# CYCLONE WINIFRED - OBSERVATONS ON SOME ECOLOGICAL AND GEOMORPHOLOGICAL EFFECTS

**T.J. Done, P.J. Moran and L. de Vantier**
Australian Institute of Marine Science

---

Cyclones constitute short lived and extreme physical disturbances to coral reefs, affecting all levels of ecosystem organization, from individual organisms, through local populations and communities, to the physical structure of reefs. Cyclone Winifred passed through an area in which the majority of reefs had already been heavily impacted by the crown of thorns starfish in the previous one to five years. This coincidence of two severe disturbances; one physical and one biological; raises fundamental questions about the role of disturbance in the coral reef ecosystem. Are their effects additive; are long-term changes in the character of the reef likely to result; and are such changes outside the 'normal' range of variability of the reef through time? These questions are far from being answered at this time.

The first step towards addressing such fundamental questions is the assessment of the immediate impact of the disturbances through field observations. Line and photo transects had previously been established on several reefs affected by the cyclone. They have subsequently been re-surveyed, allowing the extent of very localized changes to be assessed. While details varied from place to place, in all cases the already low cover of live coral was reduced even further, and there was at least superficial damage to the Reef framework.

The broader extent and nature of damage was assessed using both manta board and scuba observations on 10 reefs over a 160 km section of the Great Barrier Reef, centered on the cyclone path. The surveys were conducted within six weeks of the cyclone. Damage was classified as follows:

- breakage of coral;
- dislodgement of coral;
- scouring of soft benthos;
- peeling of surface matrix;
- slab removal of reef matrix;
- bulk transport of sediment; and,
- sand blasting of corals.

The latter four forms of damage constitute superficial changes to gross reef morphology which were nevertheless very conspicuous underwater. However, there was no damage to the structure of the reefs, such as tossing up of large reef blocks onto the reef flat, which was visible in aerial surveys conducted three days after the cyclone. Since many reefs in the area are littered with such storm-tossed blocks, Winifred appears to have been of lesser consequence in this regard than earlier cyclones.

The nature of benthic and superficial structural damage and its location on individual reefs varied in a systematic pattern in relation to predicted wind direction and reef position. On a series of reefs within 30 km of the path of the cyclone, reefs farthest from the coast appeared to receive more structural damage than those near to shore, but even the worst affected reefs appeared to have little damage on their landward sides. On reefs 60 to 75 km to the north of the path, damage was greatest on the landward side, which would have been open to cyclonic waves with a westerly component. On reefs 120 to 140 km to the south, there was significant damage to live and dead coral on parts of reefs exposed to cyclonic waves, which in this sector, would have had a strong easterly component.

The extent of changes to the benthic communities in the initial years following the cyclone will be followed by continued monitoring of the permanent study sites. The interpretation of these results in terms of the fundamental questions raised above will be based on a very incomplete understanding of reef structure and function. However the focus which these disturbances bring to the study of reef ecosystems can only improve our understanding of those systems.