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TITLE: Eutrophication and coral reefs?some examples in the Great Barrier Reef lagoon

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ABSTRACT:

Eutrophication or "nuisance" algal growth causes negative impacts on coral reefs via a number of routes and can eventually lead to the replacement of the coral community with various flora and fauna (e.g. attached algae, seagrasses and detrital/filter feeders). Chlorophyll a appears to be the best water quality indicator of eutrophication and a eutrophication threshold value at or below an annual mean of 0.5 mg m?3 is suggested. The concentrations of nutrients N and P associated with the onset eutrophication in coral reef communities are less well defined (annual mean DIN ? 1 ?M; P-PO4 ? 0.1?0.2 ?M) but are in accord with eutrophication threshold levels for sensitive freshwater ecosystems. The proliferation of nitrogen fixing algae in pristine coral reef regions highlights the importance of phosphorus and trace components such as Mo and Fe and even soluble organic matter to the overall primary production. The concentration of nutrients and levels of chlorophyll a in some regions of the Great Barrier Reef (GBR) lagoon are comparable to those that would be classed as eutrophic in other coral reef regions of the world. The available evidence points to riverine run-off as the cause of elevated P-PO4 levels in the inner lagoon. Historical evidence indicates that the levels of P-PO4 and phytoplankton growth, and particularly that of Trichodesmium spp, are relatively high in the river affected areas and that the levels may have significantly increased in the inner lagoon over the past 50?60 years. The nitrogen-fixing ability of Trichodesmium suggests that increased levels of P alone may be driving increased levels of primary productivity in the lagoon. It is hypothesized that the riverine-promoted eutrophication is a significant factor in the demise of fringing reefs in the inner GBR lagoon. The recorded levels of nano plankton growth in some river-affected regions of the GBR lagoon are sufficient to promote the survival of Acanthaster planci (crown of thorns starfish) larvae and as such eutrophication could well be a principal causative factor of the crown of thorns outbreaks. Elevated levels of nutrients and algal growth occur in some outer regions of the GBR but these appear to be due to natural phenomena. The high background concentrations of nutrients and phytoplankton in both the inner and outer GBR, whether they are natural or not, demands that special precautions be exercised in the control of sewage effluents and run-of in the vicinity of coral reefs.

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