

**OBSERVATIONS ON MACKEREL FISHERY
AT KARWAR FOR THE SEASONS
1954-55 AND 1955-56**

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INTRODUCTION

It has been pointed out (Panikkar, 1956), that the mackerel and the sardines together support a fishing industry of very high magnitude, employing several thousands of people, and unexpected large-scale fluctuations are a serious handicap to the full utilization of the fisheries. An exceptionally poor yield of mackerel was noted during the last two seasons. During the 1954-55 and 1955-56 seasons the total catches dwindled to 951.2 and 508.3 tons respectively from the high peak of 2,250 tons in 1951-52. Thus the mackerel fishery which has been considered the mainstay of Karwar fishery dwindled to a mere shadow of its former flourishing state in the last two years.

The programme of mackerel work hitherto carried out at Karwar, was altered during the 1955-56 season, with more emphasis laid on the intensive collection of data on the length-frequency distribution, and on mackerel landings at important fishing centres like Majali, Binge, Chendia, Ankola Kumta, Honavar and Bhatkal on the North Kanara Coast. Weekly observations were made at these selected centres, the data being collected throughout the season for comparative study. The magnitude of the mackerel fishery at a particular place and its fluctuations from year to year could ofcourse be gauged very well from the records if they were maintained continuously over a number of years.

During the past seven years considerable data on the biology and fishery of the Indian Mackerel—*Rastrelliger canagurta* (Cuv.) have been collected at Karwar and summarized by Pradhan (1956). The weekly observations at the selected centres were made in 1955-56 season in collaboration with Sarvashri L. B. Pradhan, S. V. Bapat and S. Ramamurthy and the assistance rendered by them is gratefully acknowledged. Special thanks are due to Shri L. B. Pradhan who directed the Mackerel Research Programme at Karwar from 1947 to 1956 and to Dr. N. K. Panikkar, the Chief Research Officer, Central Marine Fisheries Research Station for going through the manuscript and suggesting improvements.

GENERAL TREND OF FISHERY AT KARWAR

The mackerel season at Karwar and all along the North Kanara Coast is usually from October to February, and at times extends to March. During the season the fishing operations which are conducted by *Rampan* nets are restricted to a narrow strip of inshore coastal water almost one and a half mile wide. The mode of operation of the *Rampan* net, and the types of boats and nets used in the fishery have been described by Pradhan (1956).

The mackerel season for the year 1954-55 commenced late owing to the prolonged rainy season. The first *Rampan* operation at Karwar was on 4-11-1954 when about 2,00,000 mackerel were recorded as netted. The intensity of fishing was at its highest during the second and third weeks of November 1954, when on the same day, 3 to 4 *Rampan* nets were plied. Frequent breaks were noted in the fishing activity during the months of December and January 1955. From January onwards, the mackerel fishery was completely eclipsed by the oil-sardine fishery. The season ended by about the third week of February.

The mackerel fishery for the 1955-56 season was a complete failure throughout the Kanara Coast, except at Honavar, where the season could be termed good, after comparison with the last few years' catch statistics. One interesting feature during the season was the occurrence of the red-water phenomenon in October-November at Karwar. This was also reported from other fishing centres. There are many published accounts dealing with 'red', 'yellow' and 'pink' discolouration of the seawater caused by the occurrence of swarms of micro-organisms, particularly members of the *Dinophyceae* (Hayes and Austin, 1951). Some of these organisms are known to affect the fishery adversely. Probably this phenomenon might have affected the 1955-56 fishery. Further work on this aspect is in progress at this unit.

