

PROCEEDINGS OF THE SYMPOSIUM
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LIVING RESOURCES
of
THE SEAS AROUND INDIA



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SOME CHARACTERISTICS OF MARINE FISH PRODUCTION IN INDIA

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ABSTRACT

India produces annually about 0.7 million tonnes of marine fish. Total production figures as well as landings from individual fisheries vary widely over years. At the present time when increasing effort is being put in to produce higher yields a study of these figures assumes importance for a proper understanding of the resources of important fisheries. The quarterwise catch figures of important fishes have been studied and indices showing their seasonal and regional occurrence have been constructed and discussed.

INTRODUCTION

INDIA has a coast line of over 5,500 km. with over 1,200 landing centres scattered over it. Fishing is carried out by about 2,29,000 active fishermen with over 90,000 crafts almost throughout the year though the intensity of fishing varies in different seasons. While India catches about 0.7 million tonnes of fish a year, the total catch as well as species composition fluctuates a great deal over different months of the year and different maritime states of India. The purpose of this paper is to study this fluctuation and to see how landings are distributed over time and space. With this in view, the total catch as well as yields from different fisheries during the decade 1958 to 1967 by indigenous boats both mechanised and non-mechanised has been analysed. These figures, however, do not include catch from the offshore region and the union territories of Andaman, Goa and Laccadive islands, which comes to about 2% of total marine fish production in India. To study the variation over time a calendar year has been divided into four quarters and for analysing the distribution over space the each maritime state has been taken as a unit. West Bengal and Orissa have, however, been taken as one unit.

Total Catch

It is seen from the Appendix that during the last decade (1958-67) a considerable variation exists in respect of total marine fish production in India. It ranges from 870 thousand tonnes in 1960 to 579 thousand tonnes in 1959. It averages to 751 thousand tonnes. The coefficient of variation works out to 14.41%. The coefficient of variation can be taken as the index of intensity of fluctuation. While the total landings are composed of landings in the different quarters of the year, the quarterly landings also show a great variation over different years. Table I gives the average quarterly landings in tonnes and the intensity of fluctuation for different maritime states of India.

Table I shows that among the first three quarters of the year the average production varies between 113 thousand tonnes to 175 thousand tonnes, while during the period October to December it rises to 325 thousand tonnes. The intensity of fluctuation is about 18% in each of the first three quarters and in the fourth quarter it goes up to 25%. The intensity of fluctuation varies a great deal over the different maritime states of India. Gujarat with the average yield of 89 thousand tonnes records the highest coefficient of variation. During the period April to June the landings in Gujarat show the highest fluctuation. On the other hand Maharashtra shows the least fluctuation. The average catch in this state comes to 129 thousand tonnes. In Kerala where the average yield is about 284 thousand tonnes, the greatest fluctuation (43%) occurs during January to March, while in other three quarters the intensity of fluctuation is almost the same (36-37%). In West Bengal and Orissa the intensity of fluctuation records the highest point during October to December, in Madras and Mysore it occurs during July to September. The coefficient of variation does not, however, vary to any great extent in Andhra over the four quarters of the year.

TABLE I

Quarterly marine fish landings in tonnes and the intensity of fluctuation in percentage (shown in brackets)

States/Quarters	I	II	III	IV	Total
West Bengal and Orissa ..	3,061 (41·51)	1,350 (76·80)	1,029 (64·78)	4,126 (80·34)	9,566 (43·86)
Andhra ..	21,572 (38·46)	13,552 (41·77)	11,924 (36·76)	12,737 (33·73)	59,785 (30·61)
Madras ..	26,949 (34·07)	26,128 (21·91)	39,591 (80·86)	26,342 (15·19)	119,010 (11·94)
Kerala ..	65,841 (43·28)	29,529 (36·76)	69,012 (36·84)	119,833 (35·97)	284,215 (23·55)
Mysore ..	9,551 (65·70)	1,273 (37·95)	4,940 (68·44)	44,794 (59·75)	60,558 (45·08)
Maharashtra ..	28,311 (24·47)	31,815 (28·03)	8,359 (38·34)	60,734 (9·05)	129,219 (7·32)
Gujarat ..	19,446 (31·35)	9,331 (65·88)	3,772 (32·59)	56,111 (33·93)	88,660 (55·76)
All-India ..	174,731 (17·99)	112,978 (17·68)	138,627 (18·52)	324,677 (24·80)	751,013 (14·41)

In order to study the distribution of landings over different quarters of the year, it is necessary to construct seasonal indices for different maritime states and for India as a whole. On equating the total of quarterly averages to 400, the seasonal indices are worked out and shown in Table II.

