

Science-Based Policy Plan for Australia's Coral Reefs

17th March 2017

Summary: Australia's coral reefs are currently under threat from a range of short- and long-term stressors. The ability of corals to recover from acute disturbance events, such as bleaching, cyclones and crown-of-thorns outbreaks, is greatly influenced by the multitude of stressors reefs are currently experiencing (1). In summer 2015/16, the Great Barrier Reef (GBR) experienced the worst bleaching event on record (Figure 1), with almost 50% of reefs experiencing severe bleaching (>60% of corals bleached), and less than 10% of individual reefs escaping the bleaching entirely (2). Similarly, bleaching was also observed in northwest reefs in Western Australia (2). Critically, the GBR is currently (March 2017) experiencing another major bleaching event. The occurrence of two major bleaching events in consecutive years is unprecedented and highlights the need for immediate action. Coral reef bleaching is a relatively recent phenomenon, resulting in widespread decreases in structure, biodiversity and resilience (3). Since healthy coral habitat is essential for the persistence of associated fish and invertebrate communities, as well as the industries that rely on them, contributing over \$15 billion per annum to Australia's economy (4), all possible action must be taken to reduce stress factors to corals and associated organisms. Positive, practical changes to current reef policies could help reverse the decline in the health of Australia's coral reefs and increase the viability of all the industries associated with reefs. In addition, we highlight ways to build resilience in Australia's coral reefs to protect from harmful human impacts.

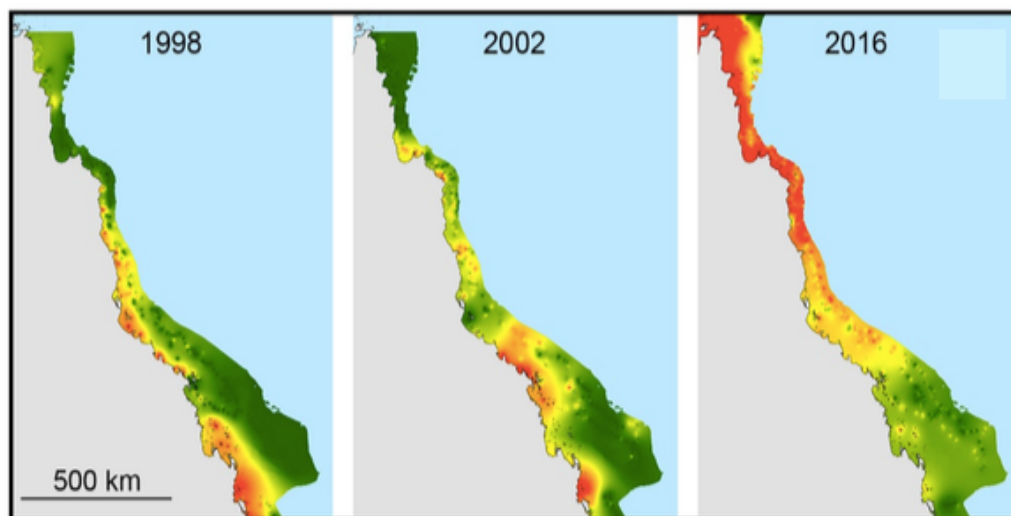


Fig 1: Footprint of bleaching severity for three major bleaching events on the GBR.

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President:	Dr Andrew Hoey; Tel: 0458 174 583; Email: andrew.hoey1@jcu.edu.au
Vice-President:	Dr Anna Scott; Tel: 02 6648 3923; anna.scott@scu.edu.au
Hon Secretary:	Dr O. Selma Klanten; Tel: 0417 341 941; Email: osklanten@me.com
Hon Treasurer:	Dr Jennifer Donelson; Tel: 0402 062 046; Email: jennifer.donelson@my.jcu.edu.au

Below is a list of issues that the **Australian Coral Reef Society** sees as the key stressors affecting coral reefs and proposed policy changes that could mitigate their effects.

- 1. Climate change:** The greatest and most pressing challenge currently facing the reefs of Australia is climate change, which affects the reef through warming sea surface temperatures, ocean acidification, increasing storm intensity and rising sea levels (5). Projected changes expected to occur in the first half of this century will have profound negative effects on the health and survival of reef organisms, including corals, invertebrates and fish species (6-10). Ongoing ocean warming will also increase the frequency and intensity of mass bleaching events (2) (Figure 1). **Firm action on greenhouse gas emissions is urgently needed if Australia is to avoid losing coral reefs as we know them.**

Suggested policy goals:

- Transition away from fossil fuels (e.g. **no approval of new or expansion of existing coal mines or ports, including clean coal**)
- Invest in renewable energy technology (e.g. via consumer rebates, R & D tax breaks)
- Establish rapid and ambitious government targets for reducing greenhouse gas emissions

- 2. Port development:** Port development leads to a range of impacts for coral reefs, primarily due to dredging for shipping channels, increased shipping activity and introduction of contaminants from materials that are in transit (11). Increased suspended sediment and contaminants from dredging can smother corals by reducing light levels and subsequently photosynthesis of organisms. Effects of increased suspended sediments have been shown to cause deformities during development in fish (12), decreased recruitment and settlement of invertebrate larvae (13). Further, coal dust concentrations commonly found in waters along shipping routes cause severe deformities and mortality in a wide range of species crucial to coral reef ecosystems (14).