The mackerel season of the year 1955-56 commenced at all places in Kanara Coast in October 1955—earlier than the previous season. The season started very well and the catches were very promising. November and December, which are considered to be the best months for the mackerel fishery were comparatively poor this season. The first *Rampan* operation at Karwar was on 24-9-1955, when about 17,500 mackerel together with miscellaneous fishes of small sizes were caught. The catches of mackerel improved towards the end of November 1955, but later on, the fishery dwindled considerably. The last *Rampan* operation at Karwar was on 28-3-1956 when about 57,000 mackerel were caught,

During November and December of the 1954-55 season, jellyfishes were caught in large numbers along with mackerel. Lucas and Henderson (1936) studied the correlation between the jellyfish and herring. The association between certain species of Carangids and jellyfish is well known, and such an association has already been reported by Panikkar and Prasad (1952). The abundant occurrence of the jellyfish at the beginning of the season is considered by the local fishermen to be an indication of a poor fishery to come. During the 1955-56 season this phenomenon was not observed. The meagre data collected at Karwar do not warrant the putting forward of any explanation at this stage, and a great deal of evidence has yet to be collected before any positive conclusion can be advanced.

CATCH PER UNIT EFFORT OF FISHING

The total numbers of *Rampanis* operated at Karwar for the 1954-55 and 1955-56 seasons were 97 and 88 respectively. The total quantity of mackerel caught, number of hauls, catch per unit of effort and the relative intensity of fishing for each month during the two seasons are shown in Table I. It may be stated that the total number of pieces of the *Rampan*

TABLE I

Unit effort of fishing during the seasons 1954-55 and 1955-56

Months	No. of Mackerel caught	No. of hauls	Catch per unit	Relative intensity
1954-55 season				
November	86,92,000	35	452	1923.0
December	18,01,000	19	126	14293.6
January	68,720	28	5	13644.4
February	92,200	15	12.6	7683.3
1955-56 season				
October	24,14,000	7	389.3	6205.6
November	14,60,600	20	132.1	11064.3
December	8,56,900	21	69.8	12417.9
January	7,60,200	10	69.9	11017.4
February	38,600	10	6.3	6433.2
March	1,62,800	10	33.5	4933.3

net operated and the number of hauls for the 1955-56 season were comparatively fewer. Viewing the table, as a whole, we see that the maximum number of mackerel per piece were obtained only in the beginning in both the seasons, *i.e.*, October for the 1955-56 season and November for the 1954-55. Later months show a decrease in the catch per unit. The minimum recorded for the 1954-55 and 1955-56 seasons were for the months of January 1955 and February 1956 respectively. We also notice a secondary peak period in the fishery towards the end of the two seasons. Thus the mackerel season can be classified into three phases, on the basis of catch per unit effort of fishing: (i) peak period of fishing, October-November, (ii) slack fishing activity, December-January and (iii) secondary peak period, February-March.

SIZE-RANGE OF MACKEREL

No true understanding of the mackerel fishery or the mackerel population can be reached until the size fluctuations occurring within each fishing season are clearly set forth. The significance of the occurrence of various size-groups during different periods on the west and east coasts of India can be better understood by comparative studies and length-frequency distributions of mackerel, landed on both the coasts. For comparative studies, samples were obtained from Majali, Ankola and Kumta during the 1955-56 season, but no marked differences in the size-ranges were noticed between the samples from the different centres.*

PRICE INDEX OF MACKEREL DURING THE SEASONS

The wholesale and retail price of wet and unprocessed mackerel fluctuates markedly from month to month during the mackerel season according to the law of supply and demand of the commodity. Scarcity of the fish during the 1954-55 season has occasioned a steep rise in the price index. Mackerel, which were quoted at Rs. 10 to 13 per thousand at the beginning of the season were sold at as high a rate as Rs. 40 to 50 per thousand during January and February 1955. The launch owners complained of financial embarrassment, in consequence of the poor supply of mackerel which led to a considerable number of the vessels lying idle at the port.

At the commencement of the 1955-56 season, mackerel were sold to the fish curers at a rate of Rs. 10 per 1,000, and to the fish carrier launches

* An unusually large specimen of mackerel measuring 30.7 cm. total length was obtained from the *Rampan* haul of 14-1-1955.