TABLE II

Seasonal indices of landings in different maritime States of India

States/Quarters	I	II	III	IV	Total
West Bengal and Orissa ..	127·98	56·43	43·03	172·55	400
Andhra ..	144·33	90·67	79·78	85·22	400
Madras ..	90·58	87·82	133·07	88·54	400
Kerala ..	92·66	41·56	97·13	168·65	400
Mysore ..	63·09	8·41	32·63	295·87	400
Maharashtra ..	87·64	98·48	25·87	188·00	400
Gujarat ..	87·73	42·10	17·02	253·15	400
All-India ..	93·06	60·17	73·83	172·93	400

In respect of all-India landings as well as the catches in the maritime states on the west coast of India and in West Bengal and Orissa, the highest index is attained during October to December. In Andhra the index attains its peak in the first quarter whereas in Madras the highest index is

attained during the period July to September. All-India yield is at its lowest during the second quarter which is also the lean period for Madras, Kerala and Mysore states. The index reaches its lowest point in Maharashtra, Gujarat and West Bengal and Orissa in the months of July to September.

Now to study the distribution of catch over space it is necessary to construct the regional indices of quarterly and annual landings. These indices are constructed by equating the total of regional average landings to 700.

It is seen from Table III that in respect of annual production the highest index is recorded in Kerala. It is followed in descending order by Maharashtra, Madras, Gujarat, Mysore, Andhra and West Bengal and Orissa. But the same pattern is not maintained in case of quarterly landings. While during all the quarters excepting the second quarter, the index attains its highest in Kerala, during the second quarter it reaches the peak in Maharashtra.

TABLE III
Regional indices of quarterly and annual landings

Quarters/Regions	West Bengal and Orissa	Andhra	Madras	Kerala	Mysore	Maha-rashtra	Gujarat	Total
I	12.26	86.42	107.96	263.77	38.26	113.42	77.91	700
II	8.36	83.97	161.89	182.96	7.88	197.12	57.82	700
III	5.20	60.21	199.21	348.48	24.94	42.21	19.05	700
IV	8.90	27.46	56.79	258.36	96.58	130.94	120.97	700
Annual	8.92	55.72	110.97	264.91	56.40	120.44	82.64	700

As the total catch is composed of different species, it is necessary to study how landings from different fisheries vary in time and space. For this purpose the important fisheries like oil sardine, *Harpodon nehereus*, crustaceans, mackerel, which constitute about 53% of total landings, have been analysed separately, the rest having been treated together.

Oil Sardine

It forms 23.44% of the total marine fish production in India. Landings of this fish fluctuate very widely, from 274 thousand tonnes in 1964 to 64 thousand tonnes in 1963. The average yield works out to 176 thousand tonnes with the coefficient of variation of 46.11%. Table IV gives the average quarterly landings of oil sardine in tonnes along with the intensity of fluctuation for different maritime states of India.

The oil sardine fishery recorded the landings of 96 thousand tonnes during the period October to December. Landings in other quarters range from 10 thousand to 49 thousand tonnes. The intensity of fluctuation is quite high in all the quarters. It is the highest (82%) during July to September and the lowest (56%) during January to March. In Kerala the average contribution from this fishery works out to 153 thousand tonnes. Among the maritime states the intensity of fluctuation is the least in Kerala. Oil sardine fishery in Kerala shows the least fluctuation during January to March and the greatest fluctuation occurs during April to June. In Mysore where the average landings of oil sardine come to 21 thousand tonnes, the annual landings vary a great deal in course of the last decade. In other maritime states the intensity of fluctuation is rather

TABLE IV

Quarterly landings of oil sardine in tonnes and intensity of fluctuation in percentage (shown in brackets)

