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Coastal Currents Off Mangalore & the Possibility of Their Relationship with Pelagic Fish Catches in the Area

M P M REDDY, V HARIHARAN & N P KURIAN
College of Fisheries, University of Agricultural Sciences, Mangalore 575 002

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Coastal currents off Mangalore along the west coast of India have been measured for 2 yr using a specially fabricated float and drag system. The currents are directed towards north from October to February and towards south in April and May along this coast. March appears to be the transition period. The strength of the current varies from month to month. Northerly current seems to favour good catches of oil sardine and mackerel, and poor catches are associated with the starting of the southerly current. Magnitude of the current also appears to have some influence on the pelagic fish catch.

A clear knowledge of coastal currents along a coastline will be very useful in fishing operations. The coast near Mangalore on the west coast of India is noted for its pelagic fisheries of oil sardine and Indian mackerel. Detailed information on coastal currents in the region is not available except for the current observations carried out in connection with the location of the new harbour near Mangalore[1,2]. The present paper deals with the observations on coastal currents off Mangalore during 1976-1978. An attempt has been made in this study to relate the pelagic fish catches with the coastal currents off Mangalore.

Materials and Methods

A float and drag system specially fabricated and tested[3], was let out in the coastal waters near Mangalore and its movement was followed from the coast by 2 observers simultaneously by means of 2 theodolites. The coastal currents were computed later from the trajectory of the float. Measurements were made once a month off Bengre and Ullal from October 1976 to May 1977 and off Thannirbhavi and Someshwara from October 1977 to May 1978. To cover a greater length of the coastline, position of the theodolites was shifted from 1976-77 to 1977-78. The location of the 2 theodolites at Bengre, Ullal, Thannirbhavi and Someshwara beaches adjacent to Mangalore are shown in Fig. 1. The observations were always carried out on 2 consecutive days in each month at the 2 locations.

The accuracy of the triangulation method used in the present investigation depends on the resolving power of the theodolites, distance between the 2 theodolites and the shape of the coastline. The resolving power of the theodolites used in this study was quite sufficient to see the float-mast and flag up to 20 m depth. Distance between the 2 theodolites was reasonably large enough *c* 1 km to minimise the error. The coastline between the 2 theodolites was straight in all the 4 locations for easy and direct communication between the 2 observations.

In order to find out the possible relationship between the coastal currents and pelagic fish catches, fish landing data for oil sardine and Indian mackerel were collected from CMFRI, Sub-station, Mangalore. The fish catch data from Ullal and Baikampady (north of Thannirbhavi) were added since the whole area between these 2 landing centres can be considered as a single unit as far as the fish catches are concerned.

Results and Discussion

The direction of current in different areas during different periods of study is shown in Fig. 1 and the magnitude of current (range in km/hr) is given in Table 1.

The monsoon circulation develops drift currents in the Arabian Sea off Mangalore. The observations for 2 yr reveal that the currents are towards north from October till February. The currents turn towards south in April and May. March appears to be the transition period as far as the direction of current is concerned. The intensity of current varies from month to month. In general, the magnitude of the current on both sides of Mangalore appear nearly same in any particular month though there are some variations in certain months.

However, there is a possibility of some discrepancy between the currents obtained during 1976-77 and 1977-78 due to sea level changes from 1st year to 2nd year. In view of this, time lapse of 1 yr between observations of 2 pairs of stations is specially chosen to know the differences in currents, if any, over a longer period. The effect of tide also may perhaps cause some

