,836	-289
Goatfishes	3	34	31
Other perches	5,954	5,053	-901
Wolf-herrings	460	202	-258
Other fishes	1,811	2,017	206
Total	1,87,758	1,64,710	-23,048

'Fish famine'- Situation in Udupi District

There are 31 fish landing centres/fishing villages in the Udupi district starting from Mulki-Hejmadi-Kodi in the south to Kesar Kodi in the north. According to the Rapid Assessment Survey of Craft and Gear conducted by

CMFRI during 1998 there are 1,051 mechanised vessels, 1,225 motorised boats and 914 non-motorised boats engaged in marine fishing along the 100 km length coast line of the district. The mechanised vessels employ trawl and/purse seine during September-May period whereas, the motorised and non-motorised boats operate gillnet for larger species during September-May or gillnet/ring seines ('*matubale*' and '*ranibale*'), castnet, hand-trawl and longline for smaller fishes during the monsoon season (June-August). As the Udupi district has been recently formed by bifurcating the former Dakshina Kannada district, at present there is no separate fishery catch statistics available for the district. Nevertheless, the study of marine fish production at the Malpe Fisheries Harbour (MFH) and that of the former Dakshina Kannada District which together contribute about 59% of the marine fish production of the state would give a fairly reasonable picture of fishery scenario of the Udupi district during the 'fish famine' year 1998-'99.

Malpe Fisheries Harbour commissioned during 1986-'87 is an all weather fishing port and at present provides landing facilities for 775 mechanised vessels (73.7% of the district's total number of mechanised vessels) and 235 motorised boats (19% of the district's total number of motorised boats).

The annual marine fish production at MFH during the decadal period of 1988/'89-1997/'98, oscillated from 19,601 t (1995-'96) to 55,906 t (1989-'90) with an annual average of 34,526 t (Table 3). During this period the decrease in production in different years varied from 5.8% (1995-'96) to 40.9% (1990-'91) and the increase from 7.2% (1988-'89) to 98.9% (1996-'97). This shows that the annual production at MFH fluctuated widely similar to that observed in the all-India or Karnataka marine fish landings. The average annual production during the first five-year period (1988/'89-'92/'93) was 39,192 t, which decreased to 29,860 t during the next five-year period (1993/'94-'97/'98). The production of 34,661 t during the 'fish famine' af-

fectured year of 1998-'99 was 0.4% (135 t) and 16.1% (4,801 t) higher than the average of the decadal period and second the five-year period 1993/'94-1997/'98 respectively. However, when, compared to the first five-year period (1988/'89-1992/'93) the landing in 1998-'99 was less by 11.6% (4,531 t). Also when compared to the previous year (1997-'98), which recorded the second peak landing of 50,558 t ever after the commissioning of the port in 1987, the landing in 1998-'99 has dropped substantially by 31.4% (15,897 t). Similar trend was observed at MFH during 1989-'90 and 1990-91 (Table 4). The year 1989-'90 witnessed the highest ever-recorded landing of 55,906 t and the following year registered a heavy fall of 40.9% (22, 849 t) in production.

TABLE 3. Marine fish landings at Malpe Fisheries harbour during 1988/'89 - 1998-'99

Year	Catch (tonnes)	+/-Compared to previous year (%)
1988-'89	48,492	7.2
1989-'90	55,906	15.3
1990-'91	33,057	-40.9
1991-'92	26,258	-20.6
1992-'93	32,245	22.8
1993-'94	19,346	-40.0
1994-'95	20,803	7.5
1995-'96	19,601	-5.8
1996-'97	38,992	98.9
1997-'98	50,558	29.7
Average (10 Years)	34,526	
1998-'99	34,661	-31.4

Estimated monthwise fish landings by all gear at MFH during 1997-'98 and 1998-'99 are shown in Table 4 and 5. It can be seen that out of 33 fish groups, which support the fishery, only 10 resource groups recorded collectively an increase of 2,408 t during 1998-'99. The rest of 23 resource groups together have registered a decrease of 18,308 t. As the remarkable slump pertained to the commercially important resource groups like cuttle fishes, squids, ribbon fish, prawns etc. the fishermen

were economically affected. The production by all gear during 1998-'99 was valued at Rs.5,049.4 lakhs as compared to Rs.7,586.3 lakhs in 1997-'98 (Table 5). Therefore, the loss of income to the owners during 1998-'99 amounted to Rs. 2,536.9 lakhs (33.4%).

The analysis of monthwise marine fish landing during 1993/'94-1998/'99 (Table 6) shows that during 1998-'99, the production declined only during two months June by 199 t and August 89 t is not considerable because, fishing by mechanised vessels was banned during June-August by the Government) October (665 t) and December (1,061 t) as compared to the average monthly catch during the five year period of 1993/'94-1997/'98. But when compared to the previous year (1997-'98) the landing fell short remarkably during eight out of nine fishing months; April (2,933t), May (5,639t), June (759 t), September (1,090 t), October (4,154 t), December (1,764 t), February (632 t) and March (1,475 t). The production decrease varied from 15.4% in September to 60.2% in May (Table 6).

Gearwise scenario

Purse seine fish landings

Eight-five purse seiners are based at MFH and their catch details during the past five years (1993/'94-1997/'98) are given in Table 7. It is seen that the annual catch varied from 6,429 t in '95-'96 to 17,733 t in '96-'97 with an annual average of 10,527 t for an average effort of 6,071 units (boat days) and catch-per-unit-effort (cpue) of 1,734 kg. In 1998-'99 the landing of 12,816 t at a cpue of 2,099 kg for 6,107 units is 21.7% (2,289 t) which is higher than that of the five-year average (10,527 t) and 3% (179 t) more than the previous year (12,437 t). This clearly shows that the purse seine fishery was better during the 'fish-famine' year, 1998-'99.