Suggested policy goals:

- Stop development of new ports and expansion of existing ports
- Restrict shipping channels to narrow corridors adjacent to ports, and ban long-shore shipping within the GBR lagoon
- Minimise pollution from goods in transit, such as coal, lead, zinc, nickel and copper, by requiring sealed covers for all carriers of materials (e.g. ships, conveyor belts, trains and trucks)
- Institute a total ban on dumping of capital and maintenance dredge spoil at sea; require all dredge spoil be disposed of properly on land away from wetlands and waterways

- 3. Water quality:** As more coastal areas are cleared for agriculture, coastal development and roads, inshore coral reefs are increasingly exposed to high levels of nutrients, sediments and pollutants through land-based runoff that increase turbidity and reduce light availability (15). These changes have led to reductions in coral diversity and coverage on inshore reefs. Under these conditions, macroalgal communities often replace corals, as algae grow well under high nutrient loads, while corals photosynthesise poorly under lowered light availability (16, 17).

Suggested policy goals:

- Reinstatement of vegetation management legislation in Queensland to minimise land clearing, particularly in the vulnerable Great Barrier Reef catchment
- Manage fertilizer and pesticide use by the agricultural sector (e.g., reduce use, provide greater regulation and mandate records)
- Restore riparian zone vegetation (i.e., the marginal areas between land and rivers/streams) vegetation, including seagrasses and mangroves, to capture runoff and reduce topsoil erosion before it reaches the ocean
- Develop an ecosystem-based assessment protocol to determine nutrient reduction targets for specific catchment areas along all coastal reef areas, which would allow for flexible, site-specific nutrient reduction targets

- 4. Fisheries:** Australia's reefs have been well protected by marine reserves and fisheries regulations. Yet, evidence shows that where fishing occurs, there can be significant consequences for reef ecosystems. For instance, loss of top predators disrupts the equilibrium of the food chain, affecting the survival and behaviour of species lower in the ecosystem hierarchy (18-20). In addition, healthy populations of herbivorous (plant-eating) fish species are needed to keep macroalgal growth in check, particularly following major disturbances (e.g. bleaching), and thereby promote the recovery of corals (21-23). Designing fisheries regulations in line with ecosystem-based management principles has the potential to mitigate many of the negative effects of fisheries.

Suggested policy goals:

- Implement strict limits on the harvest of long-lived, slow-reproducing species (e.g. sharks) and set sustainable catch limits for top predators (e.g. coral trout) on Australia's coral reefs
- Ban harvest of herbivorous fishes to provide 'insurance' against future disturbances
- Increase spatial protection (e.g. increase no-take marine park zones) for fish in important life stages, including juvenile nursery grounds and spawning aggregation zones, which will likely increase fisheries yields

- 5. Crown-of-thorns seastars:** Outbreaks of crown-of-thorns seastars (COTS) are one of the greatest contributors to coral loss on Australia's coral reefs. COTS are voracious coral predators, with individual CoTS capable of consuming 1 – 3 m² of coral per day (24). Given the slow-growing nature of corals, COTS outbreaks have led to rapid destruction of coral reefs on local scales.

Suggested policy goals:

- Increase protection of known COTS predators (e.g. pufferfish, triggerfish)
- Develop an integrated management plan for the rapid detection of CoTS outside of outbreaks and triggers for the implementation of CoTS control measures

- 6. Marine debris pollution:** Marine debris is becoming a large issue that is affecting coral reefs in Australia. Worldwide, areas such as the Pacific Garbage Patch have concentrated large amounts of marine debris, totaling ~250,000 tons (25). In particular, studies have shown microplastics (<5mm) to have severe effects on reproduction and physiology of marine animals (26).

Suggested policy goals:

- Ban non-biodegradable single-use plastics (e.g. cups, bags, plates, and cutlery) and microbeads (e.g. in personal care)
- Strict packaging guidelines and regulations promoting reduced use of plastics in conjunction with community education and increased cleanup efforts

- 7. Compliance and management:** Compliance is essential for the effectiveness of marine management policies. Therefore, investment in infrastructure that promotes compliance and increases enforcement is essential for the success any new legislation (27).

Suggested policy goals:

- Increase the presence of patrol boats in marine protected areas (MPA) to increase enforcement and compliance of zoning regulations
- Implement an accessible information system for recreational and commercial fishers on zoning, particularly temporal closures
- Install additional moorings within marine parks to reduce anchor damage to vulnerable habitats and promote tourism

- 8. Beach erosion:** Production of carbonate sands on coral reefs is vital to the maintenance of coral reef beaches. The majority of these coral reef sands are composed of the eroded skeletons of a range of species, including corals, molluscs and tiny foraminifera (28). As sea levels are currently rising, beach erosion has become a major concern on the islands of the Great Barrier Reef and beaches around the coast of Australia (15). A range of endangered species, including sea turtles and seabirds, rely on coastal habitat for nesting grounds.

Suggested policy goals:

- Implement policy changes to combat climate change and resultant sea level rise (see “Climate change” above)
- Protect beach habitat and areas of high sand production from sand-harvesting and limit destructive coastal development around them
- Reseed damaged beach habitat with living organisms (e.g. corals, foraminifera, molluscs), from areas with high sand production to encourage a continued source of sand

- 9. Anthropogenic noise:** Noise pollution from recreational boats, commercial vessels and container ships is often overlooked as a major stressor to marine habitats. Underwater noise has been shown to affect a wide range of marine species, notably marine mammals and fishes, which rely on acoustics for important processes like foraging, communication and navigation. Sound travels approximately four times faster in water than air due to pressure differences, and therefore noise pollution can often have far-ranging and unexpected impacts on marine communities (29-31).

Suggested policy goals:

- Implement quiet sanctuaries by incorporating noise into MPA spatial planning
- Create noise buffer zones for shipping lanes (e.g. position shipping lanes to maximise distance to coral reefs so that noise dissipates prior to reaching these habitats)

- Implement legislation requiring proper servicing of boat motors (e.g. engine mounts and mufflers to reduce vibrations and noise) to keep noise to a minimum

ACRS would be happy to provide additional information on the above as required.

Sincerely,



Dr. Andrew Hoey
ACRS President

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