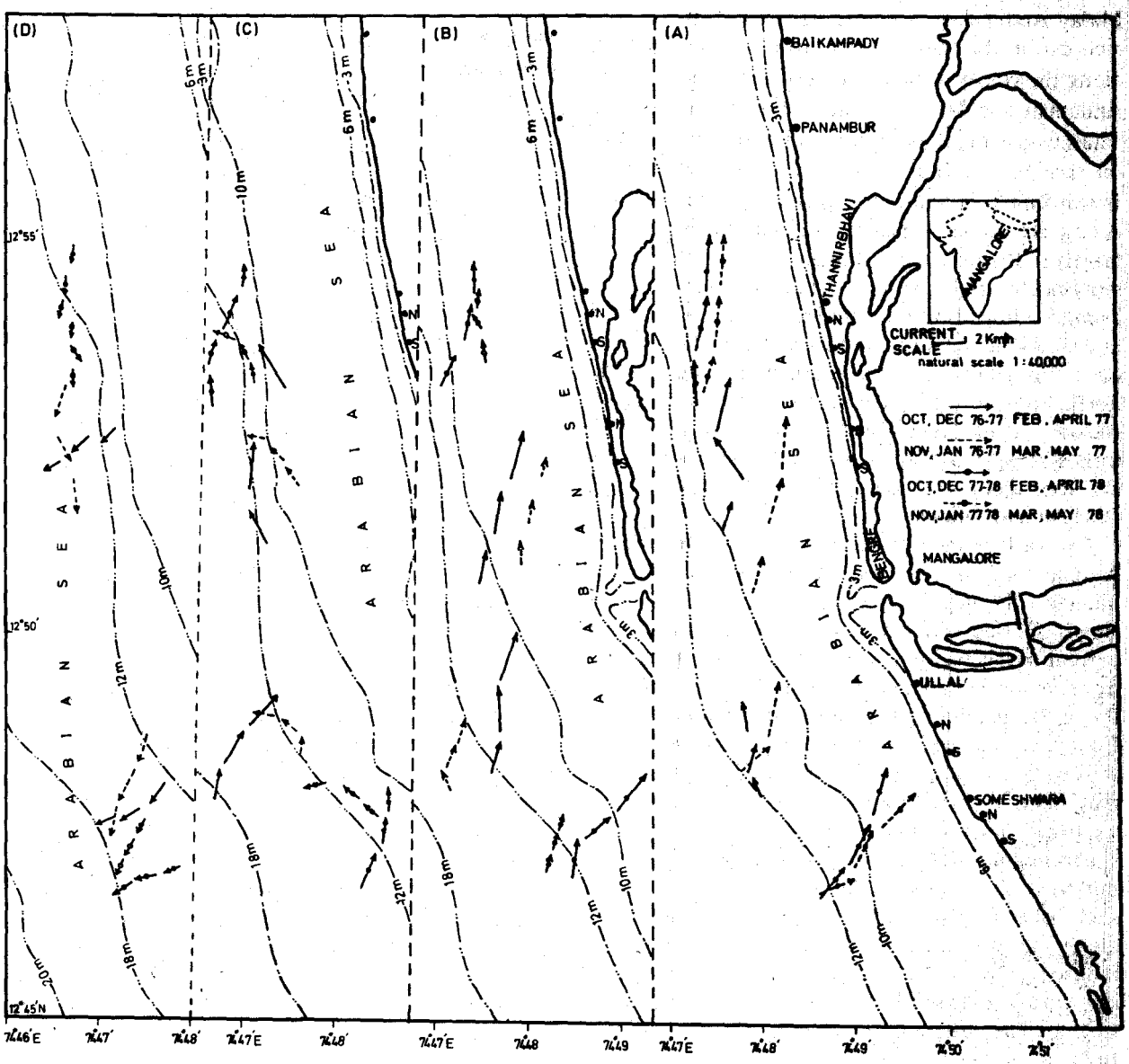

Fig. 1—Currents off Mangalore during (A) October-November, (B) December-January, (C) February-March and (D) April-May

Table 1—Magnitude of Current (range in km/hr)

Location	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May
Bengre	2.0-3.6	2.0-3.2	1.8-2.8	1 -1.4	2.2-3	1 -1.2	1.2-1.4	1.7-2.1
Ullal	1.2-1.8	2.2-3.4	2 -3	1 -1.4	1.8-2.6	0.9-1.1	1.3-1.5	1.6-2
Thannirbhavi	2.8-3.6	2.4-3	2 -2.4	0.8-1.4	1.4-2.2	1 -1.3	1 -1.3	1 -1.3
Someshwara	2.4-3	2.2-2.8	2.2-3	0.6-0.8	1.4-2.2	0.9-1.1	1 -1.3	0.9-1.1

difference on the observations as these were taken on consecutive days on both sides. In spite of these limitations, this method of obtaining currents seems to be useful in getting an idea of the strength and direction of currents.

