Impact of the 2015/16 marine heatwave and unprecedented mass bleaching in Kimberley corals

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Natural extreme environments

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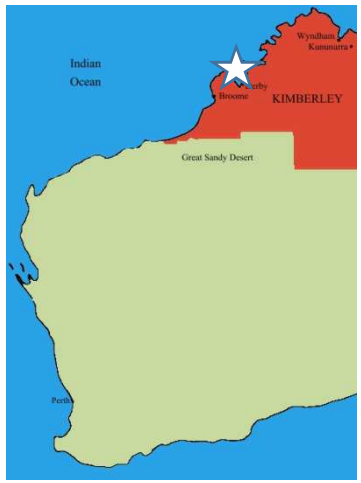
Coral Reef Studies

- Ideal natural laboratories to study coral thermal tolerance

  e.g. the Persian/Arabian Gulf, tide pools of American Samoa, Kimberley region



Study site: Shell Island, Cygnet Bay

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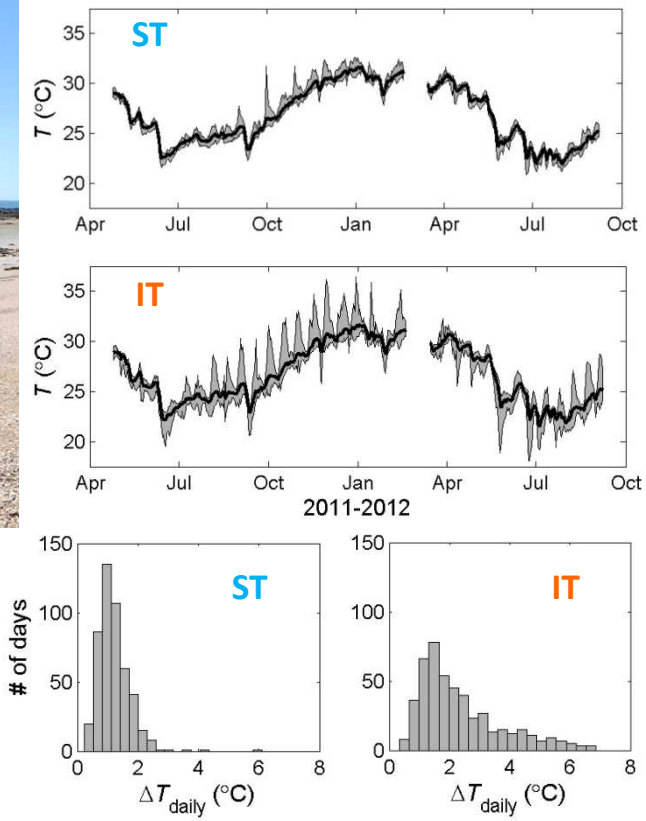

Rarely exposed to air
Up to 3°C daily variation
MMM ~31°C

Regularly exposed to air
Up to 7°C daily variation
Max. temp. of up to 37°C
MMM ~31°C

Schoepf et al. 2015, Sci Rep

Heat stress experiment

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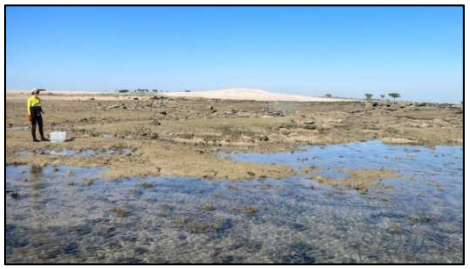
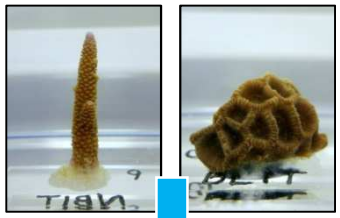
How heat-resistant are corals in such an extreme environment?

