

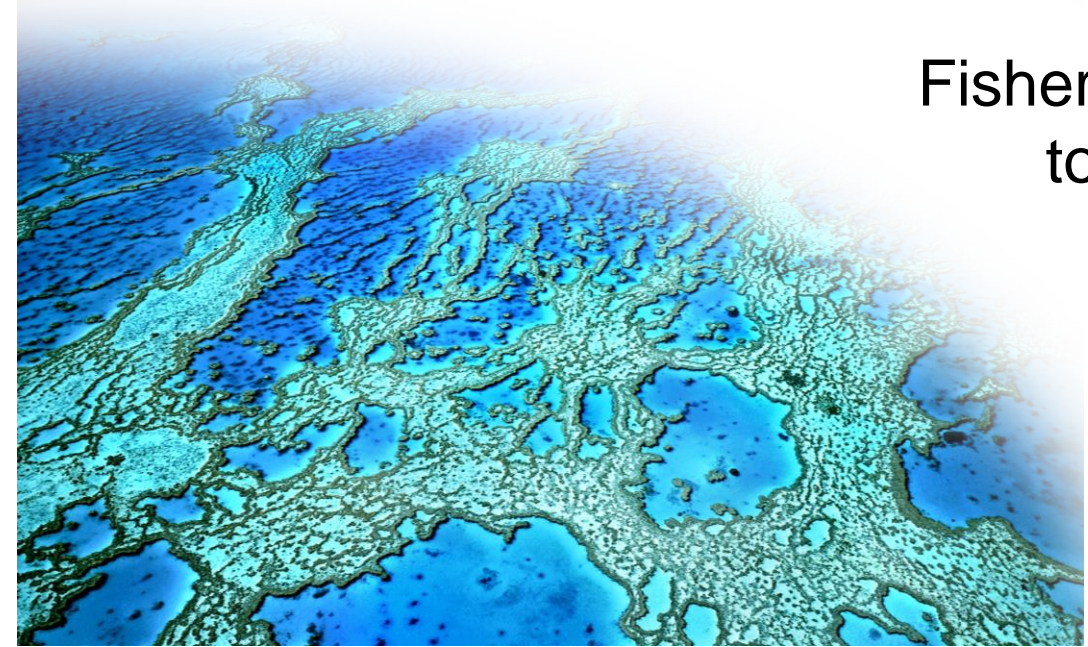
Population Dynamics in an Anthropocene Coral Reef