Possible relationship of coastal currents and pelagic fish catches (oil sardine and mackerel) in the Mangalore area—Geographic distribution of oil sardine in the Indian ocean extends from Arabia to Phillippines through Seychelles, India, Ceylon, Andamans and the

Malay Archipelago[4]. The Indian mackerel has been recorded in the Indian ocean from the Persian Gulf, along the coasts of Somalia, Seychelle Islands, India, Andaman and Nicober Islands, Ceylon and Burma. Thus, in general, the geographical distribution of both oil sardine and Indian mackerel coincides with the North Equatorial current region of the Indian ocean. Along the Indian coastline, oil sardine is confined largely to the west coast, though, during certain years, stray catches of the species are made along the coasts of Tamil Nadu and Andhra Pradesh along the east coast as well. Along the west coast large shoals of oil sardine occur from Quilon in the south to Ratnagiri in the north. Similarly, the main mackerel fishery along the Indian coastline, is confined to the west coast of India from Ratnagiri to Cape Comorin but sporadic shoals are seen along the coasts of Tamil Nadu, Andhra Pradesh and Orissa.

The surface current pattern of wind drift in the Arabian Sea as observed off Mangalore seems to influence the migration of oil sardine and mackerel shoals. During October to February the direction of current in this region is towards north. As the current from the southern boundary of the clockwise cell in the Bay of Bengal during this period joins with the North Equatorial current, there would be a concentrated westward flow south of Ceylon[5]. This strong current may take a northerly deviation from its general westward flow with which the oil sardine and mackerel shoals migrate along the west coast of India. Thus, this northerly drifts seem to be responsible for bringing such fishes into the Indian coastal waters especially along the west coast. With the onset of south-west monsoon, North Equatorial current is replaced by eastward flowing south-west monsoon current south of Ceylon. The coastal currents along the west coast of India as noticed from the currents off Mangalore during May are towards south. This may cause the oil sardine and mackerel to move away into the south-west monsoon current which flows to east.

Pelagic fish catch of oil sardine and Indian mackerel for Mangalore area for October 1976 to May 1978 (Table 2), mostly taken by fishing boats within 20 m depth, is high during October to December and February and relatively low during January and March. It is poor during April and May. Coastal currents in the area are generally towards north during October to February and towards south during April and May (Fig. 1). March appears to be the transition period for the currents and hence they are somewhat oriented towards west. The current speeds are high during October to December and February whereas in January they are relatively less. If wind generated currents are stronger, conditions would be more favourable for migration of the pelagic fish towards the coast[6]. This could be the reason for the relatively high catches during October to December and February and low catches during January though the current direction is towards north in all these months. During March, since the current is somewhat oriented towards west, the fish catch is relatively less at this time. The poor yield during April and May may be due to the southerly current at this period. The catches are high during October to December and February, moderate in January and March and poor from April to September. The pelagic fish shoals are good with the commencement of northerly current in October and are high till February with a moderate value during January probably due to the relatively low current speeds. They decreased in the transition period (March) at the end of the north-east monsoon season and became poor with the commencement of the southerly current in April. Thus, the pelagic fish of oil sardine and mackerel appear to be using northerly and southerly currents prevailing along the west coast of India for their migration.

In view of this possible relationship between the currents and the movement of pelagic fishes along the west coast of India, it is desirable to tag commercially important fishes like oil sardine and mackerel in the region of the current drifts together with the simultaneous measurement of coastal currents along the west coast and follow the movement of fish throughout the coast. Results of such studies would lead to a better understanding of the relation between currents and movement of pelagic fish which may ultimately help in forecasting these fisheries in advance.

Table 2—Total Monthly Landings of Pelagic Fish (Oil Sardine and Mackerel) Landed near Mangalore (Ullal and Baikampady) during October 1976 to May 1978*

Month	Pelagic fish landings (oil sardine + mackerel) kg	Month	Pelagic fish landings (oil sardine + mackerel) kg
1976 Oct.	136067	1977 Oct.	155674
Nov.	106507	Nov.	139110
Dec.	81393	Dec.	103137
1977 Jan.	30400	1978 Jan.	20159
Feb.	92013	Feb.	75000
March	33392	March	32829
April	4378	April	8195
May	4634	May	8084
June	—		
July	14020		
Aug.	11556		
Sept.	17344		

*Courtesy Central Marine Fisheries Research Institute, Sub-Station, Mangalore

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