States/Quarters	I	II	III	IV	Total
West Bengal and Orissa ..	..	..	..	..	..
Andhra ..	19 (316·21)	9 (225·58)	79 (316·22)	7 (316·23)	114 (297·86)
Madras ..	25 (213·33)	5 (207·20)	4 (296·37)	4 (763·46)	38 (145·70)
Kerala ..	46,249 (18·43)	9,712 (70·35)	21,335 (26·70)	75,792 (63·72)	153,088 (42·72)
Mysore ..	2,435 (153·87)	49 (118·61)	379 (254·97)	18,406 (140·50)	21,269 (127·75)
Maharashtra ..	25 (245·47)	1 (316·23)	36 (958·22)	1,394 (140·27)	1,456 (130·56)
Gujarat ..	..	..	..	4 (283·21)	4 (283·21)
All-India ..	48,753 (56·19)	9,776 (69·17)	21,833 (82·43)	95,607 (65·85)	175,969 (46·11)

too high showing the inconsistency in the quantity of landings of this fish. Table V shows the seasonal indices of landings of oil sardine in different maritime states and in India as a whole.

TABLE V

Seasonal indices of landings of oil sardine

States/Quarters	I	II	III	IV	Total
West Bengal and Orissa ..	..	..	..	..	..
Andhra ..	65·91	31·90	276·60	25·59	400
Madras ..	264·23	56·40	36·55	42·82	400
Kerala ..	120·84	25·38	55·75	198·04	400
Mysore ..	45·80	0·92	7·13	346·16	400
Maharashtra ..	6·79	0·22	10·06	382·93	400
Gujarat ..	..	..	..	400·00	400
All-India ..	110·82	22·22	49·63	217·33	400

In respect of total all-India landings of oil sardine, the highest index (217) is attained during the period October to December. It is followed by the figure (111) in January to March. The same pattern is also reflected in oil sardine fishery in Kerala. In Mysore and Maharashtra almost the entire catch is landed during October to December. In Madras the index reaches the highest point (264) during the first quarter while in Andhra it reaches the peak during the third quarter.

Now we study the distribution of landings of oil sardine among the different maritime states of India.

Table VI reveals that in respect of annual landings of oil sardine the index is the highest (609) in Kerala. The second highest occurs in Mysore. The quarterly landings also reflect the same pattern of regional indices.

TABLE VI
Regional indices of quarterly and annual landings of oil sardine

Quarters/Regions	West Bengal and Orissa	Andhra	Madras	Kerala	Mysore	Maha-rashtra	Gujarat	Total
I	..	0.27	0.36	664.05	34.96	0.36	..	700 ₁
II	..	0.65	0.39	695.40	3.50	0.06	..	700
III	..	2.53	0.11	684.04	12.15	1.17	..	700
IV	..	0.05	0.03	554.92	134.76	10.20	0.04	700
Annual	..	0.45	0.15	608.98	84.61	5.79	0.02	700

Harpodon nehereus:

It forms 10.79% of the total marine fish production in India. The yield from this fishery ranges from 109 thousand tonnes in 1960 to 57 thousand tonnes in 1959. The average landings of *Harpodon nehereus* comes to about 81 thousand tonnes. The intensity of fluctuation over the last ten years is 18.20%.

TABLE VII
Quarterly landings of Harpodon nehereus in tonnes and the intensity of fluctuation in percentage (shown in brackets)

States/Quarters	I	II	III	IV	Total
West Bengal and Orissa ..	58 (82.33)	25 (199.34)	29 (100.32)	197 (54.92)	309 (110.61)
Andhra ..	170 (201.66)	14 (134.84)	72 (66.32)	323 (185.29)	579 (41.94)
Madras ..	8 (201.19)	2 (260.34)	2 (191.29)	1 (228.58)	13 (183.28)
Kerala ..	(..)	(..)	(..)	(..)	(..)
Mysore ..	(..)	(..)	3 (226.49)	(..)	3 (226.49)
Maharashtra ..	3,517 (36.09)	5,819 (37.82)	2,957 (47.84)	15,741 (24.16)	28,034 (17.55)
Gujarat ..	10,359 (78.97)	1,766 (102.70)	893 (98.11)	39,052 (45.59)	52,070 (31.29)
All-India ..	14,112 (53.80)	7,626 (40.16)	3,956 (51.97)	55,314 (31.51)	81,008 (18.20)

Table VII reveals that about 55 thousand tonnes of *Harpodon nehereus* is landed during the period October to December. The intensity of fluctuation is also the least during this period as compared to other quarters of the year. Annual production of this fish in Gujarat and Maharashtra is 52 thousand and 28 thousand tonnes respectively, but the intensity of fluctuation is higher in Gujarat (31%) than in Maharashtra. The fishery of *Harpodon nehereus* in Gujarat shows the maximum fluctuation during April to June while in Maharashtra intensity of fluctuation is the highest during July to September. The contribution of this fishery in Andhra though small in quantity is quite consistent over the last ten years.