Protection from storms



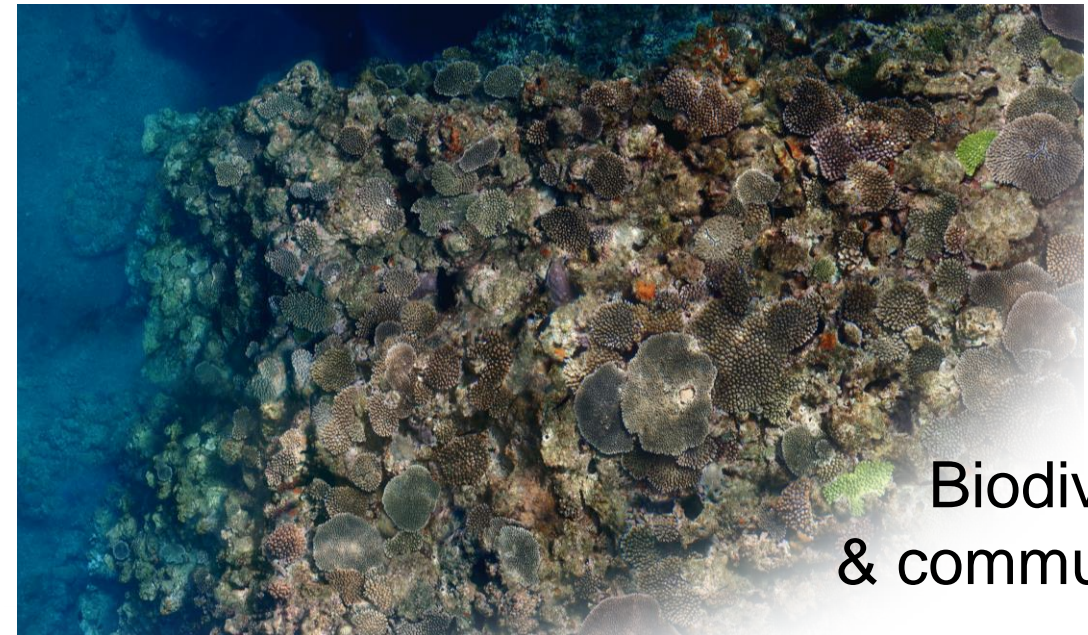
Fisheries & tourism



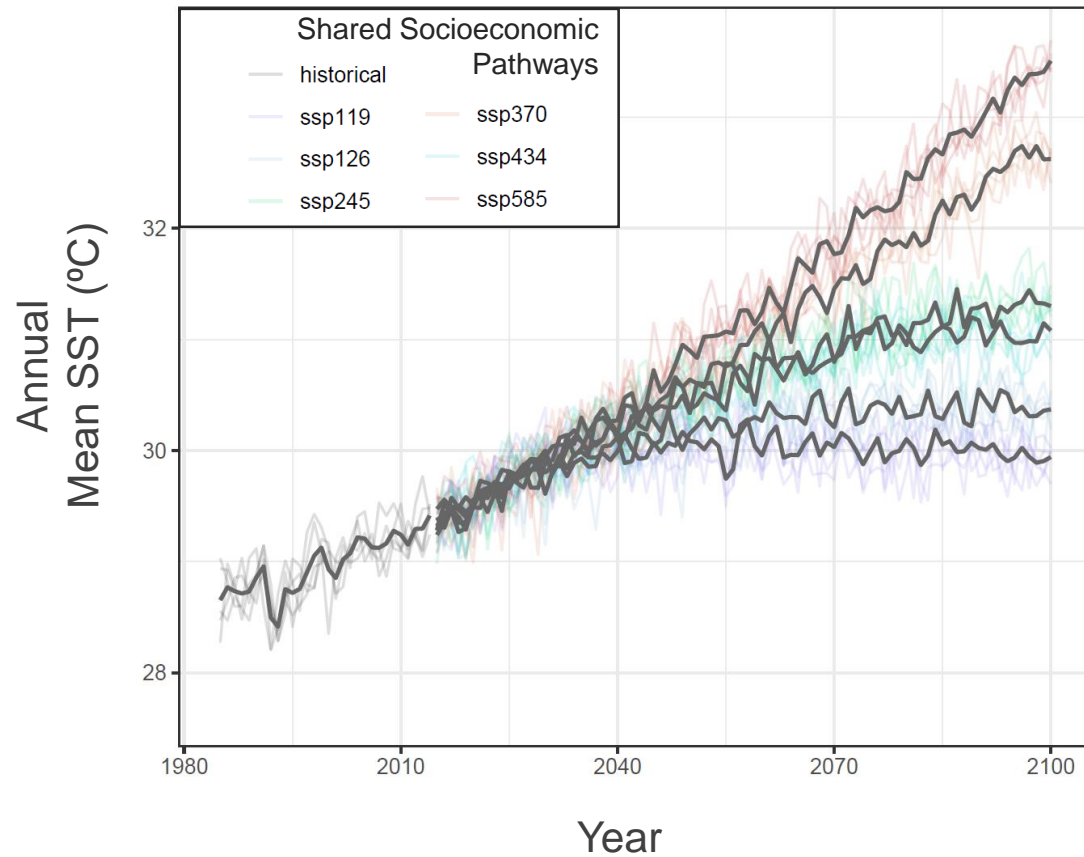
Species populations



Biodiversity & communities

