Attachment 2

Plenary Address 1
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REEFS IN TURBID AND POLLUTED WATERS: WHY THE FUSS?

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Great beauty, high diversity and healthy recolonisation characterise the few turbid inshore coral reefs of the Great Barrier Reef that remain in near-pristine condition. By contrast, other inshore reefs are severely degraded, and some consider pollution, in the form of increased supply of land-derived nutrients, sediments and pesticides, to be a major cause of their degradation. At local scales, pollution impacts are well documented and accepted, however, at regional scales, pollution is frequently denied to be a cause of reef degradation, and indeed causal links have been difficult to demonstrate. This is due to factors such as (a) a lack of historic data, (b) high spatial and temporal variability in pollutants, (c) the background of other forms of disturbances, and (d) non-linear responses of organisms to pollution. Overall, pollution appears to be a lesser threat for coral reefs than coral bleaching or destructive fishing. However, unlike many other forms of disturbances, many pollutants accumulate and are stored in the system, thus system responses may become chronic once the system's buffering capacity is exhausted.

Here, I will examine various links between inshore reef degradation and pollution. This will comprise a review of field and laboratory data from many parts of the world, followed by presentation of new experimental and reef ecological studies. It will include the characterisation of the ecological properties of near-pristine inshore reefs, and will contrast these with reefs frequently exposed to river plumes from agricultural areas. I will then identify the two most likely mechanisms for reef degradation in regions exposed to pollution. Additionally, potential secondary mechanisms of pollution will be discussed, such as the enhanced survival of crown-of-thorns larvae, which may have profound effects on the wider ecosystem.

Pollution and reef degradation is a complex issue and there are many threads of evidence of varying strengths to be considered, e.g. field studies with notoriously imperfect controls and laboratory experiments that oversimplify natural systems. It is not surprising that simple hypothesis tests are unable to resolve such complex questions. After all, it took decades of extensive and expensive research until epidemiologists established sufficient weight of evidence linking cigarette smoking with lung cancer– a link that is obvious in hindsight. As scientists, we need to synthesize multiple and complex sources of information, weigh the evidence, quantify effect sizes, and predict the ecological consequences and socio-economic costs of alternative actions. It is then up to a better informed society to decide how much ecological change is acceptable.