Fishery resources of Ullal (Mangalore) in relation to certain environmental factors during 1963-67[1]

BY

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(With four text-figures)

INTRODUCTION

Ullal, an important fishing centre situated 3 Km south of Mangalore, was known for shark fishery in the past. However, owing to the decline in the shark fishery, fishing for sardine, mackerel etc has been resorted to bottom dwelling during the past two decades. While Mangalore is at present a landing centre for ground fishes of the mechanised boats, Ullal is of special significance, being the nearest fishing village where various types of indigenous gears are employed mainly for pelagic fishes. Yet, the fishery potentiality of this area has remained unknown. However, certain observations on the mackerel fishery of this area have been made by Rao *et al.* (1962). This account relates to the total fish landings and the major categories of fishes contributing to the fishery with observations on the relation of sardine and mackerel catches to plankton, salinity, temperature and rainfall.

FISHING METHODS

The types of gears operated at Ullal are shown in Table I.

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While most of the nets are operated by the fishermen of Ullal, fishing by *Rampani* and *Kollibale* at this centre is done by fishermen from the neighbouring villages north and south of Ullal respectively. Normally, fishing is suspended from the middle of June to end of July due to the unfavourable conditions during the south-west monsoon. Fishing is resumed with cast net (*Beesubale*) operations mainly for prawns, soles and sardines during August-October following which this gear together with *Chalabale* and *Idabale* are employed for catching sardines exclusively. Occasionally, a small meshed (about 1 cm) cast net called *Kooribale* is also operated during the monsoon for catching small varieties of fishes. Although big meshed gill nets namely *Pattabale* and *Kanthabale* are operated for catching medium and big-sized mackerel, other fishes like *Hilsa kanagurta, Anadontostoma chachunda,* sharks and rays and prawns consisting of mostly *Penaeus* sp. are also caught. The other types of gill nets namely *Manangubale* and *Bolingerbale* are operated exclusively for *Thrissocles* spp. and *Kowala coval* respectively. *Odubale* usually operated from September to February, catch mainly *Cybium* spp., *Chirocentrus* spp., and sharks and rays. *Kollibale* and *Rampani* are employed when large shoals of pelagic fishes like sardine and mackerel occur. During the summer months of March to May *Maribale* operations are carried out for catching cat fishes.

Collection of Data and Estimation of Landings

The data presented here relate to the period July 1963 to June 1967 when observations were made on all the working days. Usually about 20 per cent of the total number of each type of unit operated were examined and the monthly total catch in respect of each type of unit was estimated as was followed by Rao *et al.* (1962). While estimating the catch, the weights of major categories of fishes such as sardine, mackerel, prawns etc. were noted down separately. Surface plankton and water samples for salinity estimation were collected off Ullal once a week together with temperature readings. An attempt was made to correlate these data with the fluctuations in the pelagic fishery resources of this area.

Analysis of Data

The data collected have been analysed to study the seasonal variations in the catch during the different years, fluctuations in the annual catch and the dominant species contributing to the fishery. In order to determine the relative importance of the different gears and the com-

mercially important species caught by them, the data have been subjected to an analysis on a gearwise basis. Since the fishery for oil sardine and mackerel is known to fluctuate from year to year, data on plankton volume, temperature, salinity and rainfall of this area have been plotted against the landings of these species during the period of this investigation to find out the relationship, if any.

a) *Annual and seasonal variations in the total catch*

Comparing the total fish landings of the different years (Table II) it is seen that catches during 1964-65 and 1966-67 (718.4 and 747.2 tonnes respectively) were better than those of 1963-64 and 1965-66 (228.8 and 454.9 tonnes respectively). From the monthly variations in the catch for different years, it has been observed that the fishery was generally good between September and April with the peaks occurring during September-October and January-April, the latter being dominant during most of the years. Usually, the catches dwindled after April and the poor landings recorded during June-July may be attributed to the decreased fishing activity during the peak of the south-west monsoon.

b) *Catch composition and gearwise landings*

Although the category of fishes such as *Arius* spp. *Kowala coval*, *Cynoglossus* spp., *Leiognathus* spp. and *Thrissocles* spp. together classified as 'others' constituted the bulk of the landings during 1963-64 and 1964-65 (Table II), oil sardine remained the single largest fishery in all the years. It is interesting to note that the oil sardine landings even exceeded those of 'others' during 1965-66 and 1966-67 constituting 62.4 and 51.6 per cent respectively. The trend of the monthly oil sardine catches generally coincided with that of the total catch.