Though the purse seine landing during 1998-'99 was higher by 3% as compared to last year, the total production value was less by 4.2% (Rs. 68.9 lakhs (Tables 8 and 9). This

TABLE 4. Estimated marine fish landing (t) by all gear at Malpe Fisheries Harbour during 1997-'98

Species/Gear	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan	Feb.	Mar.	Total
Elasmobranchs	26.1	57.4	6.8	0.2	0.7	110.4	1.2	13.0	2.9	29.2	29.1	45.2	322.2
Cartfishes	3.0	3.1	0	0	0	3.6	0.5	0.5	1.1	1.8	3.6	16.3	33.5
Oil Sardine	360.3	187.0	0	0	113.2	1259.2	293.2	119.3	490.1	266.2	147.7	5.8	3242.0
Lesser sardines	1.5	6.1	0	0	6.6	136.2	868.0	198.3	2.6	57.9	4.5	149.0	1430.7
Anchovies	149.5	55.8	3.8	35.8	156.3	323.1	19.5	86.1	133.6	187.6	198.7	356.5	1706.3
Other clupeoids	10.8	5.3	0	10.4	74.7	37.9	45.6	10.5	11.7	25.2	47.1	55.5	334.7
Croakers	44.1	54.9	1.7	3.8	7.7	80.1	21.8	30.2	16.6	47.1	44.1	61.3	413.4
Whitefish	32.5	41.5	1.9	1.2	16.8	29.3	15.7	13.9	6.9	22.0	30.1	71.3	283.1
Flatfishes	242.4	102.4	4.6	4.4	0.4	12.6	85.3	89.9	61.8	97.9	89.8	133.0	924.5
Threadfin breams	838.3	1856.1	62.8	0	0	879.2	591.5	139.2	304.0	416.8	396.9	616.3	6101.1
Ribbonfishes	771.5	1630.3	173.0	1.5	0.2	57.0	1099.9	251.3	42.7	145.4	175.0	234.6	4582.4
Carangids	597.1	738.4	132.1	2.5	19.5	298.7	471.2	312.8	168.7	218.2	199.6	432.6	3591.4
Silverbellies	53.1	61.6	2.9	5.9	27.0	149.2	8.4	25.0	6.1	84.2	122.1	212.0	757.5
Pomfrets	15.4	18.5	2.3	0.1	0.6	7.0	60.0	43.6	15.6	13.5	15.4	10.6	202.6
Mackerel	168.6	351.8	19.9	256.7	63.8	2140.8	3376.3	567.3	176.2	57.3	73.2	94.7	7346.6
Seerfishes	31.9	58.3	4.5	0.2	0.5	32.2	44.9	30.6	11.5	32.2	59.5	104.7	411.0
Tunas & billfishes	7.4	40.0	2.9	0	0	29.0	20.8	6.7	2.4	0.9	5.0	42.2	157.3
Prawns	240.1	133.4	0.5	69.8	197.8	47.8	32.6	108.7	117.4	99.4	127.4	177.6	1352.5
Crabs	50.1	34.4	1.8	1.5	0	6.2	7.6	7.1	22.5	55.9	67.1	72.2	326.4
Squilla	571.7	543.9	9.3	0	0	0	1.8	695.2	763.6	430.1	375.0	392.0	3782.6
Cephalopods	700.7	1853.0	305.3	0	0	990.4	601.4	59.3	142.9	258.2	521.0	899.9	6332.1
Lizardfishes	211.1	342.6	43.9	0	0	34.1	88.1	40.3	47.1	150.3	257.2	815.3	2030.0
Flatheads	28.3	152.8	4.8	0	0	18.3	65.7	30.3	53.5	25.8	123.0	341.8	844.3
Barracudas	9.5	33.9	3.0	0	0	168.2	155.2	24.0	44.5	12.1	36.6	86.4	573.4
Bullseye	332.0	808.1	31.4	0	0	125.6	231.0	41.6	155.8	103.9	107.6	334.2	2271.2
Groupers	52.2	89.4	1.8	0	0	108.6	136.3	25.4	59.4	36.7	33.1	53.6	596.5
Goatfishes	0	0	0	0	0	0	0	0	0	0.1	0.6	0	0.7
Other perches	6.6	1.0	2.5	0	0.2	0	0.1	0.1	0	10.7	31.3	41.7	94.2
Fullbeaks	1.6	0.6	0	0	0	0.9	0.6	1.0	0.5	0.4	0.2	0.5	6.3
Wolf-herrings	5.5	6.8	0	0	0	0	3.5	11.1	2.9	11.9	12.2	5.8	59.7
Other fishes	45.5	97.0	1.7	2.0	0.3	14.4	5.7	17.4	13.7	91.9	66.3	87.0	442.9
Trashfishes	0	0	0	0	0	0	0	5.6	0	0	0	0	5.6
Total	5608.4	9365.4	825.2	396.0	686.3	7100.0	8353.4	3005.3	2878.3	2990.8	2400.0	5949.6	50558.7

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TABLE 5. *Estimated marine fish landings (t) by all gear at Malpe Fisheries Harbour during 1998-'99*

