



Coral Bay reef recovery

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Background

Mass mortality of corals, fish and other reef animals occurred in inner Bill's Bay at Coral Bay, Western Australia after the mass coral spawning in 1989. Unusually calm wind and sea conditions coinciding with coral spawning caused an accumulation of coral spawn in the Bay and the respiratory demand of the spawn slick followed by its *in situ* decomposition depleted available oxygen. Live coral cover decreased from 42.9% to 9.4% over an area of about 3 km² and several large colonies up to 50 years old were killed, indicating that a mass mortality of this magnitude had not occurred at Bill's Bay for at least four to five decades. Mortality of corals and other organisms from less severe anoxic events have occurred on several occasions since 1989. The most recent of these events occurred in 2008 and is likely to have been the most severe in terms of area of coral mortality since 1989. During the event many dead fish washed ashore and observations suggest 20% to 40% of corals were killed within a 1.2 km² area of inner Bill's Bay.

Since establishment of the baseline in 1989 by the Environmental Protection Authority (EPA), the coral reef communities of Bill's Bay have been re-surveyed in 1994 by the EPA, in 1995/96 by the Department of Conservation and Land Management, in 2001 by the Australian Institute of Marine Science (AIMS) and in 2006 and 2008 by the Department of Environment and Conservation's (DEC's) Marine Science Program and the Pilbara Region.



Findings

Unlike most Indian Ocean reefs, those in the outer zone of Bill's Bay appear to have been remarkably stable over time in terms of coral cover, coral community composition, and rates and taxonomic composition of sexual recruitment. Considering the decline in the condition of coral reefs worldwide, if these back reef corals at Ningaloo continue to remain unimpacted by natural and anthropogenic disturbances they could potentially serve a critical function as reference sites of local, regional and international significance.

Coral reef communities in inner Bill's Bay were almost completely killed by the 1989 event and it was also the inner reefs that were most impacted in 2008. Prior to 2008, recovery of pre-disturbance levels of coral cover at inner Bill's Bay occurred within 10 years and recovery of pre-disturbance type acroporid-dominated coral communities was achieved at one site within 17 years.

Although recovery processes appeared to be underway at some reefs in the middle zone of Bill's Bay prior to 2008, the apparent slow recovery observed at some sites in recent surveys leads to concerns that these reefs may be vulnerable to increased frequency and/or intensity of this type of disturbance. Chronic disturbance of coral reefs elsewhere has been linked to loss of resilience and sudden shifts from coral- to algal-dominated communities, with dramatic reductions in biodiversity and productivity.

Management Implications

Recommendations for management include:

- Minimisation of human-derived disturbances to coral reef communities at Bill's Bay such as restricting boating in sensitive coral areas e.g. shallow areas.
- Increasing levels of protection by installing an informative public snorkelling trail, and increasing visitors' understanding and appreciation of the natural environment in Coral Bay.
- Annual scientific monitoring and reporting of coral spawning events, and documentation and reporting of the extent and severity of spawning-related mortality when they occur.
- Scientific investigation of the apparently increasing size of the sand spit at Coral Bay to determine whether human activities are contributing to the process. Changes in sand and water circulation patterns are likely to impact on coral communities and may have long-term ramifications for the health of local coral reefs.



For more information please see articles in 'Discovering Ningaloo – latest findings and their implications for management' report at the Forest Science Library or visit the Ningaloo Research website at: <http://www.ningaloo.org.au> and in Simpson CJ, Cary JL, Masini RJ (1993) Destruction of corals and other reef animals by coral spawn slicks on Ningaloo Reef, Western Australia. Coral Reefs, 12, 185-191.