Intertidal
(more extreme)





Subtidal
(less extreme)

More heat-tolerant

Less heat-tolerant

Schoepf et al. 2015,
Sci Rep

Heat stress experiment

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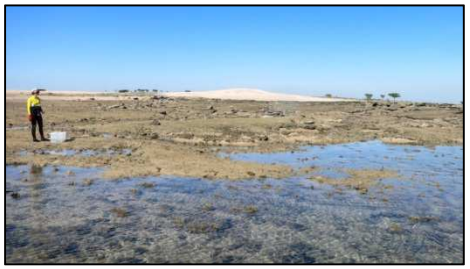
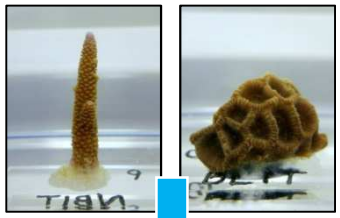
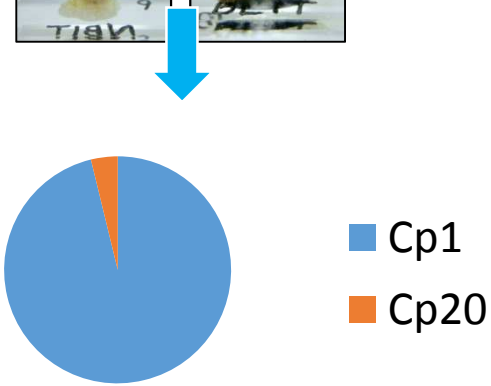


More heat-tolerant





Chloroplast 23S rDNA

Subtidal
(less extreme)

Less heat-tolerant

Schoepf et al. 2015,
Sci Rep

Marine heatwave in 2015/16

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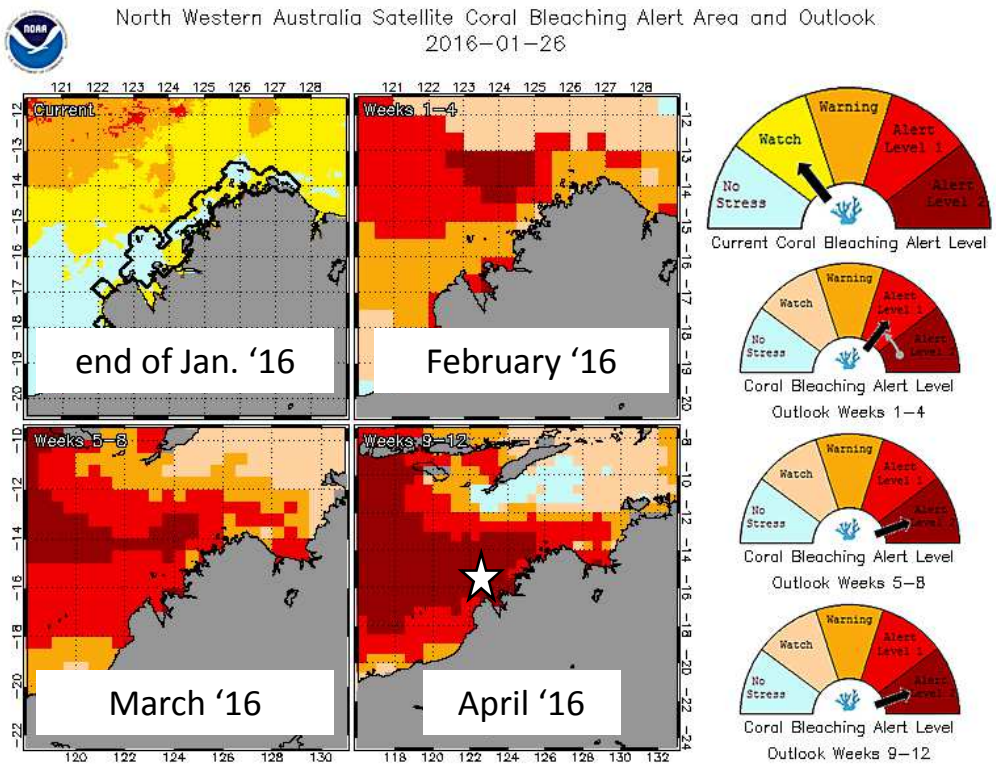