Species/Gear	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total	+/-compare to 97-98
Elasmobranchs	0.2	5.2	0.9	0.7	0.1	10.1	8.7	20.5	8.2	6.5	12.4	31.1	104.6	-217.6
Catfishes	0	0.1	0	0	0	2.5	0.8	2.8	0.4	0	0	0.8	7.4	-26.1
Oilsardine	0	34.7	0	3.4	97.8	168.5	51.7	32.0	88.5	340.0	179.7	311.0	1,307.3	-1,934.7
Lesser sardines	52.7	6.5	0	34.6	45.5	85.4	22.1	55.3	228.9	1,118.9	11.4	48.8	1,710.0	279.3
Anchovies	191.4	87.3	1.8	139.0	147.7	21.7	8.0	19.7	36.2	205.6	280.4	412.6	1,551.4	436.9
Other clupeoids	23.4	20.2	0	114.0	121.5	548.6	30.2	47.3	16.4	20.5	17.9	11.2	971.2	636.5
Croakers	24.1	52.2	1.2	35.6	19.6	23.7	45.4	8.5	13.8	63.7	41.1	60.8	389.7	-23.7
Whitefish	34.4	73.5	1.4	37.7	21.5	52.1	4.0	7.7	3.8	20.0	27.7	29.1	312.9	29.8
Flatfishes	89.6	99.6	0	4.1	4.0	153.7	501.5	92.2	28.2	116.2	73.5	138.5	1,301.1	376.6
Threadfin breams	292.7	836.8	4.3	0	1.0	873.9	0	1,493.3	33.0	205.4	635.1	770.7	5,146.2	-954.9
Ribbonfishes	95.6	652.3	6.9	1.8	0.6	3.1	17.3	14.1	31.1	14.0	8.4	64.1	909.3	-3,673.1
Carangids	147.0	190.1	2.5	4.3	0.6	293.0	1,502.0	1,431.0	341.2	116.2	87.9	378.4	4,494.2	902.8
Silverbellies	89.9	39.7	1.1	37.1	15.1	168.4	15.1	28.3	23.5	20.5	21.2	59.3	519.2	-238.3
Pomfrets	1.3	4.9	0	4.1	2.1	60.9	28.2	24.8	4.1	40.0	26.1	17.5	214.0	11.4
Mackerel	92.7	64.9	2.0	182.4	212.9	2,741.8	1,815.6	860.2	21.4	72.9	130.4	110.1	6,307.3	-1,039.3
Seerfishes	28.4	44.0	3.4	1.0	0.6	42.8	41.6	78.4	41.6	22.8	23.0	37.9	365.0	-46.0
Tunas & billfishes	2.0	19.1	9.4	0	0	40.2	24.3	22.8	8.0	1.3	6.7	23.3	157.1	-0.2
Prawns	160.5	130.7	0.6	187.3	3.8	1.7	31.2	11.1	25.2	104.2	148.5	133.6	938.4	-414.1
Crabs	8.7	5.6	0.2	0.5	0.1	0.5	0.2	0.8	1.4	14.8	35.4	35.8	104.0	-222.4
Squilla	440.5	474.2	1.0	0	0	0	0	8.5	47.4	496.7	496.8	780.2	2,745.3	-1037.3
Cephalopods	271.2	328.2	13.8	0	3.5	372.4	2.4	141.7	27.8	228.1	219.5	281.1	1,889.7	-4,442.4
Lizardfishes	255.6	248.7	6.0	0	0	52.1	2.5	59.7	8.0	4.7	59.7	194.7	891.7	-1138.3
Flatheads	31.3	19.0	0	0	0	31.1	3.3	78.8	6.9	3.9	29.7	139.1	343.1	-501.2
Barracudas	48.9	53.8	0	0	0	55.3	5.1	8.4	3.9	9.4	41.6	78.5	304.9	-268.5
Bullseye	206.7	146.8	2.7	0	0	81.4	16.8	200.9	45.1	20.7	61.9	171.2	954.2	-1317.0
Groupers	24.1	48.4	0.8	0	0	94.0	7.2	26.7	7.8	21.6	63.6	91.9	386.1	-210.4
Goatfishes	0	0	0	0	0	0	0	0	0	0	0	0	0	-0.7
Other perches	10.9	0	0	0.1	0	0	2.7	1.0	0.5	1.0	1.7	3.6	21.5	-72.7
Fullbeaks	0	0.6	0.3	0	0	26.1	0.5	1.3	0	0.4	0.8	0.5	30.5	24.2
Wolf-herrings	0	1.8	0	0	0	1.4	0.9	2.7	1.5	20.2	9.3	14.4	52.2	-7.5
Other fishes	51.0	38.5	3.7	0.5	22.3	4.1	10.1	14.1	10.2	14.7	16.4	39.5	225.1	-217.8
Trashfishes	0	0	1.5	0	0	0	0	0	0	0	0	5.8	7.3	1.7
Total	2,674.8	3,727.4	65.5	788.2	720.2	6,010.5	4,198.9	4,794.6	1,114.0	3,324.9	2,767.8	4,475.1	34,661.9	-15,896.8

was due to decreased production of high value varieties like oil sardine by 1,993 t and mackerel by 621 t during September and October.

Thus, the increase in production and cpue in 1988-'99 as compared to the five-year aver-

age and the previous year distinctly indicate that during 1998-99 the purse seine fishery has actually improved in terms of quantity of fish landed, but incurred minor economic loss. If the loss (Rs. 68.9 lakh) is shared by 85 purse seiners, then the per boat loss amounted to Rs. 0.8 lakh.