TABLE VIII
Seasonal indices of Landings of *Harpodon nehereus*

States/Quarters	I	II	III	IV	Total
West Bengal and Orissa ..	75.47	32.10	37.15	255.28	400
Andhra ..	117.66	9.26	49.78	223.30	400
Madras ..	253.44	54.96	58.02	33.59	400
Kerala ..	..	..	..	..	..
Mysore ..	..	..	400.00	..	400
Maharashtra ..	50.19	83.03	42.18	224.60	400
Gujarat ..	79.58	13.57	6.86	299.99	400
All-India ..	69.69	37.65	19.52	273.14	400

It is seen from Table VIII that in respect of the total landings of *Harpodon nehereus* the index reaches the highest point of 273 during October to December. This is followed by the index in the first quarter which comes to only 70. The fishery of *Harpodon nehereus* in Maharashtra, Gujarat, Andhra and West Bengal and Orissa reflects more or less the same pattern. In Madras state the index reaches the highest point during the first quarter of the year.

TABLE IX
Regional indices of landings of *Harpodon nehereus*

Quarters/Regions	West Bengal and Orissa	Andhra	Madras	Kerala	Mysore	Maharashtra	Gujarat	Total
I	2.89	8.44	0.41	..	..	174.45	513.81	700
II	2.28	1.23	0.17	..	..	534.20	162.12	700
III	5.08	12.75	0.34	..	0.44	523.38	158.01	700
IV	2.50	4.09	0.01	..	..	199.20	494.20	700
Annual	2.67	5.00	0.11	..	0.02	242.25	449.95	700

Table IX reveals that the regional index for the annual landings of *Harpodon nehereus* reaches the highest point (450) in Gujarat state. This is followed by the figure (242) in Maharashtra,

The landings of this fish during the period January to March and October to December exhibit the same pattern. During the second and third quarters the highest index is recorded in Maharashtra. This is followed by the figure in Gujarat.

Crustaceans:

This group constitutes 10.79% of the total marine fish production in India. In the course of the last 10 years the yield from this group varies from 99 thousand tonnes in 1964 to 64 thousand tonnes in 1961. The average landings work out to be 81 thousand tonnes with the intensity of fluctuation of 13.99%.

TABLE X

Quarterly landings of crustaceans in tonnes and the intensity of fluctuation in percentage (shown in brackets)

States/Quarters	I	II	III	IV	Total
West Bengal and Orissa ..	608 (84.93)	246 (256.49)	196 (65.37)	1,390 (148.61)	2,440 (88.94)
Andhra ..	542 (81.32)	1,161 (79.13)	2,285 (74.52)	592 (87.26)	4,580 (40.13)
Madras ..	1,442 (67.01)	1,110 (99.12)	1,448 (66.72)	1,289 (63.87)	5,289 (55.70)
Kerala ..	1,694 (62.53)	4,162 (57.53)	11,213 (41.74)	3,725 (91.74)	20,794 (35.03)
Mysore ..	100 (73.22)	51 (72.15)	388 (77.41)	313 (121.48)	852 (86.60)
Maharashtra ..	10,691 (17.11)	15,929 (27.03)	1,581 (53.34)	12,272 (38.04)	40,473 (14.93)
Gujarat ..	1,717 (134.64)	1,932 (191.28)	227 (185.80)	2,584 (61.04)	6,460 (99.33)
All-India ..	16,794 (13.11)	24,591 (23.96)	17,338 (33.64)	22,165 (21.98)	80,888 (13.99)

Table X reveals that 25 thousand tonnes of crustaceans are landed during the period April to June. In other quarters it ranges between 17 and 22 thousand tonnes. The intensity of fluctuation is the highest during July to September, while it reaches the lowest point during January to March. Among the maritime states the intensity of fluctuation of landings of crustaceans is the highest in Gujarat where the annual catch comes to about 6 thousand tonnes. It is the least in Maharashtra which records crustacean catch of about 40 thousand tonnes annually. In Kerala the average yield from crustacean fishery comes to 21 thousand tonnes with the coefficient of variation of 35%. A more consistent landing of crustaceans is noticed in Kerala during July to September as compared to other quarters of the year. The intensity of fluctuation ranges from 40% to 89% in other maritime states of India.

