CHAPTER 2

BRIEF SUMMARY OF DOCTORAL WORK UNDERTAKEN DURING THE PERIOD 1977-1982

Introduction

Soon after joining the FAO/UNDP Pelagic Fishery Project in 1977 I took up part time research work under the able guidance of Dr. A.V.S. Murthy, Head, Fishery Environment Management Division of CMFRI, Cochin. Taking into consideration my past research experience in the field of Oceanography as applied to marine fisheries, the Cochin University of Science and Technology accepted my registration as a part time research student. The topic chosen for the study was 'Physical characteristics of the coastal waters off the south west coast of India with an attempt to study the possible relationship with sardine, mackerel and anchovy fisheries'.

The data collection and preliminary analysis of the basic data were completed towards the end of 1979. I had the unique opportunity of visiting the MAFF Fisheries Laboratory, Lowestoft, England towards the end of 1979 under an FAO study tour fellowship programme. During my tenure with the Fisheries laboratory I had the benefit of
discussing the findings of my research pursuit with some of the eminent scientists of the laboratory viz. Dr. John Ramster, Dr. R. R. Dickson, Dr. Paul A. Gurbutt etc. The helpful criticisms and sound advice which I received wholeheartedly from these eminent scientists helped me to orient my thinking towards useful interpretation of basic data in consultation with my guide soon after my return to India.

Objectives

The study was aimed at observing the variations, in space and time, of important hydrographic parameters such as sea water temperature, salinity and dissolved oxygen content of coastal waters along the south west coast of India. These nearshore waters are important since they constitute the environment for significant part of Indian fisheries. Considerable seasonal variations are also characteristic of this environment. Specific data relating to the processes of upwelling and sinking was collected mainly to evaluate the extent and intensity of these processes active in the area under study. The study also attempted possible correlations between some of the selected observed parameters and the occurrence and migrations of some of the major pelagic fishery resources such as oil sardine, mackerel and anchovy in the area under study.
Results

Sea water temperature within the area under study showed very wide seasonal and spatial fluctuations. In areas where the upwelled water reached surface levels, the sea water temperature fell considerably below what could be expected for the season without the influence of the process. The salinity maximum, characteristic of tropical oceans, was found at depths of 100-150 m. during north east monsoon period and between 30-50m. during the south west monsoon period. The variations in salinity, which are mainly brought about by the influence of rainfall, river runoff and the prevailing seasonal surface currents, are characteristic of the surface layers above the salinity maximum layer. The horizontal distribution of salinity indicated the existence of a pronounced convergence zone between Karwar and Ratnagiri in 1974 and less pronounced convergence zone south of Kasaragod in 1973. In general the shelf waters were found to be well aerated during the major part of the year except during the south west monsoon period in areas of intense upwelling where low oxygen intermediate waters reached surface levels.

No regularity in the occurrence of upwelling could be observed for any specific locality. The process of upwelling which commenced in February at deeper layers
continued during the south west monsoon and the upwelled water reached surface levels during June-October depending upon the vertical velocity of upwelling.

The immediate effect of upwelled water reaching the surface levels was the expulsion of all animal life including fishes from the vicinity as the same was highly oxygen deficient. Dissolved oxygen concentrations of these water masses slowly increased due to dissolution of atmospheric oxygen brought about by wind and wave action.

The process of upwelling was initiated by the prevailing north east wind system which removed surface waters away from the coast thereby inducing subsurface waters to move towards comparatively shallower depths near the coast. Once the south west monsoon sets in, the resulting southerly current continues the induction process with the result the sub surface waters slowly rise towards surface levels inspite of south westerly winds which do not favour the process to intensify.

The vertical time sections for sea water temperature and dissolved oxygen were found to be good indicators of the commencement, intensity and duration of the process of upwelling.

The process of sinking which resulted in the spreading of more or less uniform temperature and
dissolved oxygen conditions in the subsurface layers lead to an increase in the vertical extent of the habitat of major pelagic fish populations viz. oil sardine, mackerel and anchovy within the area under study. As in the case of upwelling, vertical time sections for sea water temperature and dissolved oxygen were found to be good indicators of the commencement, intensity and duration of the process of sinking.

A study of the occurrence, abundance and migration of oil sardine, mackerel and anchovy based on observations indicated that factors such as sea water temperature, dissolved oxygen content, salinity characteristics and plankton biomass at surface levels influenced the abundance and seasonal migrations of these fishes along the south west coast of India. All these fishes were found to avoid areas of intense upwelling activity mainly because of the low dissolved oxygen concentrations and comparatively low sea water temperature conditions. Anchovy was found to move with the changing surface currents and remain within the optimum temperature range avoiding oxygen deficient upwelled water and taking advantage of the prevailing surface currents.