Are Process Indicators Better Than Inventory Indicators For Determining Estuarine Ecosystem Health?

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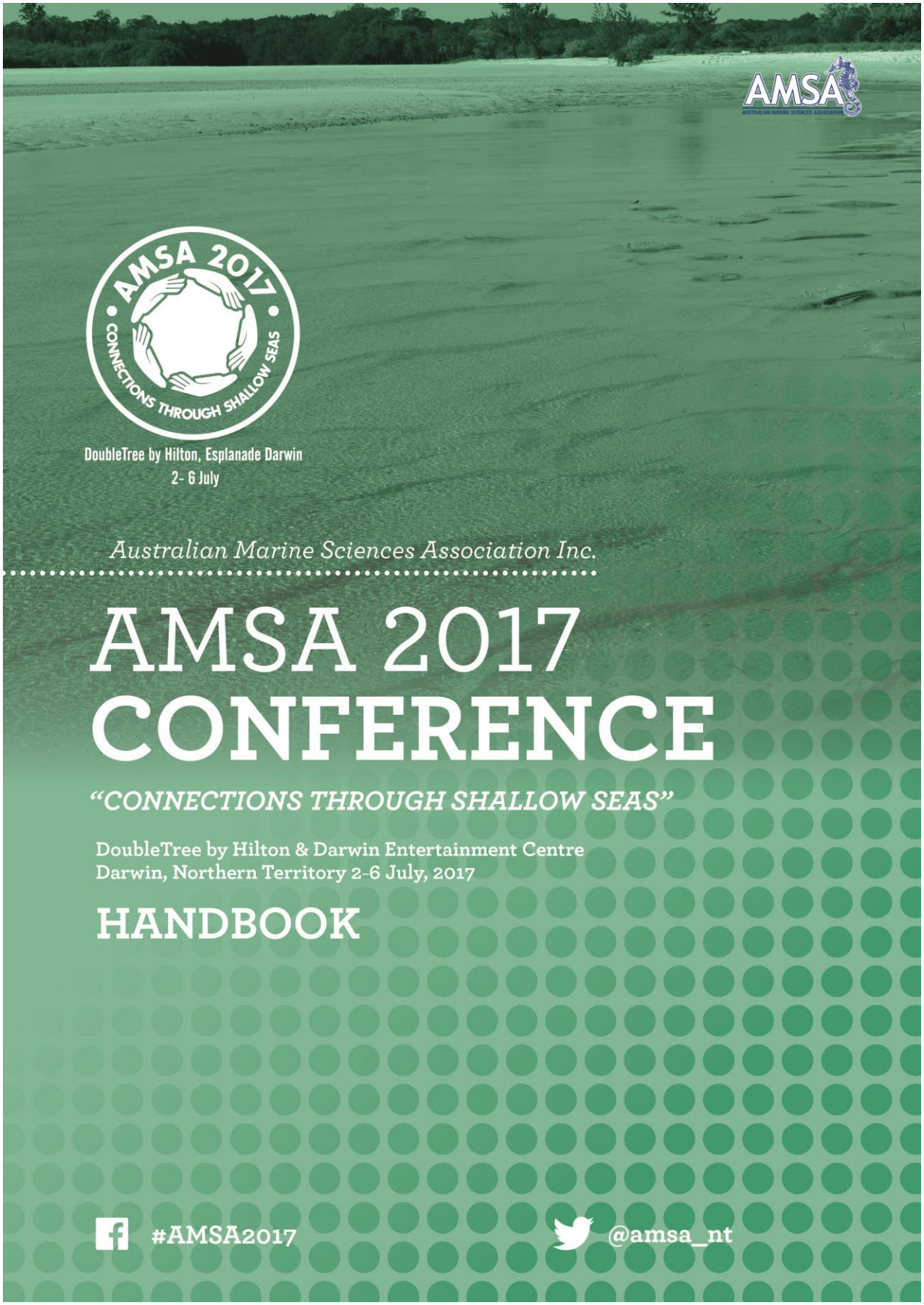
Lengthy data time-series are normally required to describe water quality improvements in seasonal estuaries. Information about the onset of eutrophication may point to likely timeframes for improvements from mitigation measures, but the onset has been difficult to describe, because of a lack of representative historical data when human impacts commenced. For the Swan River, early media reports documented significant macroalgal accumulations in the 1930s in Perth Water, associated with discharges from primary-treated sewage upstream of the Causeway. For the Peel-Harvey Estuary, accumulations of macroalgae were reported anecdotally from the late 1960s, a decade after widespread clearing, draining and fertilizing of acid leaching sands adjacent to catchment waterways. Limited historical TP data were available for the Swan and Peel-Harvey estuaries from the late 1940s, but regular inventory monitoring did not commence until the 1970s. No historical water quality data were available for other southwest estuaries. The nutrient-responsiveness of estuarine periphyton assemblages was postulated as a process, to provide early warning for the onset of eutrophication. Periphyton zone-enrichment studies were undertaken in southwest estuaries. Various rates of slow-release nutrients were introduced around glass plates anchored in situ for 7 days. Installations were located at the downstream end of estuaries extending upstream toward the upper limit of the tidal signal. Periphyton response measured as ash-free dry weight, was broadly related to ambient water quality conditions for zero nutrient additions at all sites and estuaries, with upstream sites having the highest periphyton accumulations. The response of periphyton to additions of nutrients was significant at sites in highly nutrient-enriched west-coast estuaries, like the Swan and Peel-Harvey. Periphyton nutrient response was noted, but was less for south-coast estuaries having a reduced history of nutrient enrichment, such as Hardy and Wilson Inlets and Oyster Harbour. There was almost no response to added nutrients for pristine ocean and estuarine sites. Periphyton accumulation and nutrient response over a 7-day period during the summer flow minima was consistent with nutrient-enrichment history measured by water column nutrient levels over much longer time periods.



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