

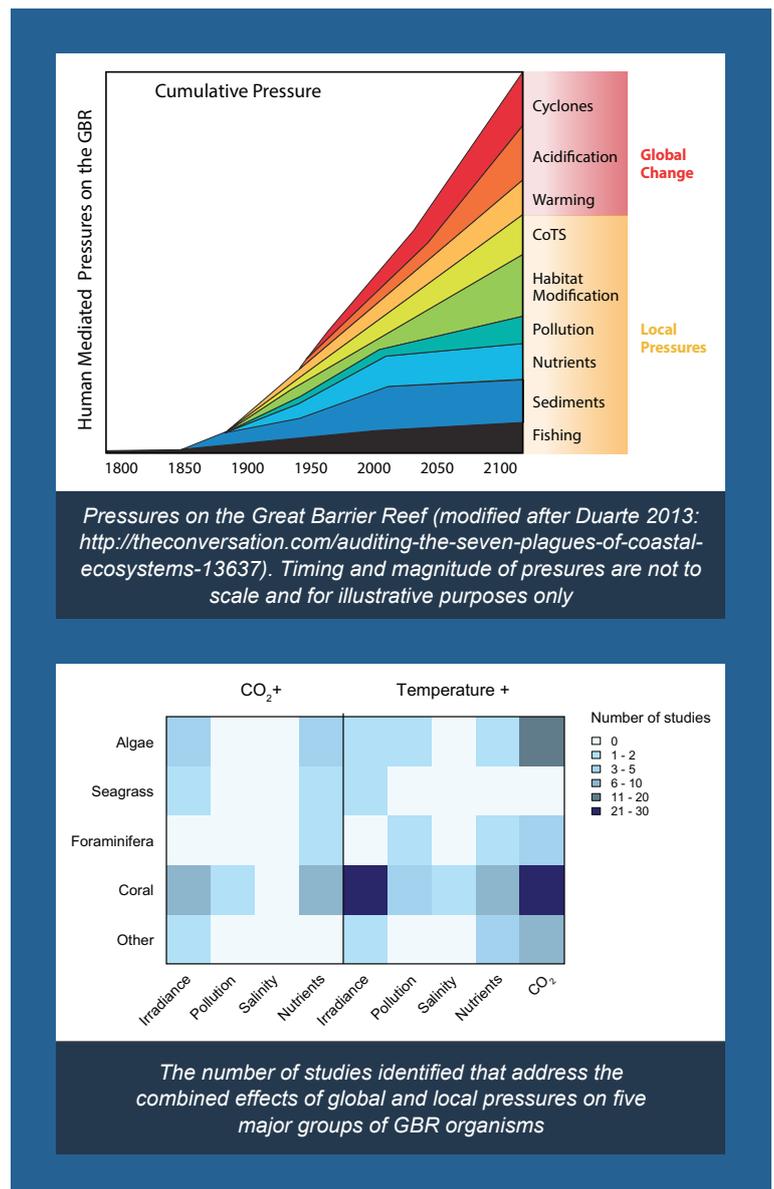
Project 1.6 Multiple and cumulative impacts on the GBR: assessment of current status and development of improved approaches for management

The Great Barrier Reef (GBR) is facing a suite of pressures and its status was recently assessed as poor and declining (GBRMPA Outlook Report 2014). Impacts on the GBR's values do not occur in isolation but overlap in time and space, reducing its health and resilience. Understanding cumulative pressures and their impacts has become a priority for environmental policy, management and conservation globally. In Australia, it is imperative to improve our understanding of cumulative impacts from global and local stressors, and the ability to attribute those impacts to specific drivers and activities, as reflected in the Reef 2050 Long-Term Sustainability Plan. Despite such prioritisation, reef managers currently rely largely on qualitative tools to assess risks from cumulative impacts associated with development proposals.

This NESP Project focuses on coral reef environments and provides: (i) a comprehensive review and synthesis of existing tools, and qualitative and quantitative studies that describe the cumulative impacts of local and global pressures on reef organisms and processes; (ii) an overview of important knowledge gaps and future research priorities; and (iii) a roadmap to develop a practical framework (incorporating quantitative approaches for assessing risks of multiple stressors) to support the assessment and management of cumulative impacts on the GBR.

The literature review on cumulative impacts identifies important gaps in the information needed to guide effective management decisions and identify potential solutions.