TABLE 6 *Monthwise marine fish production at Malpe Fisheries Harbour by all gear during 1993/'94 - 1998/'99*

Year	1993-'94	1994-'95	1995-'96	1996-'97	1997-'98	Average for 5 years	1998-'99	+/- compared to 5 years average (t)	+/- compared to 5 years average (%)	+/- compared to '97-'98	+/- compared to '97-'98 (%)
April	829	2,335	1,478	2,417	5,608	2,473	2,675	202	8.2	-2,933	-52.3
May	759	2,736	1,400	2,610	9,366	3,374	3,727	353	10.5	-5,639	-60.2
June	219	80	61	139	825	265	66	-199	-75.1	-759	-92.0
July	58	132	511	378	396	295	788	493	167.1	392	99.0
August	876	598	703	1,183	686	809	720	-89	-11.0	34	5.0
September	4,500	3,533	4,694	5,260	7,100	5,017	6,010	993	19.8	-1,090	-15.4
October	2,857	2,714	1,270	9,127	8,353	4,864	4,199	-665	-13.7	-4,154	-49.7
November	2,265	3,145	2,031	5,307	3,005	3,151	4,795	1,644	52.2	1,790	59.6
December	2,294	1,606	1,140	2,958	2,878	2,175	1,114	-1,061	-48.8	-1,764	-61.3
January	1,933	1,230	1,909	3,665	2,991	2,346	3,325	979	41.7	334	11.2
February	821	1,207	1,355	3,132	3,400	1,983	2,768	785	39.6	-632	-18.6
March	1,935	1,487	3,049	3,116	5,950	3,107	4,475	1,368	44.0	-1,475	-24.8
Total	19,346	20,803	19,601	38,992	50,558	29,859	34,662	4,803	16.1	-15,896	-31.4

TABLE 7. *Gearwise marine fish landings at Malpe Fisheries Harbour during 1993/'94 - 1998/'99*

Year	1993-'94	1994-'95	1995-'96	1996-'97	1997-'98	Average for 5 years	1998-'99
Purse seine							
Catch (t)	9,517	6,519	6,429	17,733	12,437	10,527	12,816
Effort (unit)	5,704	5,142	5,358	7,396	6,753	6,071	6,107
C/E (kg)	1,668	1,268	1,200	2,398	1,842	1,734	2,099
Drift-gillnet							
Catch (t)	344	577	120	374	452	373	519
Effort (unit)	2,702	4,029	1,755	4,044	3,886	3,283	5,276
C/E (kg)	127	143	68	92	116	114	97
Indigenous gear							
Catch (t)	562	692	736	1,198	1,004	838	1,463
Single-day trawl							
Catch (t)	3,652	4,167	2,046	4,860	6,640	4,273	4,884
Effort (unit)	24,458	15,426	17,180	16,802	19,974	18,768	19,026
C/E (kg)	149	270	119	289	332	228	257
Multi-day trawl							
Catch (t)	5,271	9,295	10,270	14,827	30,025	13,938	14,978
Effort (unit)	4,878	6,481	7,920	7,950	8,936	7,233	6,590
C/E (kg)	1,081	1,434	1,297	1,865	3,360	1,927	2,273
Total catch	19,346	21,250	19,601	38,992	50,558	29,949	34,660

TABLE 8. Gearwise estimated marine fish landing (t) and value (Rs) at Malpe Fisheries Harbour during April '97-March '98