It is seen from Table XI that in respect of all-India landings of crustaceans the seasonal indices do not vary to any great extent in the different quarters of the year. In Gujarat and West Bengal and Orissa the index reaches the highest point during October to December. The index registers the highest point in Maharashtra during April to June, while in Kerala, Madras, Mysore and Andhra the maximum index is attained during July to September. The seasonal indices, however, do not vary widely in Madras.

TABLE XI
Seasonal indices of landings of crustaceans

States/Quarters	I	II	III	IV	Total
West Bengal and Orissa ..	99.66	40.42	32.09	227.83	400
Andhra ..	47.32	101.42	199.57	51.69	400
Madras ..	109.05	83.96	109.51	97.49	400
Kerala ..	32.58	80.06	215.69	71.67	400
Mysore ..	47.21	23.81	182.10	146.88	400
Maharashtra ..	105.66	157.43	15.62	121.29	400
Gujarat ..	106.32	119.60	14.05	160.03	400
All-India ..	83.05	121.61	85.73	109.61	400

TABLE XII
Regional indices of landings of crustaceans

Quarters/Regions	West Bengal and Orissa	Andhra	Madras	Kerala	Mysore	Maha-rashtra	Gujarat	Total
I	25.34	22.58	60.10	70.60	4.19	445.62	71.57	700
II	7.02	33.06	31.60	118.48	1.44	453.42	54.98	700
III	7.91	92.26	58.46	452.72	15.65	63.84	9.16	700
IV	43.90	18.69	40.70	117.64	9.88	387.57	81.62	700
Annual	21.12	39.64	45.77	179.95	7.37	350.26	55.90	700

Table XII reveals that the regional index in respect of annual landings of crustaceans reaches the highest point (350) in Maharashtra. This is followed by the figure (180) in Kerala. The yields from this group during the fourth and the second quarter of the year exhibit the same pattern. During July to September the regional index is the highest in Kerala, the second highest point being recorded in Andhra. During January to March the highest index is attained in Maharashtra followed by the figure in Gujarat and Kerala.

Mackerel

Mackerel comprises 7.59% of the total marine fish production in India. During the last 10 years the yield of this fish ranges from 134 thousand tonnes in 1960 to 22 thousand tonnes in 1966. The average landings of mackerel during the same period comes to 57 thousand tonnes. The intensity of fluctuation is as high as 73.16%.

Table XIII shows that about 36 thousand tonnes of mackerel are landed during the period October to December, with the intensity of fluctuation of 104%. The maximum fluctuation, 121%, takes place during July to September. The average landings of this fish in Kerala and Mysore range between 24 thousand and 26 thousand tonnes. In both the states the highest intensity of fluctuation is recorded during July to September. The contribution of this fishery in different states is very inconsistent over different years.

TABLE XIII

Quarterly landings of mackerel in tonnes and the intensity of fluctuation in percentage (shown in brackets)

<i>States Quarters</i>	I	II	III	IV	Total
West Bengal and Orissa ..	64 (168·26)	5 (88·94)	1 (316·23)	27 (63·92)	97 (165·36)
Andhra ..	573 (122·05)	359 (143·68)	34 (104·96)	405 (127·63)	1,371 (61·51)
Madras ..	547 (155·44)	629 (111·05)	819 (189·20)	319 (151·46)	2,314 (73·59)
Kerala ..	6,293 (85·10)	1,584 (126·98)	3,530 (142·75)	12,541 (94·37)	23,948 (71·91)
Mysore ..	5,115 (132·11)	125 (252·55)	222 (285·81)	20,735 (119·96)	26,197 (100·66)
Maharashtra ..	806 (232·09)	1 (141·42)	1 (175·00)	2,247 (168·68)	3,055 (126·76)
Gujarat ..	.. (..)	.. (..)	.. (..)	2 (301·88)	2 (301·88)
All-India ..	13,398 (93·76)	2,703 (67·65)	4,607 (121·19)	36,276 (103·66)	56,984 (73·16)

It is seen from Table XIV that in respect of all-India landings of mackerel the seasonal index reaches the highest point during October to December. This is followed by the index in the period January to March. In respect of landings of mackerel in Maharashtra, Mysore and Kerala the same pattern as the all-India landings is reflected. Mackerel fishery in east coast, however, shows a different picture. In Madras the highest index is recorded during July to September. The second highest index occurs during April to June. In Andhra, West Bengal and Orissa the highest point is reached during January to March followed by the figure in the fourth quarter of the year.

