FISHERIES RESOURCES•North West Shelf Programme

OBJECTIVES OF THE NORTH WEST SHELF PROGRAM

P.C. Young

Demersal trawling has occurred along the continental shelf of northern Australia since 1971. The catch consists of several hundred commercially utilized species from 20 major families, and over a thousand other species which are caught incidentally to the main catch and subsequently trashed. Previous observations on a similar fishery in the Gulf of Thailand suggest that tropical demersal fish stocks such as these, respond in a complex and as yet unpredictable way to fishing. The commercial catch returns from northern Australia are showing similar trends. The Division of Fisheries Research initiated in 1982 a major study of the resource, using the North West Shelf of Western Australia as a model. The initial field sampling stage of the study has just ended. Here regular measurements were taken every other month from 6 major components of the system. These were (a) water column characterization and its flora and fauna, (b) bottom sediment characterization and its flora and fauna, (c) fish reproduction and recruitment, (d) fish diet, (e) fish growth and mortality, (f) industry aspects.

This data set represents the most complete synopsis of a tropical continental shelf ecosystem that has yet been collected and from it novel hypotheses related to controls of fish populations are already in the process of derivation for further experimental verification.

SOME GENERAL OCEANOGRAPHICAL FEATURES OF THE NORTH WEST SHELF STUDY REGION

D. Rochford

Oceanographical characteristics of off-shore waters to depths of around 300 m are determined by seasonal shifts in position of sub-tropical high salinity oxygen-rich nutrient-poor waters from the south, and tropical lower salinity oxygen-poor nutrient-rich waters from the north. In general, these sub-tropical waters extend further north in winter, and the tropical waters extend further south in summer. The on-shore movement of these two kinds of water terminates at around the 200 m shelf break contour, with seasonal changes in their proximity to the surface, resulting in large changes in shelf break nutrients, induced by the winter/summer shifts off-shore. Nearer the coast, seasonal changes in the oceanographical characteristics of the shelf waters are independent of those off-shore, and sub-surface nutrient replenishment from off-shore is minimal during the year. Nutrient levels of these waters therefore, remain very low throughout the year.

THE HYDROLOGY OF THE NORTH WEST SHELF

N.C. Bulleid

The North West Shelf between 115^{o} and 120^{o}E lies in a hydrologically transitional region subjected to both tropical and sub-tropical influences. Data collected over thirteen months of the current programme, supplemented by previous cruise data, reveal seasonally repeated patterns.

The influence of off-shore water masses was investigated with temperature/salinity and temperature/oxygen plots, which showed a complex mixture of water types in the top 500 metres. Below the surface mixed layer (SML), the water column is composed of tropical water to about 150m, South Indian Central Water (SICW) at about 200m, Sub-tropical Oxygen Maximum Water (SOM) at about 400m and Antarctic Intermediate Water at 500m and below. The two sub-tropical water masses, SICW and SOM, reach their maximum influence in about August and are almost absent in December and February. The western hydrology transect at about 116°E generally shows a greater sub-tropical influence than does the eastern transect at about 118°E.

The continental shelf can be regarded as two regions. The outer shelf, at and beyond the 100m isobath, was strongly influenced by off-shore waters. In winter the SML extended to 40-50m and nitrate concentrations in the upper 100m were low (<2μM). In the summer, the SML is virtually non-existent and in the lower water column below 80m, cooler, high nutrient water (<23°C, up to 16μM nitrate) reaches farther onto the shelf than at other times. The inner shelf within the 70m isobath showed a temperature cycle similar to the outer shelf, though salinities were always higher, particularly in summer, probably due to evaporative losses in shallow water and the influence of the inter-tidal zone. Nitrate concentrations were low (mostly <2μM), particularly in the winter. Phosphate concentrations in the top 40m were very low in summer throughout the study area, though not in winter - an as-yet unexplained phenomenon.

Preliminary findings are that, with the exception of a brief period in the summer, the hydrology of the inner shelf is independent of the outer shelf and the open ocean. This may be attributable to the unusual bathymetry in this region, which has a 'mid-shelf break' at about the 80m isobath. Further conclusions will be possible when all data is available.

MODELLING THE NORTH WEST SHELF CIRCULATION

C. Fandry

The shelf circulation plays a key role in nutrient dynamics and driving forces of the North West Shelf fisheries. Numerical models of wind forced circulation will be discussed. (Full abstract to come)

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