OCEANOGRAPHIC CONDITIONS ON THE NORTH QUEENSLAND SHELF AFTER PASSAGE OF CYCLONE WINIFRED

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An intensive oceanographic survey (February 4 to 9, 1986), was carried out in shelf waters surrounding the Winifred storm track shortly after its passage through the GBR. Extensive mixing caused by energetic cyclonic winds (greater than 200 km/hr), coupled with rainfall and river runoff produced dramatic changes in shelf waters. These changes included:

Greatly increased water turbidity

While GBR and lagoon waters are normally quite clear (from 0.5 to 5 percent of surface light can be measured at the bottom of the mid and outer shelf: a depth of 60 to 80 m), greatly increased turbidity reduced measurable light penetration to less than 5 m inshore, and less than 35 m on the outer shelf. Sources of this suspended material included river plumes from the Herbert, Tully, Murray and Johnstone Rivers, resuspended lagoon and reef sediments, and blooming plankton.

Reductions in shelf water salinity

Near-surface waters across the shelf were measurably diluted with freshwater. Measured salinities ranged from 10 parts per thousand (ppt) near the mouth of the Tully river to about 35 ppt. Observable plume structures in the lagoon ranged from less than 1 m, to several metres thick. By February 6, plumes from the Johnstone and Murray Rivers were considerably reduced and trapped near the shoreline.

Dissolved nutrient levels increase

Inter-reef and lagoon waters are normally characterized by low and uniform distributions of dissolved nutrients, particularly of nitrogen. Following Winifred, concentrations of inorganic nitrogen species - ammonium and nitrate - were readily detectable and often quite high (greater than 1 um). Sources of the nutrients added to shelf waters include river runoff, pore water from resuspended sediments and rainfall. With time, nutrient levels declined, particularly in a surface waters as plankton blooms developed.

Plankton blooms in inter-reef and lagoon waters

Following the injection of large amounts of nutrients into shelf waters, a pronounced phytoplankton bloom developed in the cyclone track area within two days. Chlorophyll concentrations were frequently five to 10 times higher than normally measured in mid-shelf waters and surface blooms extended to the shelf break. Blooming populations were dominated by net phytoplankton (greater than 10 uM). Despite high water column turbidity, primary production rates measured on the mid and outer shelf were also five to 10 times higher than normal.

No obvious effects of cyclone Winifred were observed in waters off Townsville, at stations occupied on February 10 and 15. Despite the dramatic shifts observed in shelf waters after the passage of Winifred, these changes are short-lived and are likely to have few direct effects upon the Great Barrier Reef. Indirect effects remain to be established.