Two mackerel specimens, slightly differing from the normal ones in body proportions, were obtained from *Rampan* hauls at Kumta on 6-12-1955 and 21-12-1955 respectively. They are being dealt with elsewhere.

at Rs. 20 per 1,000. Generally, if the fishing season is good and the supplies are not too short there is less competition among the fish merchants. But owing to the failure of the fishery, marked fluctuations in prices were noticed (*vide* Table II).

TABLE II
Price index of mackerel for the 1955-56 season

Months	Fish curers	Launch owners
October	Rs. 10-12 per 1,000	Rs. 20-22 per 1,000
November	„ 10-12 „	„ 25-60 „
December	.. ..	„ 25-65 „
January	.. ..	„ 35-40 „
February	.. ..	„ 70-80 „
March	„ 30-40 „	„ 80 „

LENGTH-FREQUENCY DISTRIBUTION OF MACKEREL

Table III shows the inter-seasonal length-frequency distribution of mackerel at Karwar for the seasons 1954-55 and 1955-56. The range of size during the 1954-55 season was from 17.1 to 24.7 cm. as against 14.0 to 24.7 cm. during the 1955-56 season. Viewing the table as a whole, we see two modes for the season 1955-56, one at 16 to 18 cm. and the other at 21.5 cm. Only one mode at 22.5 cm. was noticed in the 1954-55 season. Pradhan (1956) states that when the dominant size class was small, the seasonal catch of mackerel was also comparatively small, as seen in the 1949-50 and 1952-53 seasons. He further states that it appears that the direct relation of catch to dominant size-group holds good only when the fishery is contributed by one size-group persisting throughout the season. This hypothesis may be correct for the 1955-56 season as two dominant size-groups persisted in the fishery during the period, but it may be pointed out that the distinction made by Pradhan for small and large dominant size-groups is rather confusing.

Length-frequency studies were based on random samples of mackerel collected regularly when there was fishing for mackerel in Karwar Bay.

TABLE III
*Inter-seasonal length-frequency distribution of mackerel for
 1954-55 and 1955-56 seasons*

Size-groups in cm.	1954-55 season	1955-56 season
14.0-14.9	..	11 (0.6)
15.0-15.9	..	24 (2.1)
16.0-16.9	..	107 (6.6)
17.0-17.9	4 (0.1)	72 (4.5)
18.0-18.9	71 (3.1)	106 (6.6)
19.0-19.9	250 (12.2)	58 (3.6)
20.0-20.9	391 (14.2)	282 (17.6)
21.0-21.9	474 (23.2)	566 (35.3)
22.0-22.9	544 (26.6)	237 (14.6)
23.0-23.9	285 (13.9)	93 (5.8)
24.0-24.9	20 (0.9)	34 (2.1)

(The figures in brackets are percentages)

The length-frequency data for the season month by month are shown in Tables IV (a) and (b).

TABLE IV (a)
Length-frequency distribution of mackerel at Karwar for 1954-55 season

Size-groups in cm.	November	December	January	February	March
17.0-17.9	..	4 (0.8)	..	..	..
18.0-18.9	4 (0.4)	62 (13.4)	5 (2.2)	..	..
19.0-19.9	83 (7.2)	120 (26.0)	46 (20.4)	1 (0.49)	..
20.0-20.9	217 (19.0)	91 (19.7)	82 (36.4)	1 (0.49)	..
21.0-21.9	327 (18.5)	67 (14.5)	46 (20.4)	34 (16.8)	5 (18.9)
22.0-22.9	323 (18.3)	104 (22.8)	36 (11.1)	81 (40.1)	14 (51.8)
23.0-23.9	184 (16.0)	23 (4.9)	7 (3.1)	71 (35.1)	6 (22.2)
24.0-24.9	3 (0.3)	..	2 (1.3)	14 (6.9)	2 (7.5)

(The figures in brackets are percentages)

TABLE IV (b)