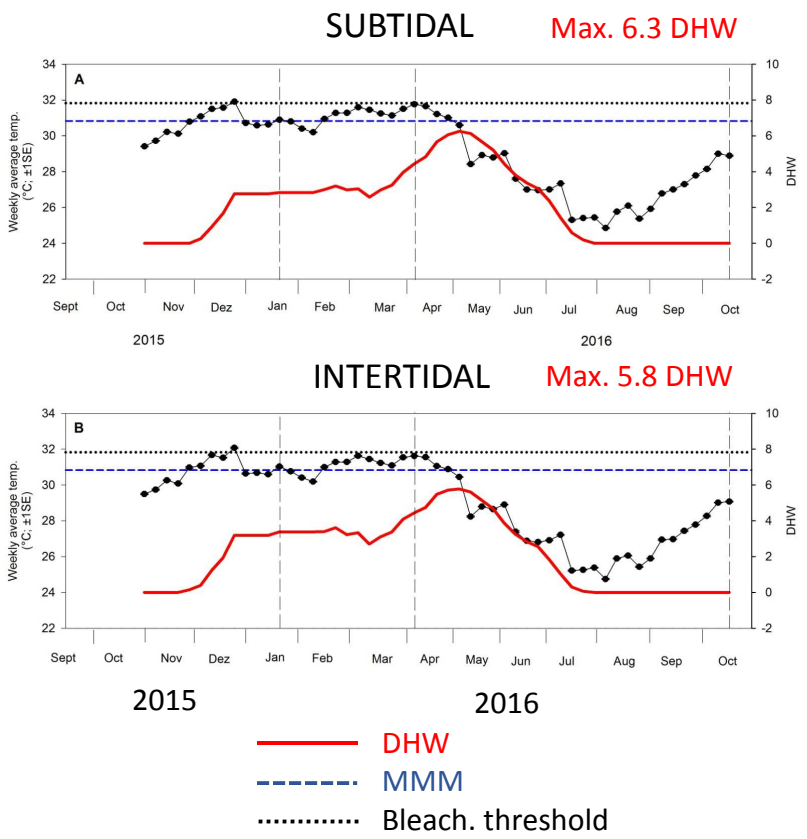

First documented mass bleaching

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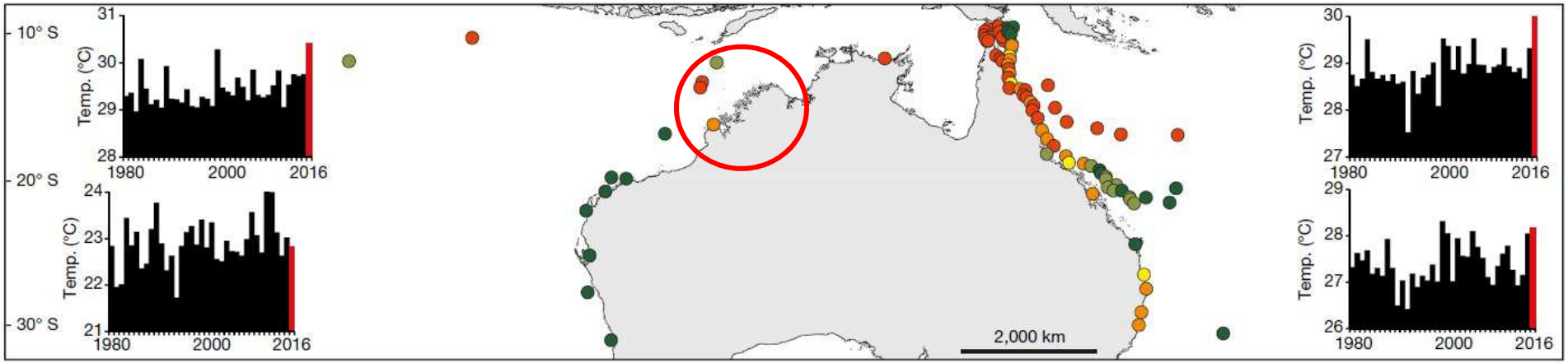
Kimberley region:

- Aerial surveys of ~30 reefs in southern Kimberley
- ~50% bleaching on most inshore reefs
- First documented mass bleaching event in inshore Kimberley
- First regional mass bleaching event in WA during an El Niño year

Hughes et al. 2017, Nature



First mass bleaching event in 2016

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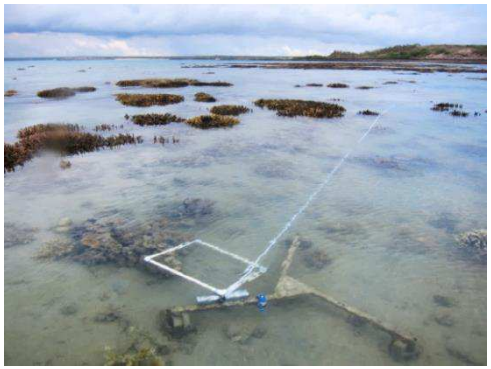
Shell Island *in situ* surveys:

- January, April and October 2016
- Photo-surveys, 6 transects per site
- Tagged colonies
- Collected samples for physiological and genetic analyses
- Most corals were affected, incl. massive and encrusting taxa



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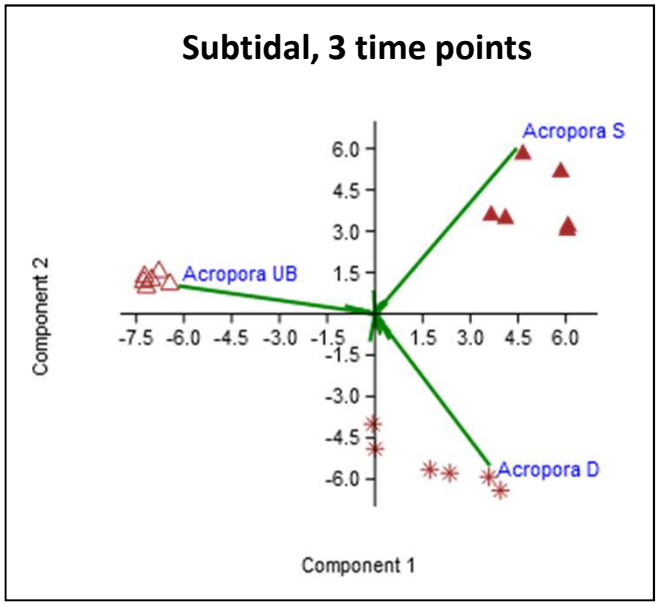
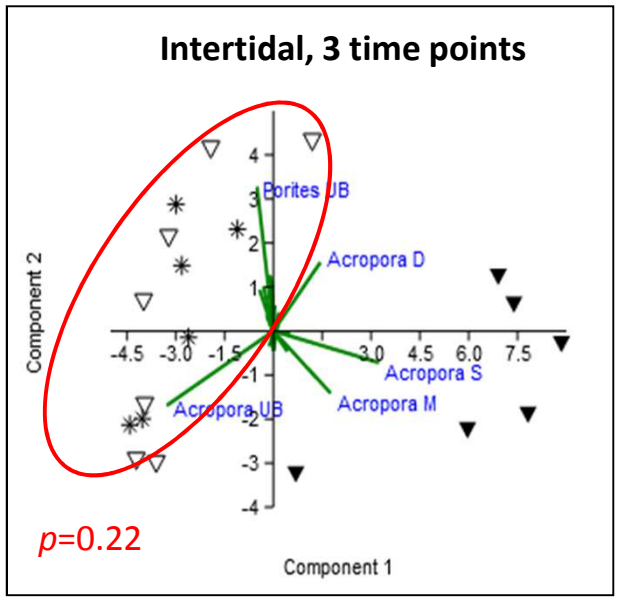
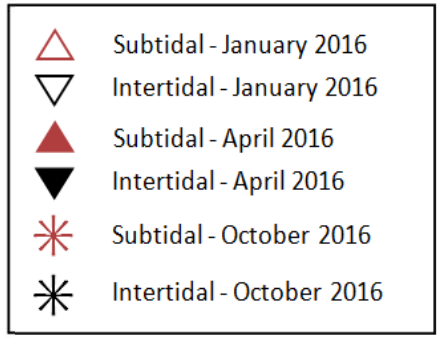