Our review of statistical and ecotoxicological methods identified a suite of techniques to analyse complex data and better interpret cumulative impacts. We identified risk and exposure maps, as a key tool to inform management decisions (e.g. for the purpose of assessing permit applications). The report presents a prototype for an improved method to produce risk maps, through incorporating: (i) spatially explicit data on the temporal variability of pressures, and (ii) improved mechanistic understanding of how multiple pressures interact and what the ecological consequences are.



In the report, we summarise our findings in a **Roadmap for cumulative impacts research and management**. In short, the Roadmap provides a framework for how different quantitative approaches can support the assessment and management of cumulative impacts on the GBR.

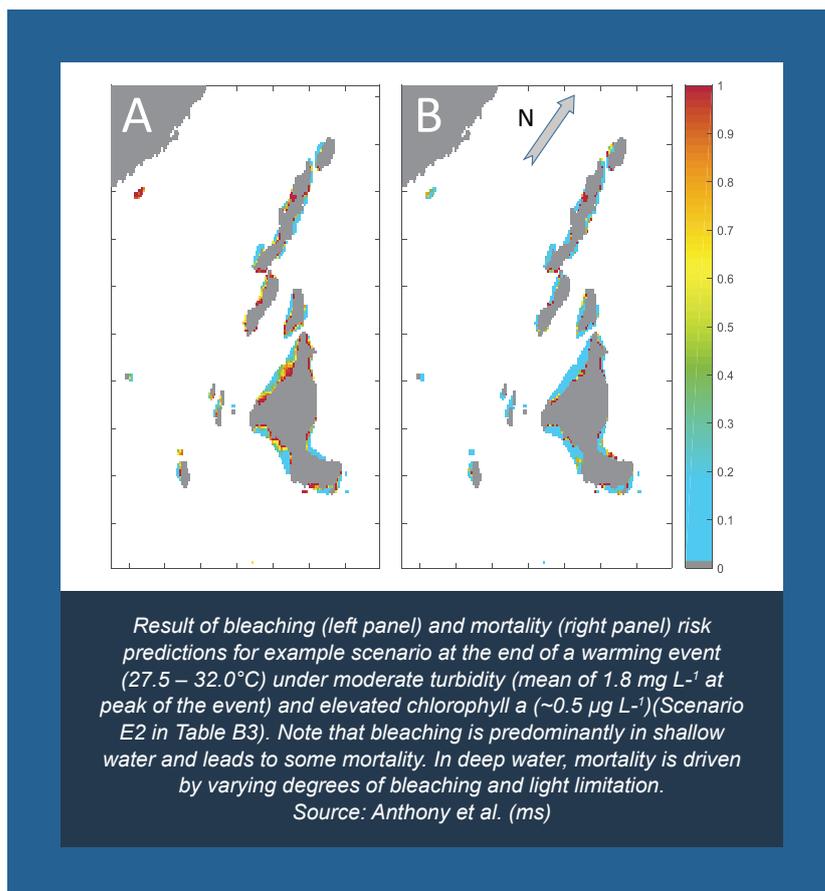
Simple, linear changes in ecosystems are rare. It is likely that ecological thresholds, under multiple pressures, are different from physiological thresholds observed under single or multiple pressures. Such thresholds and responses also likely vary over time, through either acclimatisation of organisms that ameliorate pressures, or accumulation of effects that exacerbate the responses to pressures. Predictions without experimental or field confirmation of response mechanisms may lead to false conclusions, and hence misguided management investment.

Addressing these complexities needs to be the focus of further research to provide an improved knowledge base for the assessment of cumulative impacts on GBR reef environments. The development of a toolset will need to specifically identify:

- Pressure combinations that represent high risk;
- Spatial distribution and intensity of cumulative pressures to generate exposure and risk maps;
- Responses of key ecosystem values (e.g. corals and fish species and habitats) to changing environmental conditions; and
- Critical pressure thresholds for these responses.

The recently commenced NESP Project 2.1.6 “From exposure to risk: novel experimental approaches to analyse cumulative impacts and determine thresholds in the GBRWHA” is designed to address some of these key science needs.

The full report for Project 1.6 can be found at: <http://nesptropical.edu.au/wp-content/uploads/2016/05/NESP-TWQ-1.6-FINAL-REPORT.pdf>.



Further information

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