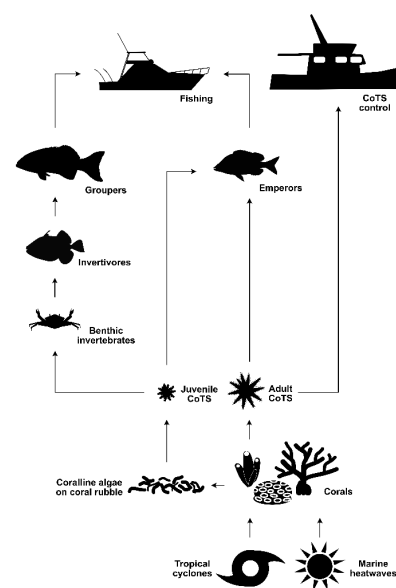


# Evaluating interventions to support the future health of the Great Barrier Reef under climate change

The cumulative pressures of tropical cyclones, coral bleaching and predation by crown-of-thorns starfish (CoTS) have contributed to a significant decline in coral cover on the Great Barrier Reef over recent decades, with further deterioration expected with changes in climate. The Coral Community Network (CoCoNet) model combines cumulative pressures with realistic food web interactions and reef connectivity to provide a platform for testing alternative interventions and adaptation strategies.

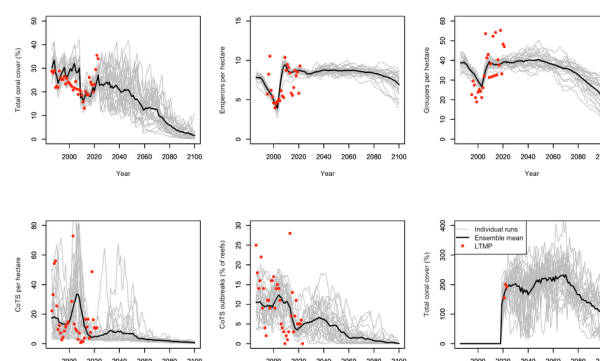
## How does CoCoNet work?

- More than 3800 reefs represented by nodes on a dynamic network, with every reef resolved down to 10 ha sites.
- Predation and competition on each reef involving coral communities and age-structured CoTS and fish populations.
- Exchange between reefs of coral, CoTS and fish larvae based on ocean currents derived using eReefs hydrodynamic models.
- Environmental influences include tropical cyclones, floods, bleaching and ocean acidification under climate change.
- Human interventions such as fisheries zoning, CoTS control, and potential shading, coral reseedling, and rubble stabilisation.
- Extensive calibration against AIMS long term monitoring.
- Uncertainty captured using large ensemble projections.



## Key findings

- CoTS outbreaks at the observed frequency (~15-years) are an emergent property of the model.
- Reef futures are strongly dependent on changes in climate.
- Interventions may delay decline of coral reefs by 1-2 decades, although climate action is key to the GBR's long-term health.
- Combinations of interventions that include CoTS control and shading (e.g. cloud brightening) have the highest efficacy.



## Publications

- Condie et al. (2021) Large-scale interventions may delay decline of the Great Barrier Reef. *Royal Society Open Science* 8. <https://royalsocietypublishing.org/doi/10.1098/rsos.201296>
- Stoeckl et al. (2021) Assessing changes to ecosystem service values at large geographic scale: A case study for Australia's Great Barrier Reef. *Ecosystem Services* 51. <https://doi.org/10.1016/j.ecoser.2021.10135>
- Condie (2022) Changing the climate risk trajectory for coral reefs. *Frontiers in Climate* 4. <https://doi.org/10.3389/fclim.2022.980035>
- Castro-Sanguino et al. (2023) Control efforts of crown-of-thorns starfish outbreaks to limit future coral decline across the Great Barrier Reef. *Ecosphere* 14. <https://doi.org/10.1002/ecs2.4580>
- Condie et al. (2025) Protection of coral reef fish delivers ecosystem-critical biocontrol of coral-eating starfish across the Great Barrier Reef. *Nature Ecology and Evolution* (in review).

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