Morane Le Nohaïc

Maria Jung



Le Nohaïc et al. in review; Schoepf et al., in prep.

First mass bleaching event in 2016

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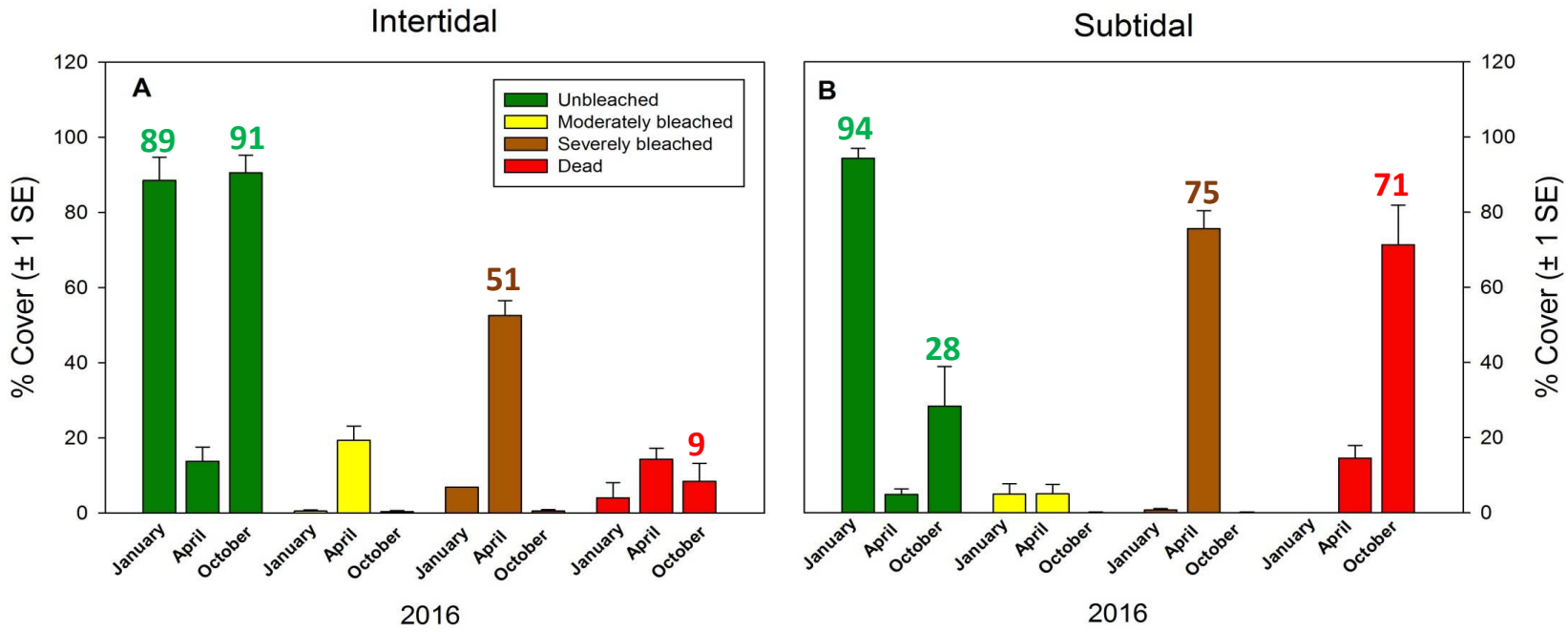

