

APPLICATION OF REMOTE SENSING AND GIS FOR FISH FORECASTING

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Introduction

The use of satellite remote sensing to provide synoptic measurements of the oceans is becoming increasingly important in fisheries research and fishing operations. Information on the changing ocean is necessary to understand and to eventually predict the effects of the ocean on fish population. The evolving capabilities of satellite sensors and data processing technologies combined with conventional data collection techniques and GIS modelling provide a powerful tool towards fish forecasting and thus allowing sustainable management of living marine resources. With the advent of satellite oceanographic, these oceanographic features such as ocean colour, sea surface temperature, chlorophyll-a concentrations and salinity can be successfully mapped in near real time basis. With the knowledge of oceanographic conditions affecting fishery population and provided with historical catch data can lead towards forecasting of fish populations, natural fluctuations of stocks, congregation and migrations, thus afford the capacity to harvest the fishery resources more effectively. The overall goal of the project was to develop an efficient system for fish forecasting in the South China Sea and make this information available through a fishery information system.

Materials and Methods

The project involved three major phases. In phase 1 of the project, which already completed, the project developed automatic geocoding of the NOAA AVHRR data, operationalise five methods of cloud masking techniques and develops the algorithm for quick sea surface temperature extraction for the tropical areas (Mansor et al. 1999a). Concurrently oceanographic data obtained from SEAFDEC fishery/ oceanographic surveys, The Royal Malaysian Navy, PETRONAS and other oceanographic expedition are obtained and a GIS model enveloping these data are being developed. Historical catch data of pelagic fish for the South China Sea for the three east coast states of Kelantan, Trengganu and Johore for the years 1992 to 1997 are being gathered and organised according to monsoon season. This will be then be used to verify the initial forecast maps for the area.

Results and Discussion

To date, the first phase of the project is completed with the development of an efficient extraction algorithm of sea surface temperature of South China Sea, which includes automatic geocoding, cloud masking and land masking. A GIS model of historical fish catch and oceanographic database for satellite and ship-based data is currently being developed. Preliminary results show a clear correlation of fish catch areas with the present of warm waterfronts of Malaysia continent (Mansor et al. 1998). The thematic maps of historical catch data shows some interesting observations. Clearly in the first estimation, the correlation between the catch and that of the warm front is very high. Other thematic maps presently developed also show such high correlation between the warm waterfronts and the catch of pelagic fish off the coast of Peninsular Malaysia (Mansor et al. 1999b). We have yet to determine the presence of upwelling off the coast of Trengganu during the SouthWest Monsoon. The occurrence of the chlorophyll-a concentration and the pattern of sea surface temperature for the South China Sea for the North East, South West monsoon and two other inter-monsoon periods. Studies on ocean colour, chlorophyll-a, upwelling and other oceanographic phenomena have yet to be completed. This will provide the missing pieces towards assembling this jigsaw of oceanographic data from historical fish catch data and GIS-based decision support system for forecasting fishing ground. The research is expected to develop an intelligent system in the form of expert system that is capable of predicting potential fishing zones (Boniface et al. 1998).

Conclusions

This major study to develop a real time fish forecasting system for the South China Sea is a bold attempt to assist the nation to achieve its aspirations to develop its offshore fishery and to harvest the fishery resources in a sustainable manner. Preliminary results of the study showed tremendous potential towards achieving the desired objectives.

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