The mackerel fishery was good only during 1963-64 when it formed 29.3 per cent which was even higher than the oil sardine catch (22.8%). Subsequently, the fishery declined with a tendency for revival during 1966-67. Unlike the sardine fishery, the mackerel fishery was restricted to short periods with the peak occurring during October and November. However, a secondary peak was noticed in May during all the years except in 1966-67. Comparing the trend of oil sardine and mackerel fishery, no definite relation was discernible on a monthwise basis. However, from the annual trend it was observed that while the oil sardine catches were on the increase leading to a bumper fishery in 1966-67, the mackerel fishery was declining touching its lowest ebb in 1965-66.

As in the case of mackerel, the prawn fishery also was active only for brief periods during July-September which coincided with the south-west monsoon season. The fishery was supported chiefly by a single species namely, *Metapenaeus dobsoni*. The prawn fishery noticed during January, February and sometimes April was meagre and it was

TABLE II

MONTHWISE CATCH IN KG OF DIFFERENT CATEGORIES OF FISHES DURING DIFFERENT YEARS

		July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	Total	%age
1963-64	Oil sardine	—	—	382	4729	1241	—	1330	26729	17694	—	—	—	52105	22.8
	Mackerel	—	—	10718	25785	4032	—	278	798	3898	9191	12234	95	67029	29.3
	Prawns	164	1582	315	—	—	—	762	445	—	200	35	76	3579	1.5
	Others	461	2091	15480	15341	2383	8050	20706	14376	3450	10264	6501	7017	106120	46.4
	Total	625	3673	26895	45855	7656	8050	23076	42348	25042	19655	18770	7188	228833	
1964-65	Oil sardine	123	7531	6028	60330	20394	5312	13024	13879	9330	17821	18171	206	172149	24.0
	Mackerel	—	—	—	2832	8852	5410	4066	—	4815	946	2420	1123	30464	4.2
	Prawns	6393	5190	196	—	—	—	—	—	26	157	80	13	12055	1.7
	Others	16627	7730	54622	7554	4049	2701	7676	119612	251543	7237	17691	626	503768	70.1
	Total	23143	20451	60846	70716	33295	13423	24766	133491	265714	26161	38362	1968	718436	
1965-66	Oil sardine	2040	15265	16204	6848	54702	28380	73759	29430	26755	28475	1875	—	283733	62.4
	Mackerel	—	28	1523	5913	1314	3	778	28	—	—	382	6	9975	2.2
	Prawns	—	2163	4713	502	21	22	185	105	312	839	194	64	9120	2.0
	Others	—	12288	66790	19496	17047	6919	4706	6234	8643	4885	3495	405	152078	33.4
	Total	2040	29744	89230	32750	73084	35324	79428	35797	35710	34199	5946	475	454906	
1966-67	Oil sardine	—	56572	66474	13994	23645	36453	10500	60747	35482	60005	19166	2580	385618	51.6
	Mackerel	—	—	3889	16908	2244	54	285	—	—	—	—	—	23380	3.1
	Prawns	—	2753	8726	225	219	7	33	—	—	—	—	—	11963	1.6
	Others	—	4411	11952	17585	5251	4678	5341	1438	2288	224012	48997	329	326282	43.7
	Total	—	63736	91041	48712	31359	41192	16159	62185	37770	284017	68163	2909	747243	

constituted by bigger varieties such as *Penaeus indicus* and *P. merguiensis*.

