



Australian Coral Reef Society Inc

Promoting the scientific study of Australian coral reefs

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Submission by the Australian Coral Reef Society Inc to the Senate Rural and Regional Affairs and Transport References Committee (RRAT) regarding:

The identification of leading practices in ensuring evidence-based regulation of farm practices that impact water quality outcomes in the Great Barrier Reef

The Australian Coral Reef Society (ACRS) is the world's oldest group of coral reef scientists and conservationists, and the Society has been actively leading coral reef research since 1922. In recent years, the Great Barrier Reef (GBR) and catchment areas have been exposed to extensive habitat degradation and diminishing water quality. Thus, the ACRS strongly supports the request initiated by the Senate for an inquiry and report from the RRAT in regard to the regulation of farm practices that impact water quality in the GBR.

Response to: "a. the existing evidence-base on the impact of farm water runoff on the health of the Great Barrier Reef and catchment areas"

The two largest threats to the GBR are water quality from land-based pollutants and climate change. Urgent and efficient action is necessary to curb the impacts of both threats on the GBR, as many habitats are deteriorating accordingly. It takes several years for management practices to improve the effects of poor water quality on aquatic systems. Without immediate action, water quality will remain in poor condition in the GBR, and will continue to threaten ecosystem health. Currently, poor water quality is known to increase invasive and harmful species, reduce seagrasses, corals, and algae, disrupt nutrient cycling, fertilization in invertebrates, and hormone production in vertebrates (Au et al., 2001; Bell, 1992; Brodie and Landos, 2019; Bryan et al., 1979; Chislock et al., 2013; Duckworth et al., 2017; Katagi, 2010; Kroon et al., 2017; Saunders et al., 2017; Walczak and Reichert, 2016; Weber et al., 2012).

Climate change and poor water quality from land-based run-off are the highest risk threats to the GBR in the Great Barrier Reef Marine Park Authority's 2019 Outlook Report. Every five years, the report synthesised multiple lines of evidence to produce a 'state of the region' and the changes the GBR has faced since previous reports. The 2019 Outlook Report underlines the need for immediate action on both climate change and water quality in order to reduce anthropogenic impacts and improve the outlook of the GBR. The report emphasizes that sediment and nutrient loads from land-based run-off are the leading problems facing the region, and mentions 'water quality' more than 170 times. Agriculture is the overwhelming contributor to poor conditions of water quality in the GBR, with cattle and sugarcane industry generating the greatest impact. Additionally, certain areas of the GBR are threatened by high concentrations of pesticides (especially the Mackay-Whitsunday region), which is downstream of a large portion of sugarcane industry. The accumulated threats of sediment and nutrient input, with additional localised input of pesticides, need to be addressed urgently to provide the GBR with an opportunity to recover from its current state.

Every four to five years, a large team of policy makers and expert scientists prepare a Scientific Consensus Statement in which all recent research is reviewed and discussed at length. These control measures provide an unbiased detailed analysis on the current state of many aspects affecting the

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natural world. The 2017 Scientific Consensus Statement specifically reviewed the current state of water quality on the GBR and how it has changed since 2013. The statement reviewed many sources of pollutants, and stressed that agricultural diffuse sources are the dominant contributors to land-based pollutants that are affecting the water quality of the GBR. Primary pollutants to the GBR and catchment areas are sediment, nutrients and pesticides, and each pollutant impacts at different scales and locations. For example, one of the highest risk-producing pesticides is diuron, which is a general-use herbicide that is used in many agricultural crops (e.g. fruit, cotton, sugarcane, legumes) to control for a large number of weeds. The highest priority areas for reducing pesticides are Plane, Pioneer and Haughton catchments. Inshore coral reefs are especially vulnerable to land-based run-off, and current impacts, including agricultural practices and past and ongoing catchment development, need to be managed effectively and immediately.

Response to: “d. proposed changes to regulations that would impact on farm productivity and the potential benefits and costs of such proposed regulation”

Review reports, programs, and improvement plans are essential to the continued monitoring and management of water quality and farm practices in the GBR. Combined, the following reports and plans highlight the current state of water quality, emphasize what areas are especially vulnerable, and suggest improvements that are necessary to ameliorate the current trajectory of the GBR:

- Great Barrier Reef Marine Park Authority Outlook Report
- Scientific Consensus Statement
- Great Barrier Reef Marine Park Authority’s Marine Monitoring Program
- Paddock to Reef Integrated Monitoring, Modelling, and Reporting Program
- Reef 2050 Water Quality Improvement Plan 2017-2022
- Reef 2050 Long-Term Sustainability Plan
- 2019 Reef Report Card

Currently, few areas are adopting land management practices that will improve water quality in the GBR. The Reef 2050 plan, which underlines required changes for the improvement of the GBR, emphasizes the following targets by 2025: reduction in anthropogenic end-of-catchment loads of inorganic nitrogen by 60%, particle nutrients by 20%, sediments by 25%, and pesticides to protect 99% of aquatic life. Thus, additional regulations are required to reinforce the reduction of the land-based run-off from farming in many areas. For example, more stringent testing and better applicators of pesticides need to be implemented for chemicals that are currently on the market and for those that are proposed for future use before customer purchase. Impacts of pesticides need to be tested on freshwater, saltwater, and brackish flora and fauna separately in order to understand the scope of impact. Brodie and Landos (2019) evaluate the current ecosystem impacts and management practices of pesticides on the GBR, and propose regulatory and management changes that have the potential to improve the GBR health.