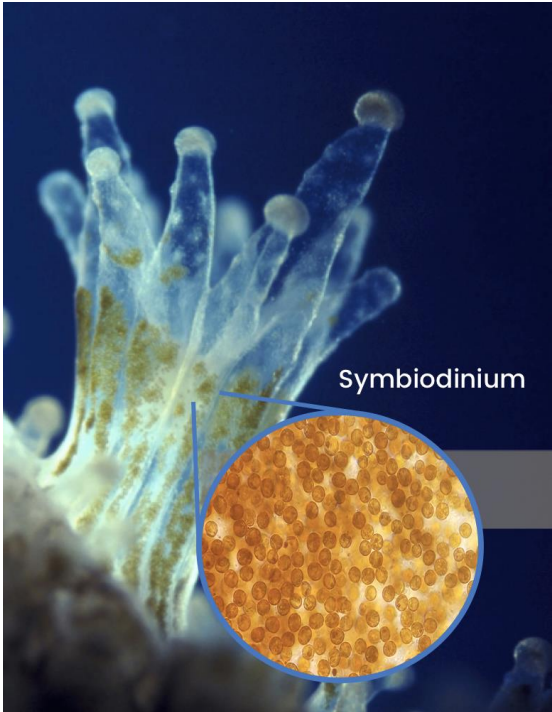


Future Climate Projections



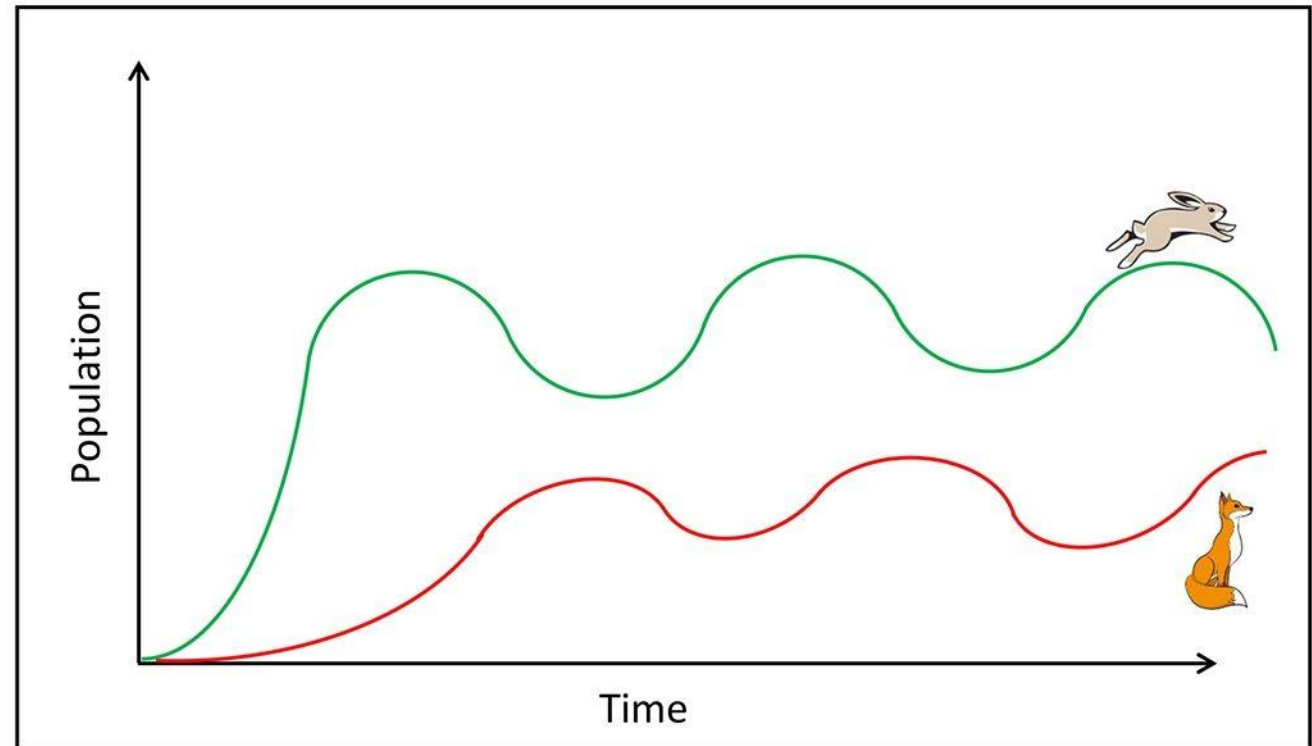


Monitoring often report
as percentages



Inference into population dynamics:

- Growth
- Mortality
- Recruitment



Reef A

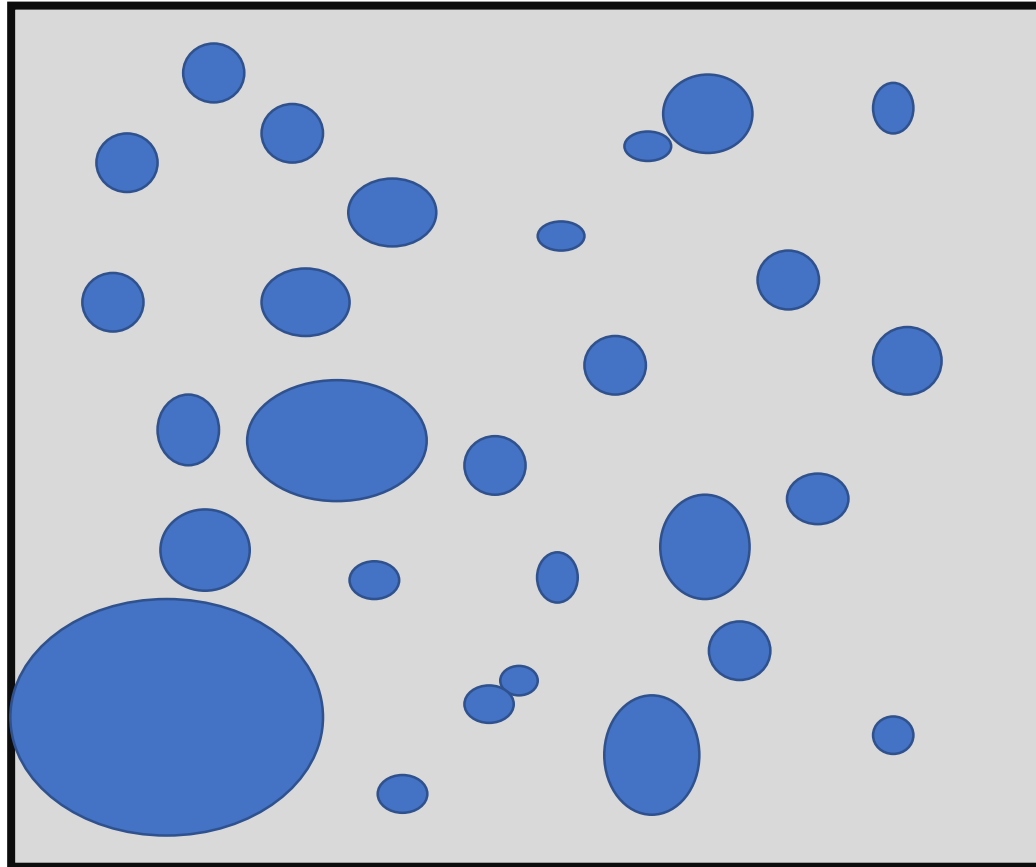


Reef B