Among the 'other' categories, *Arius* spp. accounted for the bulk of this group during 1964-65 and 1966-67 forming 73 and 82 per cent respectively, whereas *Kowala coval*, *Cynoglossus* spp., *Leiognathus* spp. and *A. chacunda* together formed about 72 per cent during 1963-64 and *Cynoglossus* spp., *Leiognathus* spp., *A. chacunda* and *H. kanagurta* 73 per cent during 1965-66. It was interesting to note that the cat fish fishery was prevalent only during alternate years. Though this fishery was restricted to one or two months in a year (February-March 1965 and April 1967), huge quantities were landed within this short period. When the cat fish shoals are sighted, the fishermen generally fish them exclusively because of the better returns. The fishery for *Kowala coval*, generally lasting from December to May, constituted about 38.0, 3.1, 13.0 and 3.0 per cent respectively during the years 1963-64 to 1966-67. *Cynoglossus* spp. and *Leiognathus* spp., appeared together in large quantities from August to October, forming about 19.0, 13.3, 51.3 and 1.5 per cent respectively during the above years. *Thrissocles* spp. were caught throughout the year but the maximum quantity was landed generally between July and October. They constituted 10.4, 3.4, 11.8 and 2.1 per cent respectively among the 'other' categories during the years of study.

For a study of the importance of the various types of gears, the catches landed by these during the different years are given in Table III from which it can be seen that *Maribale*, *Chalabale*, Cast nets, *Bolingerbale*, *Pattabale* and *Kanthabale* were the most important gears accounting for the major portion of the catch during the entire period. Among these, *Maribale* landed the maximum catches during 1964-65 and 1966-67 and *Chalabale* during 1965-66. The landings by cast nets were consistently good throughout the period. Except during 1966-67, *Bolingerbale* brought fairly good catch. The landings by *Pattabale* were best in 1963-64 and those of *Kanthabale* in 1966-67.

The proportion of each of the major category of fishes caught by the different gears (Table IV), shows that sardines are netted mainly by *Chalabale* and cast nets. *Kollibale*, the most commonly used gear in the southern region for sardine fishery, was operated only on a few occasions during 1964-65 and 1966-67, which accounted for a small percentage of the sardine catch. Similarly, *Rampani*, a shoreseine operated for sardine and mackerel in the northern region, was employed only once in 1966-67 accounting for 6.2 per cent. For the other pelagic variety namely mackerel, *Pattabale* was found to be the most successful gear accounting for more than two-thirds of the entire mackerel catch during all the years. The rest of the catch was by *Kanthabale*. Majority of the prawn catch was by cast nets during all the years.

TABLE III

GEARWISE CATCH IN KG OF THE MAJOR CATEGORIES OF FISHES DURING DIFFERENT YEARS

		Cast net	Kantha bale	Chala bale	Manangu bale	Patta bale	Kolli bale	Bollinger bale	Mari bale	Ida bale	Odu bale	Rampani	Total
1963-64	Oil sardine	9875	—	42230	—	—	—	—	—	—	—	—	52105
	Mackerel	—	2014	30	—	64985	—	—	—	—	—	—	67029
	Prawns	2061	1434	—	—	84	—	—	—	—	—	—	3579
	Others	22759	14483	15366	470	12960	220	39862	—	—	—	—	106120
	Total	34695	17931	57626	470	78029	220	39862	—	—	—	—	228833
1964-65	Oil sardine	83677	—	84752	—	—	3720	—	—	—	—	—	172149
	Mackerel	—	6217	—	—	24247	—	—	—	—	—	—	30464
	Prawns	11288	246	375	146	—	—	—	—	—	—	—	12055
	Others	67310	11048	22411	10093	2720	156	16320	367610	—	6100	—	503768
	Total	162275	17511	107538	10239	26967	3876	16320	367610	—	6100	—	718436
1965-66	Oil sardine	23955	414	258463	—	—	—	—	—	901	—	—	283733
	Mackerel	14	3228	—	10	6719	4	—	—	—	—	—	9975
	Prawns	5296	2029	1329	466	—	—	—	—	—	—	—	9120
	Others	78765	15949	24357	3830	6070	1301	20636	—	—	1170	—	152078
	Total	108030	21620	284149	4306	12789	1305	20636	—	901	1170	—	454906
1966-67	Oil sardine	145322	735	210955	14	—	4592	—	—	—	—	24000	385618
	Mackerel	—	7318	4	—	16058	—	—	—	—	—	—	23380
	Prawns	11150	728	42	43	—	—	—	—	—	—	—	11963
	Others	5570	27642	4427	3246	3581	165	9632	267003	—	5016	—	326282
	Total	162042	36423	215428	3303	19639	4757	9632	267003	—	5016	24000	747243