Species/Gear	Purse seine(t)	value (Rs)	Multi-day trawl (t)	Value (Rs)	Single-day trawl (t)	Value (Rs)	Drift gillnet(t)	Value (Rs)	Indigenous gear (t)	Value (Rs)	Total value(Rs)
Elasobranchs	45.0	20,27,025	184.9	55,46,820	20.3	4,06,580	70.7	33,94,512	0.9	8,750	11,383,687
Catfishes	0	0	27.0	6,75,775	0.6	87,00	5.9	1,78,410	0	0	8,62,885
Oilsardine	3,195.0	4,79,24,550	2.5	25,200	6.6	1,32,060	0.2	2,790	37.6	5,64,525	4,86,49,125
Lesser sardines	1,403.8	5,61,5048	18.6	93,025	1.6	11,165	0	0	6.6	32,825	57,52,063
Anchovies	81.2	2,43,552	978.4	19,56,882	454.8	13,64,397	0	0	191.9	5,75,934	41,40,765
Other clupeoids	111.8	3,35,496	73.1	2,19,156	64.8	2,59,336	0	0	85.1	3,40,376	11,54,364
Croakers	24.7	3,70,005	198.0	29,70,675	178.8	17,88,370	0.1	710	11.8	1,17,690	52,47,450
Whitefish	1.4	27,900	182.7	27,40,980	81.1	12,15,855	0	0	18.0	2,70,525	42,55,260
Flatfishes	2.0	12,048	132.1	13,21,120	785.0	62,80,376	0	0	5.2	41,960	76,55,504
Tread fin breems	0	0	6,629.5	2,41,18,068	71.5	2,85,820	0	0	0	0	2,44,03,888
Ribbon fish	0	0	3,957.1	4,74,85,560	623.5	93,52,050	0.2	1,600	1.8	14,000	5,68,53,210
Carangids	653.9	19,61,559	2,706.3	81,18,762	203.7	4,07,410	5.4	38,066	22.1	44,108	1,05,69,905
Silverbellies	27.3	5,45,54	371.4	11,14,227	325.8	9,77,457	0	0	33.1	66,102	22,12,340
Pomfrets	53.9	21,57,000	122.6	49,04,120	22.1	7,72,975	3.3	1,47,285	0.7	7,320	79,88,700
Mackerel	6,341.5	9,51,22,575	673.2	1,00,98,720	8.1	1,21,695	7.8	1,16,385	315.8	47,37,510	11,01,96,885
Seerfishes	28.3	11,33,080	215.6	86,22,960	4.0	1,15,075	161.7	97,01,940	0.7	7,260	1,95,80,315
Tunas and billfishes	2.3	23,090	0	0	0	0	155.1	31,02,100	0	0	31,25,190
Prawns	46.9	37,50,240	496.3	4,96,26,900	541.6	2,70,81,700	0	0	267.8	2,14,20,240	10,18,79,080
Crabs	0	0	199.0	99,51,75	125.4	8,77,877	0	0	2.0	9,855	18,82,907
Squilla	0	0	796.0	15,91,928	2,986.8	4,48,0182	0	0	0	0	60,72,110
Cephalopods	2.6	1,04,480	6,273.7	28,23,15,485	55.7	16,71,870	0	0	0	0	28,40,91,815
Lizard fishers	0	0	2,019.5	1,21,17,252	10.5	62,748	0	0	0	0	1,21,80,000
Flatheads	0	0	815.2	44,83,413	29.0	1,45,245	0	0	0.1	480	46,29,138
Barracudas	309.5	15,47,315	245.5	17,18,451	3.4	17,010	15.1	3,01,680	0	0	35,84,456
Bullseye	0	0	2,271.2	90,84,944	0	0	0	0	0	0	90,84,944
Groupers	30.2	90,459	564.1	8,460,900	2.3	18,088	0	0	0	0	85,69,447
Goatfishes	0	0	0.7	2,022	0	0	0	0	0	0	2,022
Other perches	0.1	150	92.9	1,85,876	0.9	2,760	0.2	1,900	0.2	654	1,91,340
Full beaks	1.9	5,820	0	0	0	0	4.3	64,605	0	0	70,425
Wolf-herrings	0	0	57.7	4,33,110	0.9	7,080	1.1	9,008	0	0	4,49,198
Other fishes	74.2	2,22,702	314.1	14,13,266	31.0	92,946	21.0	1,67,792	2.6	7,665	19,04,371
Traffishses	0	0	5.6	11,186	0	0	0	0	0	0	11,186
Total	12,437.5	16,27,28,648	30,024.5	49,24,51,938	6,640.4	5,79,56,827	452.1	1,72,28,783	1,004.0	2,82,67,779	75,86,33,975
Effort (Unit)	6,753		8,936		19,974		3,886				

TABLE 9. Gerwise estimated marine fish landing (t) and value (Rs) at Malpe Fisheries Harbour during April '98-March'99

Species/gear	Purse seine(t)	Value (Rs)	Multi-day trawl (t)	Value (Rs)	Single-day trawl (t)	Value (Rs)	Drift-gillnet (t)	Value (Rs)	Indigenous gear (t)	Value (Rs)	Total value (Rs)
Elasmobranchs	0	0	57.7	20,19,535	3.6	78,672	42.5	21,26,700	0.8	8,100	42,33,007
Catfishes	1.9	37,340	0.9	22,275	0.1	1,365	4.6	1,60,580	0	0	2,21,560
Oilsardine	1202.1	2,40,42,000	3.2	48,185	2.9	57,120	0	0	99.0	19,79,820	2,61,27,105
Lessersardines	1614.8	80,73,975	15.2	91,158	0	0	0	0	79.9	4,79,634	86,44,767
Anchovies	81.6	2,44,580	1060.2	31,20,738	123.8	45,324	0	0	285.9	1,43,348	5,00,43,000
Other clupeids	638.8	19,16,295	58.6	2,05,093	40.8	2,04,095	0	0	233.1	11,65,325	34,90,808
Croakers	71.2	14,23,320	186.9	37,37,420	76.7	9,20,772	0	0	55.0	6,60,060	67,41,572
Whitefish	44.6	8,91,000	133.5	26,69,840	75.6	13,61,178	0	0	59.0	8,85,090	58,07,108
Flatfishes	2.5	15,006	54.0	6,48,444	1237.1	123,70,750	0	0	7.4	73,840	1,31,08,040
Threadfinbreems	0	0	5138.3	30,62,908	7.8	39,040	0	0	0	0	3,08,68,948
Ribbonfish	10.0	1,50,000	689.8	1,03,46,280	206.9	33,10,912	0.1	1,200	2.4	19,424	1,38,27,816
Carangids	3111.2	93,33,723	1236.5	61,82,735	134.6	3,36,405	7.1	56,488	4.8	11,943	1,59,21,294
Silverbellies	30.8	77,115	132.2	3,96,689	308.0	9,24,081	0	0	48.0	1,20,073	15,17,968
Pomfrets	101.2	50,61,400	90.7	45,35,600	7.2	2,86,680	8.6	431,600	6.2	61,760	1,03,77,040
Mackerel	5721.3	10,29,83,670	197.5	39,49,660	4.3	86,280	18.8	282,165	365.5	73,09,260	11,46,11,035
Seerfishes	6.5	3,27,450	91.3	45,64,650	1.0	23,825	264.7	1,85,25,570	1.6	16,140	2,34,57,635
Tunas and billfishes	31.1	3,72,996	0	0	0	0	126.0	27,71,516	0	0	31,44,512
Prawns	2.9	2,63,250	302.2	3,77,79,000	442.0	2,65,21,020	0	0	191.1	1,71,96,750	8,17,60,020
Crabs	0	0	45.9	2,75,142	57.6	461,016	0	0	0.6	2,820	7,38,978
Squilla	0	0	624.4	12,48,698	2120.8	42,41,668	0	0	0	0	54,90,566
Cephalopods	0	0	1880.1	10,34,04,785	9.6	3,34,705	0	0	0	0	10,37,39,490
Octopus	0	0	0.8	1,62,480	0.4	41,000	0	0	0	0	1,66,580
Lizardfishes	0	0	891.7	71,33,888	0	0	0	0	0	0	71,33,888
Flatheads	0	0	334.1	20,04,450	9.0	45,025	0	0	0	0	20,49,475
Barracudas	52.0	2,59,930	230.9	18,46,896	0.6	4,032	21.5	5,37,850	0	0	26,48,708
Bullseye	0	0	954.1	47,70,605	0	0	0	0	0	0	47,70,605
Groupers	0	0	378.4	75,67,700	7.7	76,890	0	0	0	0	76,44,580
Goatfishes	0	0	0	0	0	0	0	0	0	0	0
Other perches	0.7	2,025	20.3	40,582	0.4	1,408	0.2	1,590	0.1	296	45,901
Fullbeaks	25.8	1,03,072	0	0	0	0	4.6	69,375	0	0	1,72,447
Wolf-herrings	0	0	45.7	3,65,760	0.4	3,544	6.1	60,590	0	0	4,29,894
Otherfishes	66.2	2,60,996	108.5	5,42,700	5.4	16,227	14.7	147,240	22.9	68,775	10,35,938
Trashfishes	0	0	7.3	18,350	0	0	0	0	0	0	18,350
Total	12816.2	1,55,83,9153	14970.9	24,05,11,066	4884.3	5,22,06,124	519.5	2,51,72,464	1463.3	3,12,02,458	50,49,49,636
Effort (unit)	6107		6590		19026		5376				