*Length-frequency distribution of Mackerel at Karwar for 1955-56 season**

Size-groups in cm.	October	November	February	March
14.0-14.9	11 (2.4)	..	..	..
15.0-15.9	34 (7.4)	..	..	..
16.0-16.9	107 (24.2)	..	..	..
17.0-17.9	51 (11.3)	21 (2.4)	..	..
18.0-18.9	73 (16.5)	33 (3.8)	..	..
19.0-19.9	2 (0.4)	56 (6.4)	..	..
20.0-20.9	59 (13.3)	193 (22.2)	9 (3.7)	27 (12.7)
21.0-21.9	94 (21.2)	366 (42.2)	29 (36.2)	77 (36.3)
22.0-22.9	11 (2.4)	126 (14.5)	42 (52.5)	58 (27.3)
23.0-23.9	..	47 (5.4)	6 (7.4)	40 (18.8)
24.0-24.9	..	24 (2.7)	..	10 (4.7)

* Data for December and January not available.

(The figures in brackets are percentages)

Mackerel measured for dominant size class during the 1954-55 season totalled 2,039; the length-frequency was calculated for each month. For November 1954, the beginning of the season, a mode at 21.5 cm. size-group was prominent. For December 1954, two modes, one at 19.5 cm. and the other at 22.5 cm. were seen, and for January, February and March 1955 at 20.5 cm., 22.5 cm. and 22.5 cm. respectively.

During the 1955-56 season 2163 mackerel were measured for plotting length-frequency distribution. For October 1955 one mode at 16.5 cm. and the other mode at 21.5 cm. were seen. For November 1955 and February 1956 the modes appeared at 21.5 cm. and 22.5 cm. respectively. For March 1956 a mode at 21.5 cm. size-group was seen.

For comparative studies, the length measurements of mackerel were recorded from Majali, Kumta and Ankola during the 1955-56 season (*vide* Table V).

TABLE V

Length-frequency chart of mackerel at Kumta, Majali and Ankola for the 1955-56 season

Size-group in cm.	Kumta		Majali		Ankola	
	December	January	December	January	February	January
16.0-16.9	6 (2.4)	..	..	..	..	..
17.0-17.9	41 (16.7)	1 (0.3)	..	..	..	..
18.0-18.9	117 (47.7)	1 (0.3)	3 (2.07)	..	..	..
19.0-19.9	71 (29.3)	46 (18.3)	17 (17.8)	10 (10.6)	..	19 (13.1)
20.0-20.9	9 (3.6)	118 (47.0)	22 (21.7)	38 (40.4)	4 (9.9)	64 (44.1)
21.0-21.9	..	45 (17.5)	15 (14.8)	29 (30.8)	19 (42.1)	55 (38.1)
22.0-22.9	..	35 (13.9)	32 (31.6)	17 (18.0)	21 (47.7)	6 (4.1)
23.0-23.9	..	5 (1.9)	7 (6.9)	..	..	..
24.0-24.9	..	..	4 (3.9)	..	..	..

(The figures in brackets are percentages)

Kumta.—For December and January, one mode each at 18.5 cm. and 20.5 cm. size-groups respectively was noticed.

Majali.—For December two modes appeared, one at 20.5 cm. and the other at 22.5 cm. For January the first mode remained stationary and for February, it had moved to 21.5 cm.

Ankola.—For January a mode at 20.5 cm. was noticed.

It is gathered that the mackerel in the maturity stages I and II constitute the fishery along the west coast. Data on length-frequency studies for the last two seasons showed that the fishery draws its support mainly from a single age-group.

MACKEREL FISHERY IN RELATION TO SARDINE FISHERY

Nair (1952) states that the fluctuations in the oil-sardine (*Sardinella longiceps*) fishery seen within the season do not in any way influence the course of mackerel fishery. Studies have been initiated already at Karwar to see how far the sardine fishery is complementary to the mackerel fishery of this area. The oil-sardine fishery was good for the 1954-55 season, the total landings being 157·8 tons (November-March). Even after March, good landings were noted at Karwar for the succeeding three months. During the 1955-56 season the sardine shoals did not enter the inshore waters at Karwar. The estimated landings of mackerel are shown in Table VI.