TABLE IV

PERCENTAGES OF MAJOR CATEGORIES OF FISHES CAUGHT BY DIFFERENT GEARS

		Cast net	Kanthabale	Chalabale	Manangubale	Pattabale	Kollibale	Idabale	Rampani
1963-64	Oil sardine	19.0	—	81.0	—	—	—	—	—
	Mackerel	—	3.0	—	—	97.0	—	—	—
	Prawns	57.6	40.1	—	—	2.3	—	—	—
1964-65	Oil sardine	48.6	—	49.2	—	—	2.2	—	—
	Mackerel	—	20.4	—	—	79.6	—	—	—
	Prawns	93.6	2.0	3.1	1.3	—	—	—	—
1965-66	Oil sardine	8.4	0.2	91.1	—	—	—	0.3	—
	Mackerel	0.1	32.4	—	0.1	67.4	—	—	—
	Prawns	58.1	22.2	14.6	5.1	—	—	—	—
1966-67	Oil sardine	37.7	0.2	54.7	—	—	1.2	—	6.2
	Mackerel	—	31.3	—	—	68.7	—	—	—
	Prawns	93.2	6.2	0.3	0.3	—	—	—	—

However, fairly good proportion of the prawn catches was landed by *Kanthabale* during 1963-64 and 1965-66.

Relation of the Pelagic Fisheries to Ecological conditions

Mean monthly temperature, salinity and displacement volume of plankton of the surface waters off Ullal together with the sardine and mackerel landings are shown in Text Figs. 1 to 4. Temperature was low during August-January, the minimum value ranging between 25.4 to 25.6°C. However, within this period it showed an increase in October except in 1963-64 when it was in November. Temperature remained high during April-May (29.8 to 31.0°C). Salinity was low during August-September (13.9 to 30.9‰) followed by an increase till Decem-