Gillnet fish landings

Motorised canoes operate gillnets with mesh-size varying from 65 to 135 mm for exploiting larger species like seerfishes, sharks and rays, tunas and billfishes, catfishes, pomfrets, barracuda, carangids etc., during all months except monsoon period (June-August). The annual landing during the five-year period of 1993/'94-1997/'98 varied from 120 t in 1995-'96 to 577 t in 1994-'95 with an average of 373t

(Table 7). The gillnet fishery during 1998-'99 was fairly good with an annual production of 519 t which is 146 t (39.1%) and 67 t (14.8%) higher than the five-yearly average of 373 t and the previous year's (1997-'98) catch of 452 t respectively. However, the cpue has come down from 116 kg in 1997/'98 to '97 kg in 1998-'99. This was owing to more effort put in 1998-'99 i.e., 5,376 units as against 3,886 units in 1997-'98 and the annual average of 3,283 units during 1993/'94-1997/'98.

The gillnet fishermen have earned more economic returns during 1998-'99 as the production was valued at Rs. 251.7 lakhs against Rs.172.3 lakhs during 1997-'98 (Tables 8 and 9).

Indigenous gear fish landings

Indigenous gear fishing is practiced in the Malpe area during the monsoon season (June-August) when the mechanised vessel fishing is banned. Motorised and non-motorised canoes carry out fishing operations with gillnets ('*kanthabale*', '*pattabale*', '*kotibale*'), ring seines ('*matubale*', '*ranibale*'), shore seines, castnet and hand-trawl. The fishery during 1998-'99 has improved over the previous year. The total landing during 1998-'99 was estimated at 1,463 t which is 625 t (74.6%) and 459 t (45.7%) higher than the five-year (1993/'94-1997/'98) annual average landing and that of previous year respectively (Table 7). The income earned from the fishery during 1998-'99 was Rs.3.1 crores against Rs.2.8 crores in the previous year (Tables 8 and 9). Overall, the indigenous gear fishery during the 'fish famine' year 1998-'99 was better than the preceding five years.

Day trawl landings

About 440 trawlers (<12.8 m) are engaged in single-day trawling operations during September-May period. These vessels make 2-3 hauls starting from early morning until noon every day and land their catches in the afternoon/and evening. The annual production during the five-year period 1993/'94-1997/'98 varied from 2,046 t ('95-'96) to 6,640 t ('97-'98) with an average of 4,273 t at a cpue of 228 kg (Table 7). During 1998-'99 the annual production was estimated at 4,884 (cpue 256 kg) which is 14.3% (611 t) higher than the average annual landing for the five year period. However, as compared to previous year's (1997-'98) landing of 6,640 t (cpue 332 kg) there was a decline of 1,756 t (26.4%). The effort of 19,026 units in 1998-'99 was 1.4% more than the average effort for the five-year period but 4.75% less

than that of the previous year. The cpue also showed similar trend of an increase during 1998-'99 (256 kg) as compared to the average of the five-year (228 kg) but a decline as compared to the preceding year (332 kg).

The single-day trawl production during 1998-'99 was valued at Rs.522.1 lakhs which is Rs. 57.5 lakhs (9.9%) lower than the previous year figure of Rs.579.6 lakhs (Table 8 and 9). The decrease in monetary return during the year was mainly due to reduced production of export varieties like ribbonfish and high value species like croakers. If the income deficit of Rs. 57.5 lakhs is distributed amongst the 440 boats, the income loss works out to Rs.13,068 per boat.