TABLE XIV

Seasonal indices of landings of mackerel

<i>States/Quarters</i>	I	II	III	IV	Total
West Bengal and Orissa ..	264·74	20·21	4·12	110·93	400
Andhra ..	167·15	104·86	9·95	118·04	400
Madras ..	94·50	108·83	141·54	55·13	400
Kerala ..	105·11	26·45	58·96	209·48	400
Mysore ..	78·10	1·91	3·38	316·61	400
Maharashtra ..	105·64	0·07	0·05	294·24	400
Gujarat ..	..	..	..	400·00	400
All-India ..	94·05	18·98	32·33	254·64	400

It is seen from Table XV that the regional index for annual landings of mackerel comes to 322 in Mysore followed by 294 in Kerala. The landings of mackerel in the fourth quarter also follow the same pattern. During the other quarters of the year the index reaches the highest point in Kerala.

TABLE XV
Regional indices of quarterly and annual landings of mackerel

Quarters/Regions	West Bengal and Orissa	Andhra	Madras	Kerala	Mysore	Maha-rashtra	Gujarat	Total
I	3.35	29.93	28.56	328.77	267.24	42.15	..	700
II	1.27	93.06	163.03	410.09	32.42	0.13	..	700
III	0.15	5.18	124.45	536.51	33.64	0.07	..	700
IV	0.52	7.81	6.15	242.01	400.11	43.36	0.04	700
Annual	1.19	16.84	28.43	294.18	321.81	37.52	0.03	700

Other Fishes

It is now necessary to study how yield from other fishes behaves. This figure includes landings of all fishes excepting oil sardine, *Harpodon nehereus*, crustaceans and mackerel, landings of which have been analysed above. This group forms 47.39% of the total marine fish production in India. During the last decade the contribution from these fisheries ranges from 421 thousand tonnes in 1966 to 315 thousand tonnes in 1961. The average yield comes to 356 thousand tonnes with the coefficient of variation of 9.36%.

It is seen from Table XVI that the average yield from this group comes to about 115 thousand tonnes during the period October to December, while in other quarters it ranges from 68 to

TABLE XVI
Quarterly landings of "other fishes" in tonnes and the intensity of fluctuation in percentage (shown in bracket)

States/Quarters	I	II	III	IV	Total
West Bengal and Orissa	.. 2,330 (45.46)	1,073 (52.88)	804 (52.48)	2,512 (46.91)	6,719 (30.62)
Andhra	.. 20,268 (39.68)	12,009 (42.46)	9,454 (46.03)	11,410 (35.83)	53,141 (32.58)
Madras	.. 24,927 (32.40)	24,381 (20.39)	37,319 (25.23)	24,729 (13.07)	111,356 (10.36)
Kerala	.. 11,605 (32.79)	14,071 (44.12)	32,935 (33.15)	27,775 (114.48)	86,386 (21.13)
Mysore	.. 1,900 (38.83)	1,048 (77.93)	3,950 (79.58)	5,340 (56.55)	12,238 (32.41)
Maharashtra	.. 13,272 (30.77)	10,066 (40.13)	3,784 (49.52)	29,080 (16.09)	56,202 (15.95)
Gujarat	.. 7,369 (43.95)	5,634 (48.21)	2,653 (35.77)	14,468 (50.08)	30,124 (24.42)
All-India	.. 81,671 (17.96)	68,282 (22.97)	90,899 (27.21)	115,314 (10.92)	356,166 (9.36)

91 thousand tonnes. The intensity of fluctuation is also the least during October to December. The fluctuation of landings of this group is, in general, low in all the maritime states of India. In Madras the average landings work out to 111 thousand tonnes, with the coefficient of variation of 10.36%. In different quarters, here, the intensity of fluctuation ranges from 13% to 32%. It is interesting to note that in Kerala the contribution from these fisheries during October to December is very inconsistent and shows the coefficient of variation of 114%.