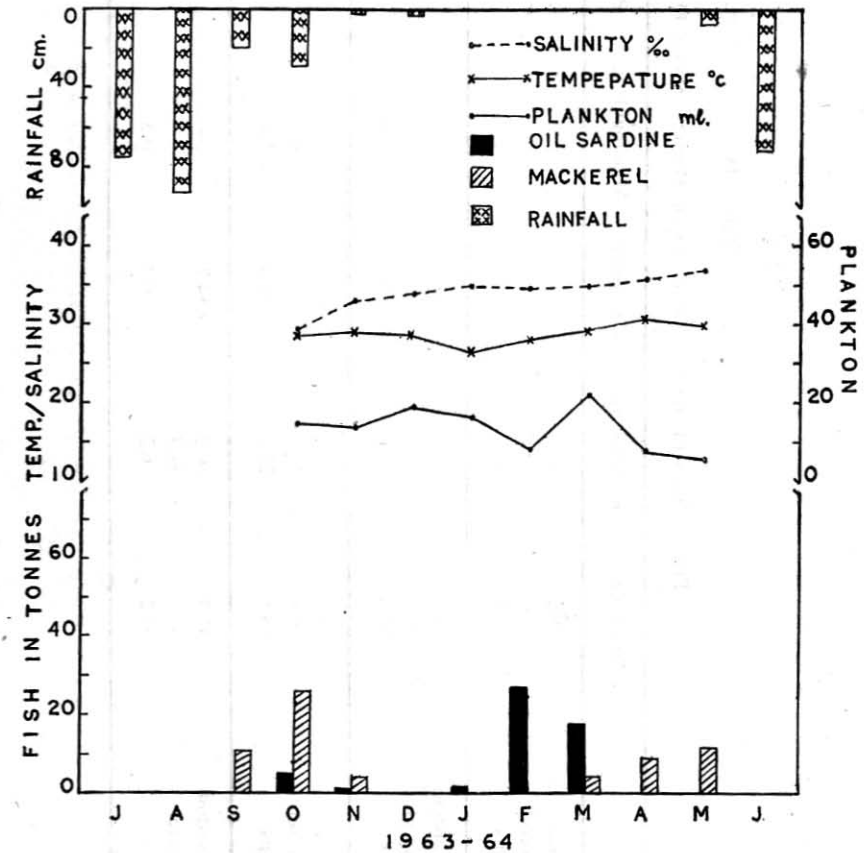

Fig. 1. Monthly landings of oil sardine and mackerel in relation to temperature, salinity, rainfall and plankton volume during 1963-64.

ber (29.4 to 35.1 ‰) with a drop in January-February (Figs. 2 to 4) except in 1963-64 when the salinity values were steadily rising (Fig. 1). Maximum values for salinity were obtained during April-May (34.2 to 37.0‰). The period of low salinity coincided with the south-west monsoon season (June to September) when the monthly maximum rainfall ranged from 86.8 to 95.0 cm. Comparing the annual rainfall during the four years of study, it was found to be highest in 1963-64 (306.5 cm) and lowest in 1965-66 (274.1 cm).

The characteristics of the plankton volume varied widely from year to year with peaks in December '63 (18.9 ml), March '64 (22.0 ml), October '64 (39.0 ml), May '65 (13.7 ml), October-November '65 23.3-24.5 ml) and February (13.0 ml) and May '66 (17.7 ml) and March '67 (37.8 ml). The minimum plankton volume was recorded during November '66 (1.8 ml) and the maximum in October '64 (39.0 ml). Considering the monthly variations of the plankton volume during

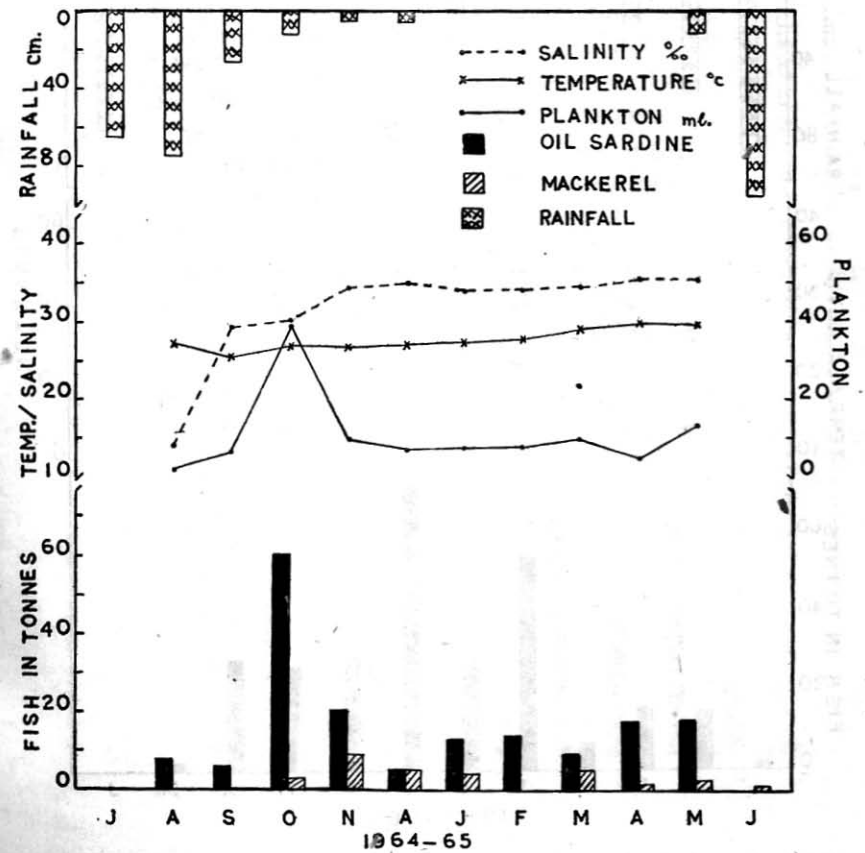

Fig. 2. Monthly landings of oil sardine and mackerel in relation to temperature, salinity, rainfall and plankton volume during 1964-65.

the different years, no definite relationship was discernible between these and the sardine and mackerel fisheries.