Multiday trawl landings

In the Udupi district multiday trawl fishing is carried out only from MFH. About 250 trawlers of >12.8 m OAL conduct multiday fishing operations upto 100 m depth area. During the five-year period of 1993/'94-1997/'98 the annual landing by these trawlers ranged from 5,271 t (1993-'94) to 30,025 t (1997-'98) with an average of 13,938 t (Table 7). The cpue varied from 1,081 kg ('93-'94) to 3,360 kg ('97-'98) with an average of 1,927 kg. An estimated 14,978 t of fishes were landed during 1998-'99. As compared with the annual average for the five-year period the production during 1998-'99 was higher by 7.5% (1,040 t). But when compared to the preceding year (1997-'98) when the production by the gear attained a peak of 30,025 t, the landing during the year is less by 50.1% (15,047 t) but comparable to that of 1996-'97. The Cpue of 2,273 kg in 1998-'99 was higher than those of the previous four years (1993/'94-1996/'97) but 32.4% (1,087 kg) lower than that of 1997-'98.

Because of high landings in 1997-'98, the fishermen got more monetary benefit. The production was valued at Rs. 4,924.5 lakhs. However, during 1998-'99 the production value has slumped to Rs. 2,405.3 lakhs thereby, regis-

TABLE 10. *Monthwise marine fish production at Malpe Fisheries Harbour by multi-day trawlers during 1993/'94 - 1998/'99*

Year		1993-'94	1994-'95	1995-'96	1996-'97	1997-'98	Average for 5 years	1998-'99	+/- compared to 5 years average	+/- compared to '97/'98	Specieswise decrease (t compared to '97/'98
Apr.	Catch (t)	536	1,659	1,180	1,670	4,224	1,854	1,826	-28	-2,398	Threadfin breams (553), Ribbonfish (670), Cephalopods (428), Carangids (381)
	Effort (unit)	678	940	1,089	1,085	1,112	981	968	-	-	
	C/E (kg)	791	1,765	1,084	1,539	3,799	1,890	1,886	-	-	
May	Catch (t)	158	1,872	977	2,174	7,686	2,573	2,681	108	-5,005	Cephalopods (1523), Ribbonfish (726), Bullseye (661), Carangids (445), Mackerel (204)
	Effort (unit)	394	744	956	1,118	1,273	897	1,178	-	-	
	C/E (kg)	401	2,516	1,022	1,945	6,038	2,868	2,276	-	-	
Jun.	Catch (t)	0	0	0	0	814	163	51	-112	-763	Cephalopods (291), Ribbonfish (166), Carangids (130), Threadfin breams (59)
	Effort (unit)	0	0	0	0	172	34	50	-	-	
	C/E (kg)	0	0	0	0	4,733	4,794	1,020	-	-	
Aug.	Catch (t)	0	0	98	8	0	21	5	-16	5	
	Effort (unit)	0	0	67	15	0	16	3	-	-	
	C/E (kg)	0	0	1,463	533	0	1,313	1,667	-	-	
Sep.	Catch (t)	0	503	1,534	953	2,214	1,041	1,505	464	-709	Cephalopods (602)
	Effort (unit)	0	266	784	535	619	441	396	-	-	
	C/E (kg)	0	1,891	1,957	1,781	3,577	2,361	3,801	-	-	
Oct.	Catch (t)	33	490	403	2,146	2,969	1,208	72	-1,136	-2,897	Ribbonfish (963), Cephalopods (591), Threadfin breams (591), Bullseye (214), Carangids (204), Groupers (129), Lizardfish (86)
	Effort (unit)	225	345	552	921	1,063	621	138	-	-	
	C/E (kg)	147	1,420	730	2,330	2,793	1,945	522	-	-	
Nov.	Catch (t)	514	994	1,553	990	1,233	1,057	2,341	1,284	1,108	
	Effort (unit)	334	840	991	849	808	764	939	-	-	
	C/E (kg)	1,539	1,183	1,567	1,166	1,526	1,384	2,493	-	-	
Dec.	Catch (t)	1,080	1,116	197	1,427	1,444	1,053	335	-718	-1,109	Threadfin breams (271), Cephalopods (112), Bullseye (11), Anchovies (84), Squilla (106), Praws (64)
	Effort (unit)	943	809	420	851	645	734	271	-	-	
	C/E (kg)	1,145	1,379	469	1,677	2,239	1,435	1,236	-	-	
Jan.	Catch (t)	1,336	839	1,327	1,571	2,058	1,426	1,145	-281	-913	Threadfin breams (192), Squilla (162), Lizardfish (114), Ribbonfish (122), Bullseye (83)
	Effort (unit)	924	777	1,131	840	769	888	930	-	-	
	C/E (kg)	1,446	1,080	1,173	1,870	2,676	1,606	1,231	-	-	
Feb.	Catch (t)	479	850	992	1,931	2,588	1,368	1,804	436	-784	Cephalopods (297), Lizardfish (197), Ribbonfish (159), Carangids (99)
	Effort (unit)	635	773	686	915	934	829	702	-	-	
	C/E (kg)	754	1,100	1,120	2,110	2,771	1,650	2,570	-	-	
Mar.	Catch (t)	1,137	972	2,010	1,957	4,795	2,174	3,213	1,039	-1,562	Cephalopods 617, Lizardfish (612), Flatheads (167), Bullseye (163), Carangids (105), Seerfish (72), Praws (67)
	Effort (unit)	745	987	1,044	821	1,541	1,028	1,015	-	-	
	C/E (kg)	1,526	985	1,925	2,384	3,112	2,115	3,166	-	-	
Total	Catch (t)	5,273	9,295	10,271	14,827	30,025	13,938	14,978			
	Effort (unit)	4,878	6,481	7,920	7,950	8,936	7,233	6,590			
	C/E (kg)	7,749	13,319	12,510	17,335	33,264	23,361	21,868			

tering about 50% income loss compared to the previous year (Table 8 and 9). If the loss of Rs.2,519.2 lakhs is shared by the 250 multiday trawl boats, the per boat income loss works out to Rs.10.08 lakhs.