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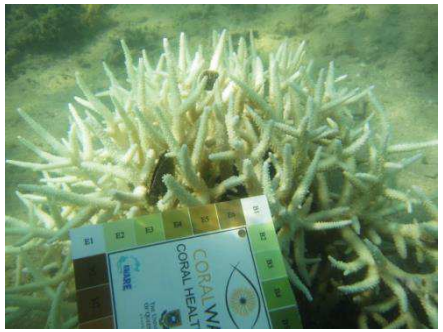
Shell Island tagged colonies:



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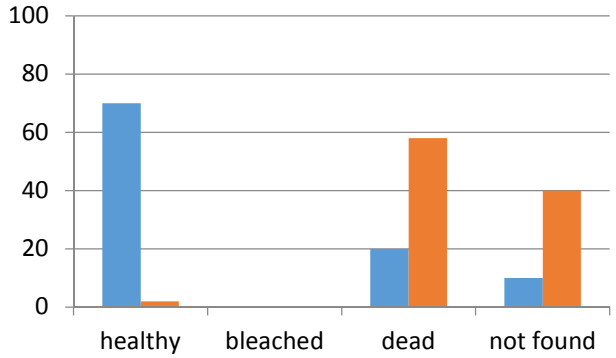
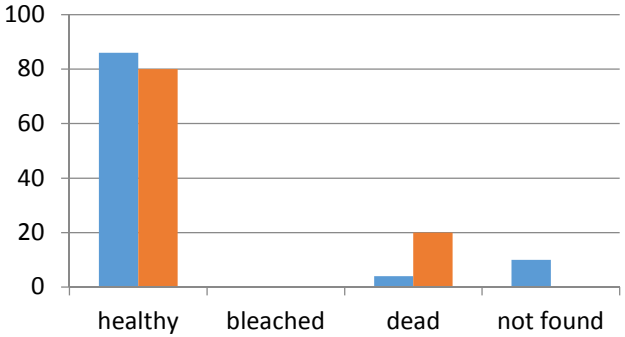
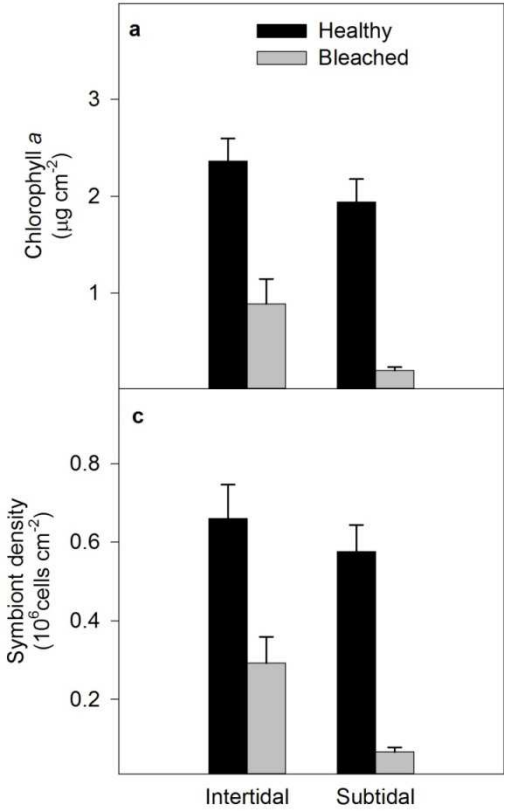
Acropora – Subtidal – Nov. '16



Acropora – Intertidal – Nov. '16





Summary

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- Kimberley corals are extremely stress-tolerant but not immune to bleaching.
- Intertidal coral are more heat-tolerant than subtidal coral.
- The 2015/16 El Niño caused the first mass bleaching in the inshore Kimberley – this was also the first El-Niño related regional bleaching event in WA.
- Intertidal corals showed remarkable recovery capacity whereas most subtidal corals died.