Climate Variability and its Impact on Spatial and Temporal Distribution Patterns of Minicoy Tuna Fishery in the Eastern Arabian Sea – A Study based on Remote Sensing and GIS

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The availability in space and time of tuna is subject to strong variations, and it is only when certain environmental conditions are linked that tuna gather. In other terms, tuna distribution in a given ecosystem depends directly on biotic and abiotic elements and their interactions, that is to say their synergetic action. These environment parameters will have direct and indirect effects on tuna. Direct effects are (a) on mortality of the species, (b) on their growth by influencing factors favoring the presence of food and recruitment; the indirect effects are on (a) migration, (b) on the availability of tuna to fishing gears and therefore on fishing effort.

The present study aims to address two main objectives 1) Study of climate variability in terms of physico-chemical and biological parameters and their interactions, 2) Observing impact of these environmental conditions on spatio-temporal distribution patterns of regional tuna fisheries in the Arabian Sea. Climatic variability study was carried on Arabian Sea based on five year satellite and WOD data, having latitudinal extent from 05°-20° N and longitudinal extent from 48°-80° E. While impact study of environmental conditions on spatio-temporal distribution patterns of regional tuna fisheries in the Arabian Sea was limited to Minicoy Island, Lakshadweep based on catch data of Minicoy pole and line & troll line tuna fishery during the period 2003~2007. We used a geographic information system (GIS) to compile a fishery database to statistically explore the catch per unit effort (CPUE), and the relationship between distribution and environmental factors.

Results indicated that increase the intensity and frequency of annual climate variability over the Eastern Arabian Sea affect regional tuna fisheries in terms of an increase in the annual fluctuations of the spatio-temporal distribution patterns of tuna. The monthly CPUE distribution maps were produced to explore spatio-temporal patterns. We then identified the peak abundance regions, i.e., hotspots or good fishing zones. Temporal trends of the CPUE indices showed regional differences. Most of the monthly mean CPUE values in the 4 ecoregions showed an increasing pattern during study period except for the year 2006.