Analysis of monthwise catch and catch rate during the five-year of 1993/'94-1997/'98 shows that during 1998-'99 the catch and catch rate were either comparable or higher in five months (April, May, September, November and March) but poor in four months (October, December, January and February). As compared to the previous year (1997-'98), the monthwise total production and the catch rate were low in all the eight out of nine months of fishing operations except November when the landing has almost doubled (Table 10).

Barring anchovies and threadfin breams, all other resources have shown a decline in 1998-'99 resulting in a monetary loss of Rs.25.2 crores to the multiday trawl fishermen. The low production of export varieties like cuttlefishes, squids and ribbonfishes in almost all months, prawns in April, December and May and high value species like groupers in April and October, lizardfishes in May, October, January, February and March, carangids in April, May, October, January and February, bullseyes in April, May, October, December, January and March seerfishes in March, pomfrets in November and December and mackerel in April, May and December contributed to the income deficit (Table 10). The reduction in income was mainly due to low production of cuttle fishes and squids (Rs. 1789.2 lakhs), ribbonfish (Rs. 371.4 lakhs), prawns (Rs. 118.5 lakhs), mackerel (Rs.61.5 lakhs) lizardfishes (Rs. 40.6 lakhs) and sharks and rays (Rs. 35.3 lakhs).

General remarks

The marine fish landing in Karnataka is marked with annual fluctuations akin to the general catch trends of the country. The production of 1,64,710 t in 1998 is less by 12.3% (23,048 t) compared to 1997 but, higher than

the average production of 1,59,567 t for 1993-'97. Therefore, this marginal decrease in production in 1998 cannot be considered as any fishfamine condition in the marine fishery sector of the state during 1998.

As far as the fishery situation during 1998-'99 in the Udupi district is concerned, the study on the fish landing at the largest landing centre of the district i.e., Malpe Fisheries Harbour shows that the production during 1998-'99 was normal compared to the past several years but, when compared to the previous year (which was one of the two most productive years since the commissioning of the MFH in 1986-'87 with a record landing of 50,558 t), the landing declined by 31.4% (15,897 t). Similar trend was recorded during 1989-'90 and 1990-'91, when the former recorded a high landing of 55,905 t followed by a 40% (22,849 t) decline in the latter year.

The study also reveals that the purse seine fishing by mechanised vessels was better than the previous year in terms of quantity of fish landed but the income earned during 1998-'99 had dropped marginally by 4.2% compared to 1997-'98. While the gillnet fishing by motorised boats and indigenous gear fishing by motorised and non-motorised boats had shown improvement over the previous years, the trawl fisheries by mechanised vessels suffered a serious set back in terms of both total quantity of fish catch and the income earned.

The landing by the single-day trawl declined by 26.4% (1,756 t) in 1998-'99 compared to last year. However, when compared to the average annual landing of the preceding five years, the production was higher by 14.3% (611 t).

For the multiday trawl fisheries, 1997-'98 was the most productive year with 30,025 t compared to the annual average of 13,938 t for 1993/'94-1997/'98. During 1998-'99 the landing of 14,978 t was less by 50.1% (15,047 t) compared to 1997-'98 but 7.5% (1,040 t) higher than that of the five-year average. The cpue in 1998-'99 was also higher than the previous four

years, 1993/'94-1996/'97 but less than that of 1997-'98 by 32.4% (1,087 kg). Compared to 1997-'98 the catch and CPUE declined in all months except November. Specieswise landing also indicated a fall in all resources except anchovies and threadfin breams.

Economic loss to the fishery sector

During 1998-'99, the marine fishery sector at MFH has incurred a loss of Rs. 2,537 lakhs compared to the previous year (Table 11). Though the purse seine fish landing (379 t) increased marginally by 3% compared to 1997-'98, the boat owners (85 Nos.) suffered an economic loss of Rs. 68.9 lakhs (Rs.0.8 lakhs/boat) due to reduced availability of high value species like mackerel and oil sardine.

The gillnetters (motorised canoes) and indigenous gear operators (motorised and non-motorised canoes) landed better catches and gained a profit of Rs. 79.4 lakhs and 26.4 lakhs respectively (Table 11).

As the landing by single-day trawlers (440 Nos.) fell short of 26.4% (1,756 t) they incurred a loss of Rs. 57.5 lakhs (Rs.13,070/boat) (Table 11).

Among the different sectors, the multiday trawl fishery sector was the worst affected during the year. The production by 250 trawlers fell short of 15,047 t (50.1%) and incurred heavy losses to the tune of Rs. 2,519.2 lakhs (99.3% of total income loss at MFH during 1998-'99) (Table 11). The loss to individual boat works out to a whopping Rs.10.08 lakhs. This enormous loss had led the fishermen to self-declare 1998-'99 as fish famine year.

Conclusion

Short-term, long-term and cyclic fluctuations in marine fish landings are common features and are governed by a complex of biotic and abiotic factors and the exact causes for these variations are largely unknown. Therefore, the decrease of 12.8 and 31.4% in the marine fish landings of the state and Udupi district with reference to Malpe Fisheries Harbour respectively during 1998-'99 can be treated as one such short-term fluctuations and hence, the year cannot be considered as fish famine affected, not withstanding devastating loss of Rs. 25.4 crores to the marine fishery sector of Udupi district.