Further management practices should try to limit the spread of land-based run-off from farms and catchment development. Current regulations need to be reinforced and greater incentives and assistance should be implemented making it easier and economically viable for farmers to adopt landscape remediation and conversion scopes. In doing so, biodiversity will be increased in farmed areas and there will be a reduction in the extent of run-off. In the 2017 Scientific Consensus Statement, current management options are assessed for their effectiveness, and the report finds that



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improvements are necessary. Social and economic factors need to be more interlaced in assessment protocols, additional support and resources are warranted, and alternative solutions need to be sought out to improve water quality on a large scale. According to the 2019 Great Barrier Reef Marine Park Authority Outlook Report, voluntary arrangements for farmers are inadequate, and new legislations are needed to increase the compliance and uptake of better management practices.

Current initiatives do not meet water quality targets, which reiterates the need for improvements to governance, program design and delivery, and on-ground management and reinforcement. In the 2019 Reef Report Card, sugarcane and cattle grazing were the two largest contributors to water quality, and both have not met targets for best management practices. By 2025, both industries are supposed to meet 90% target of best practices across priority areas. Currently, only 9.8% of sugarcane land exhibit best practices, and only 35.8% for cattle grazing. Since 2016, there has been very limited progress in meeting these targets by both industries. Immediate changes to initiative regulations need to be undertaken to reach targets for 2025, otherwise water quality will continue to disrupt important processes in the GBR.

Wetland and treatment systems should also be monitored more closely and frequently to confirm that they are able to stop the spreading of land-based run-off to the rivers and oceans. New treatment systems need to be implemented as current practices are unable to control for the outflow of excessive sediment, nutrients and pesticides. In the short-term, these improvements will increase economic input into the management upgrades. However, the initial monetary input will be beneficial economically and socially in the long run because future resources will be unnecessary for removing high loads of inflow in the GBR if we can stop them now. More importantly, habitats in the GBR will have less stressors if water quality improves and will have the potential to recover to previously healthy conditions without the onslaught of continued agricultural diffuse sources.

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

Sincerely,

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President, Australian Coral Reef Society

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References

- Au, D.W.T., Lee, C.Y., Chan, K.L., Wu, R.S.S., 2001. Reproductive impairment of sea urchins upon chronic exposure to cadmium. Part I: Effects on gamete quality. *Environmental Pollution* 111, 1–9. [https://doi.org/10.1016/S0269-7491\(00\)00035-X](https://doi.org/10.1016/S0269-7491(00)00035-X)
- Bell, P.R.F., 1992. Eutrophication and coral reefs—some examples in the Great Barrier Reef lagoon. *Water Research* 26, 553–568. [https://doi.org/10.1016/0043-1354\(92\)90228-V](https://doi.org/10.1016/0043-1354(92)90228-V)
- Brodie, J., Landos, M., 2019. Pesticides in Queensland and Great Barrier Reef waterways - potential impacts on aquatic ecosystems and the failure of national management. *Estuarine, Coastal and Shelf Science* 230, 106447. <https://doi.org/10.1016/j.ecss.2019.106447>
- Bryan, G.W., Waldichuk, M., Pentreath, R.J., Darracott, A., 1979. Bioaccumulation of Marine Pollutants [and Discussion]. *Philosophical Transactions of the Royal Society B: Biological Sciences* 286, 483–505. <https://doi.org/10.1098/rstb.1979.0042>
- Chislock, M.F., Doster, E., Zitomer, R.A., Wilson, A.E., 2013. Eutrophication: Causes, Consequences, and Controls in Aquatic Ecosystems. *Nature Education Knowledge* 4, 10.
- Duckworth, A., Giofre, N., Jones, R., 2017. Coral morphology and sedimentation. *Marine Pollution Bulletin* 125, 289–300. <https://doi.org/10.1016/j.marpolbul.2017.08.036>
- Katagi, T., 2010. Bioconcentration, bioaccumulation, and metabolism of pesticides in aquatic organisms. *Rev Environ Contam Toxicol* 204, 1–132. https://doi.org/10.1007/978-1-4419-1440-8_1
- Kroon, F., Streten, C., Harries, S., 2017. A protocol for identifying suitable biomarkers to assess fish health: A systematic review. *PLOS ONE* 12, e0174762. <https://doi.org/10.1371/journal.pone.0174762>
- Saunders, M.I., Atkinson, S., Klein, C.J., Weber, T., Possingham, H.P., 2017. Increased sediment loads cause non-linear decreases in seagrass suitable habitat extent. *PLOS ONE* 12, e0187284. <https://doi.org/10.1371/journal.pone.0187284>
- Walczak, M., Reichert, M., 2016. Characteristics of selected bioaccumulative substances and their impact on fish health. *Journal of Veterinary Research* 60, 473–480. <https://doi.org/10.1515/jvetres-2016-0070>
- Weber, M., Beer, D. de, Lott, C., Polerecky, L., Kohls, K., Abed, R.M.M., Ferdelman, T.G., Fabricius, K.E., 2012. Mechanisms of damage to corals exposed to sedimentation. *PNAS* 109, 9242–9243.