When the sardine fishery was good the temperature was found to range from 25.4 to 27.7°C and salinity from 30.1 to 33.8‰. However, in the course of this study, good catches of oil sardine were recorded even in higher ranges of temperature (28.0 to 30.5°C) and salinity (33.8 to 35.5‰) during the period February-April '67. At Calicut, while a temperature range of 28.0 to 29.0°C was found to be favourable for the sardine fishery, no consistent relation was noticed between salinity and the fishery (Sekharan 1962a). Along North Kanara coast the period of sardine fishery had temperature and salinity ranges of 26.8 to 30.3°C and 22.2 to 34.53‰ respectively (Ramamurthy 1965).

In general, the mackerel fishery was not as good as that of oil sardine, its peaks coinciding with the temperature and salinity ranges

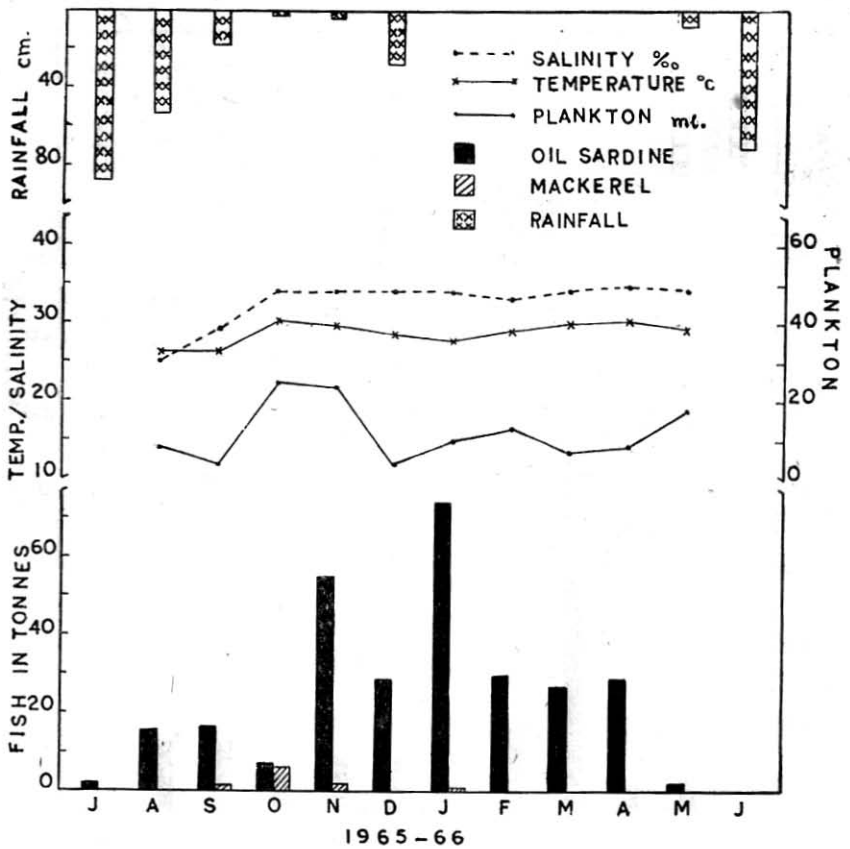

Fig. 3. Monthly landings of oil sardine and mackerel in relation to temperature, salinity, rainfall and plankton volume during 1965-66.

of 26.9 to 30.5°C and 29.4 to 34.4‰ respectively. In 1963-64, however, the fishery was good even at a higher salinity of 37.0‰ in May. Sekharan (1962b) stated that intermediate values for temperature (27.0 to 28.0°C) and salinity (34.2 to 35.44‰) representing an upward trend after their minimum values occurred during the mackerel season at Mandapam. Subsequently, while dealing with the mackerel fishery of Calicut, Pradhan & Reddy (1962) have reported that high temperature and salinity affect the fishery adversely. The mackerel season in North Kanara coast coincided with the transition period from the low salinity and temperature conditions during the south west monsoon period to the high salinity and warmer conditions in summer (Ramamurthy 1965).