TABLE VI
Estimated landings of mackerel and oil-sardine in lb. for the 1954-55 and 1955-56 seasons

Months	1954-55		1955-56	
	Mackerel	Oil-sardine	Mackerel	Oil-sardine
October .. ..	..	..	4,75,047	Nil
November ..	17,38,400	1,430	2,92,100	..
December ..	3,60,200	5,940	1,71,380	..
January ..	13,644	2,31,010	1,52,040	..
February ..	18,440	76,600	7,720	..
March .. ..	..	38,595	32,560	..

OBSERVATIONS ON MACKEREL FISHERY AT EIGHT CENTRES

Information on the mackerel fishery during the 1955-56 season at eight centres of observation has been summarized and shown below in Table VII.

SUMMARY

1. During the 1954-55 and 1955-56 seasons the total landings of mackerel at Karwar were 951·2 tons and 508·3 tons respectively.
2. A secondary peak period in the mackerel fishery was noted towards the end of both the seasons, in the months of February and March.

3. No marked differences were noted in the size-groups of mackerel caught at Karwar, Majali, Ankola and Kumta during the 1955-56 season.

4. Two dominant size-groups, namely, 16-18 cm. and 22.5 cm. entered the fishery of the 1955-56 season, as against one size-group (22.5 cm.) in 1954-55.

5. In general the mackerel fishery during the 1955-56 season was poor along the North Kanara Coast.

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TABLE

Observation centre	Karwar	Binge	Chendia
Duration of season	October 1955 to March 1956		
Whether season was good or bad	Bad	Bad	Bad
Type of net employed	<i>Rampan</i>	<i>Rampan</i>	<i>Rampan</i>
Number of <i>Rampan</i> nets in operation	15	4	7
Number of hauls	88	118	51
Catch during different months of the season (all figures are in numbers)			
October 1955	24,14,000	20,63,199	The estimated total landings for the season are 29,71,275 (in numbers)
November 1955	14,97,000	55,555	
December 1955	8,56,900	3,48,340	
January 1956	7,60,200	3,52,125	
February 1956	38,600	1,29,860	
March 1956	1,62,800	1,38,861	
Size composition of the catch during the season	14 to 24 cm.	15 to 24 cm.	18 to 24.5 cm.
Disposal of the catch	Fresh 60% Cured 40%	Fresh 50% Cured 50%	Fresh 50% Cured 50%
Places of distribution and mode of transport	Fresh fish taken direct to Bombay by fish-carrier launches; cured fish sent to Ratnagiri, Malwan, Belgaum, Hubli, Dharwar and Colombo.		

VII

Ankola	Kumta	Majali	Honavar	Bhatkal
October 1955 to March 1956				
Bad	Bad	Bad	Much better than last 2 years	Bad
<i>Rampan</i>	<i>Rampan</i>	<i>Rampan</i>	Gill-nets and cast nets	Gill-nets
3	1	8	..	..
6	13	14	..	..
4,30,000	60,000	1,00,000	The estimated	The estimated
..	4,00,000	3,61,000	total landings	total landings
..	24,200	87,500	of mackerel up	are 2,50,000
95,000	50,000	1,00,000	to January are	
..	..	90,000	2,50,000 (in	
..	..	4,37,000	numbers)	
14 to 23 cm.	14 to 22 cm.	16 to 24 cm.	15 to 23 cm.	18 to 23 cm.
80% to 90% cured and the rest sold as fresh fish in the market	Fresh 50% Cured 50%	Fresh 50% Cured 50%	Cured 50% Fresh 50%	Cured 50% Fresh 50%
Fresh fish taken to Bombay by fish carrier launches; cured fish sent to Upghat, Hubli, Dharwar, etc., by trucks.			..	..