TABLE XVII
Seasonal indices of landings of 'Other fishes'

States/Quarters	I	II	III	IV	Total
West Bengal and Orissa ..	138.71	63.89	47.83	149.57	400
Andhra ..	152.66	90.39	71.16	85.89	400
Madras ..	89.54	87.88	134.05	88.83	400
Kerala ..	53.73	65.15	162.50	128.62	400
Mysore ..	62.11	34.25	129.09	174.55	400
Maharashtra ..	94.46	71.64	26.93	206.97	400
Gujarat ..	97.85	74.81	35.22	192.12	400
All-India ..	91.72	76.69	102.08	129.51	400

Table XVII reveals that in respect of all-India landings of these fishes the quarterly indices range from 77 to 130, the highest being obtained during October to December. Similarly, in Gujarat, Maharashtra, Mysore and West Bengal and Orissa the highest index is seen during October to December. In Kerala and Madras the highest point occurs during July to September, while in Andhra it takes place during January to March.

TABLE XVIII
Regional indices of landings of 'Other Fishes'

Quarters/Regions	West Bengal and Orissa	Andhra	Madras	Kerala	Mysore	Maha-rashtra	Gujarat	Total
I	19.97	173.71	213.65	99.47	16.29	113.75	63.16	700
II	11.00	123.11	249.95	144.25	10.74	103.19	57.76	700
III	6.19	72.81	287.39	253.63	30.42	29.14	20.42	700
IV	15.25	69.26	150.11	168.60	32.42	176.53	87.83	700
Annual	13.42	106.14	222.41	172.54	24.44	112.25	48.80	700

It is seen from Table XVIII that the regional index for annual landings of "other fishes" is the highest in Madras. This is followed in descending order by the figures recorded in Kerala, Maharashtra, Andhra, Gujarat, Mysore and West Bengal and Orissa. In respect of quarterly landings also Madras shows the highest index during first, second and the third quarter of the year. During October to December the regional index for this group reaches the highest point in Maharashtra.

DISCUSSION

The foregoing analysis shows that out of the total annual landings of 751 thousand tonnes, 314 thousand tonnes, 42% of the total, exhibit a wide variation from year to year. This quantity of 314 thousand tonnes is contributed by oil sardine, Bombay duck and mackerel showing the individual intensity of fluctuation as 46%, 18% and 73% respectively. Naturally it follows that if fluctuations in these fisheries can be controlled, total landings will lead to a stable figure. The intensity of fluctuation in respect of crustaceans and "other fishes" is quite low, implying a comparatively consistent contribution from these fisheries year after year. Again, all the quarters of the year are not equally productive. The highest landings take place during the period October to December when contribution from the oil sardine, *Harpodon nehereus*, and mackerel is also the highest. Thus the success or failure of these fisheries during the fourth quarter of the year is the great determinant factor of the total marine fish production in India. It is, however, quite interesting to note that the pattern of seasonal abundance of different fisheries in different regions does not in general coincide with that at all-India level. The oil sardine fishery showing the regional index of 609 at Kerala records the highest seasonal index (217) during October to December. But in Andhra and Madras for which regional indices are small, the seasonal index reaches the highest point during July to September and January to March respectively. Similarly, Bombay duck fishery records the highest seasonal index (273) during October to December with the highest regional index of 450 in Gujarat. But in Madras and Mysore where again the regional indices are very small, the seasonal index reaches the highest point during January to March and July to September respectively. Mackerel fishery also records the highest seasonal index (255) during October to December, the highest regional index of 322 being attained in Mysore followed by the figure (294) in Kerala. But in Madras and Andhra for which the regional indices are 28 and 17 respectively, the seasonal index reaches the highest point during July to September and January to March. The crustacean fishery records the highest seasonal index (122) during April to June with the maximum regional index 350 in Maharashtra. But in Kerala, Madras and Andhra with their respective regional indices as 180, 46, and 40, the highest seasonal index is reached during July to September. The all-India landings from "other fishes" record the highest seasonal index (130) during the fourth quarter of the year, the highest regional index is recorded in Madras. In Andhra and Kerala, with regional indices of 106 and 173, the seasonal index reaches the maximum point during January to March and July to September respectively. As regards landings of these fishes in Madras itself, the highest catch is recorded during July to September.

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