Normally, the bulk of the sardine catch was landed following the period of heavy rainfall during the south-west monsoon season. How-

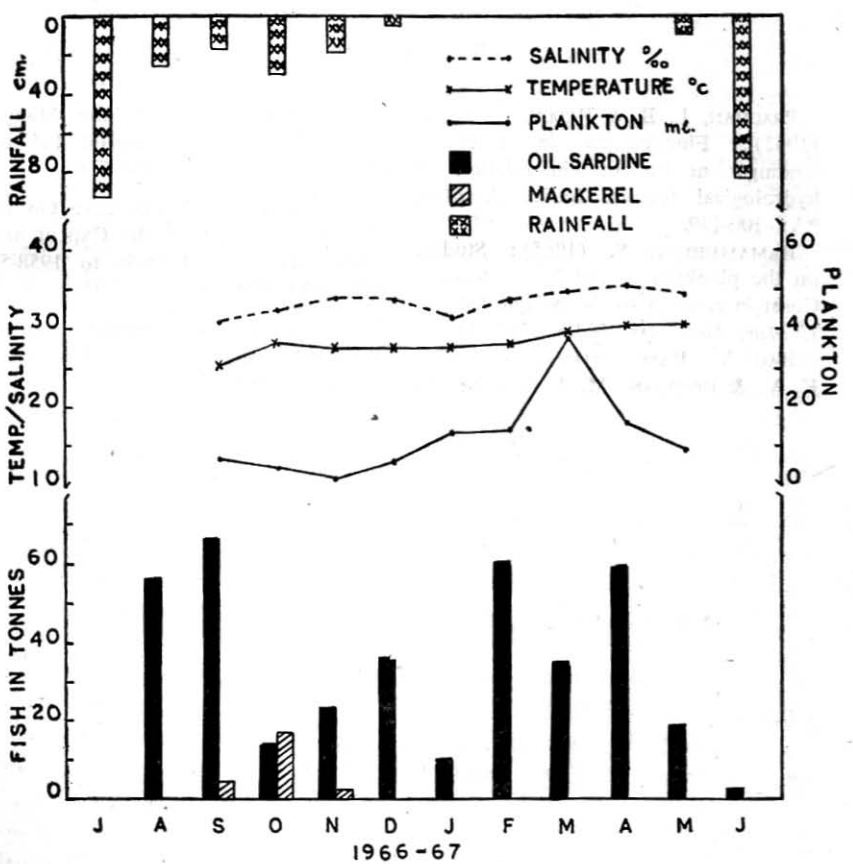

Fig. 4. Monthly landings of oil sardine and mackerel in relation to temperature, salinity, rainfall and plankton volume during 1966-67.

ever, fairly good quantities of oil sardine were also caught late in the season viz., February '64 and February and April '67 when the rainfall was negligible during the preceding months. The best catches of mackerel were also made following the south-west monsoon rains. The total mackerel landings appeared to have a direct relation to the annual rainfall, the maximum catch (67.0 tonnes) and rainfall (306.5 cm) occurring in 1963-64 and the minimum (9.97 tonnes and 274.1 cm respectively) in 1965-66. Pradhan & Reddy (1962), on the contrary, found an inverse relation between the annual rainfall and mackerel at Calicut. The sardine fishery at Ullal, on the other hand, was at its lowest (52.1 tonnes) in 1963-64 when the rainfall was heaviest (306.5 cm). The catches were better during 1965-66 and 1966-67 (283.7 and 385.6 tonnes respectively) when the annual rainfall was comparatively low (274.1 and 283.6 cm respectively).

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