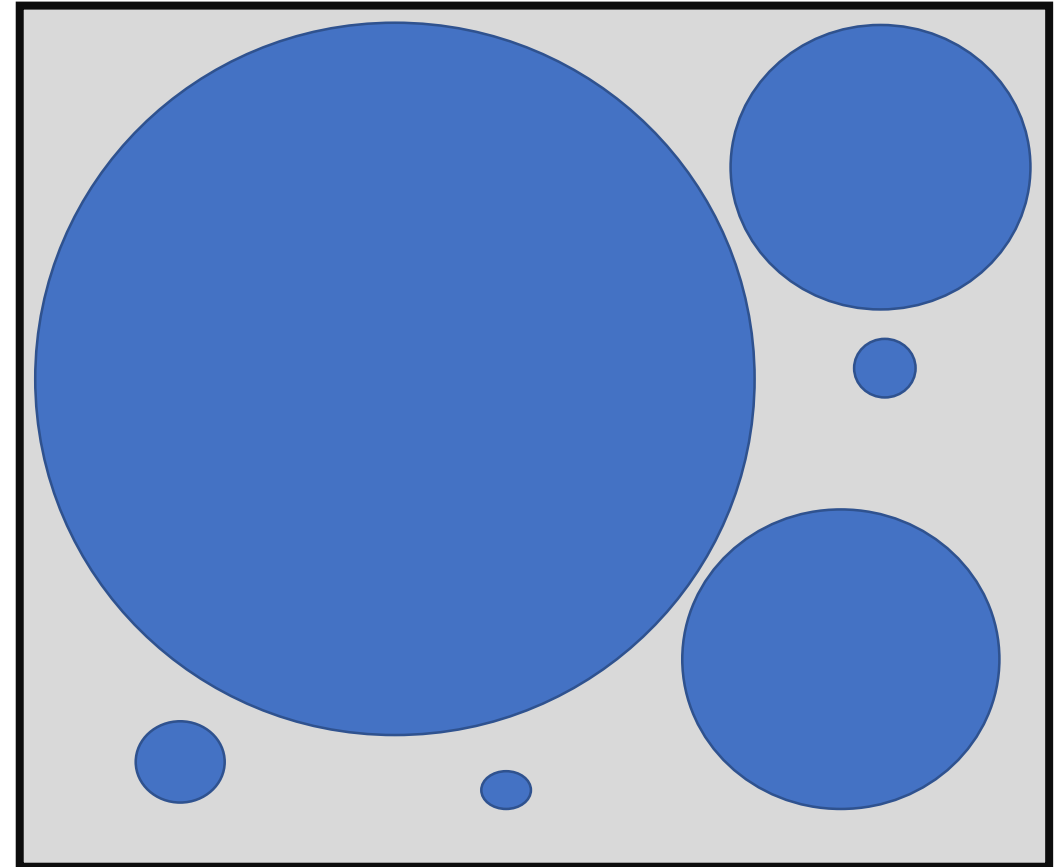


t1

Reef A

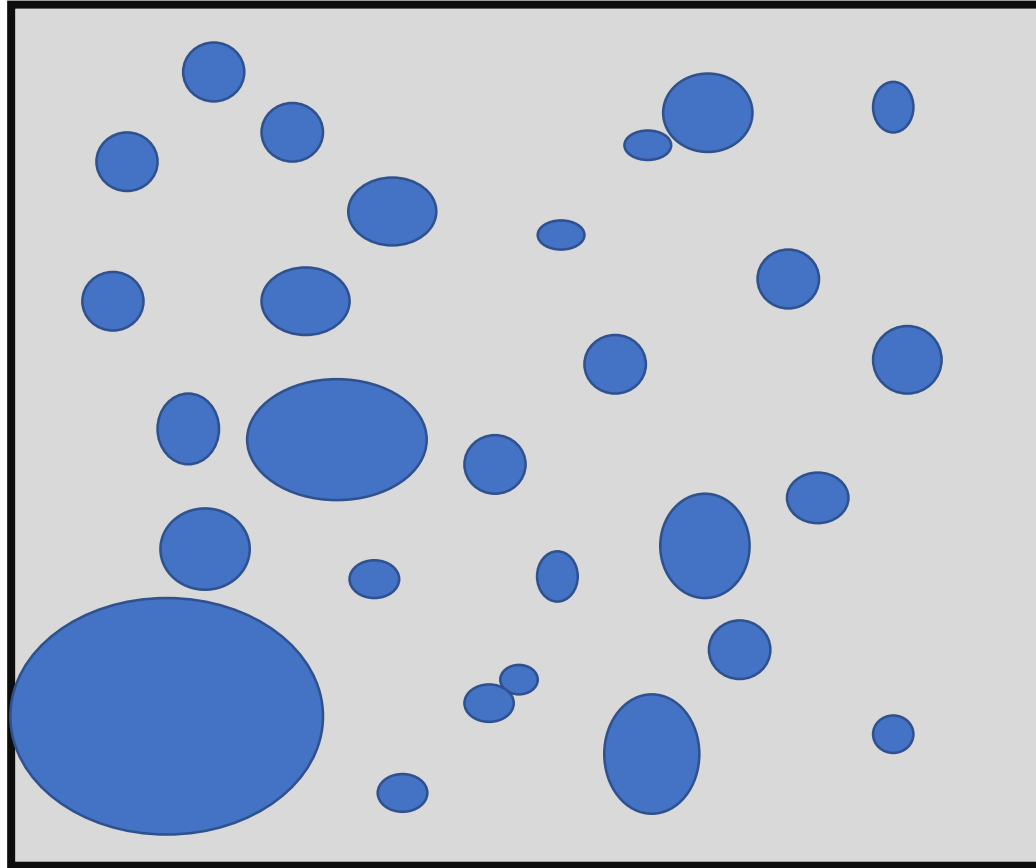


Reef B

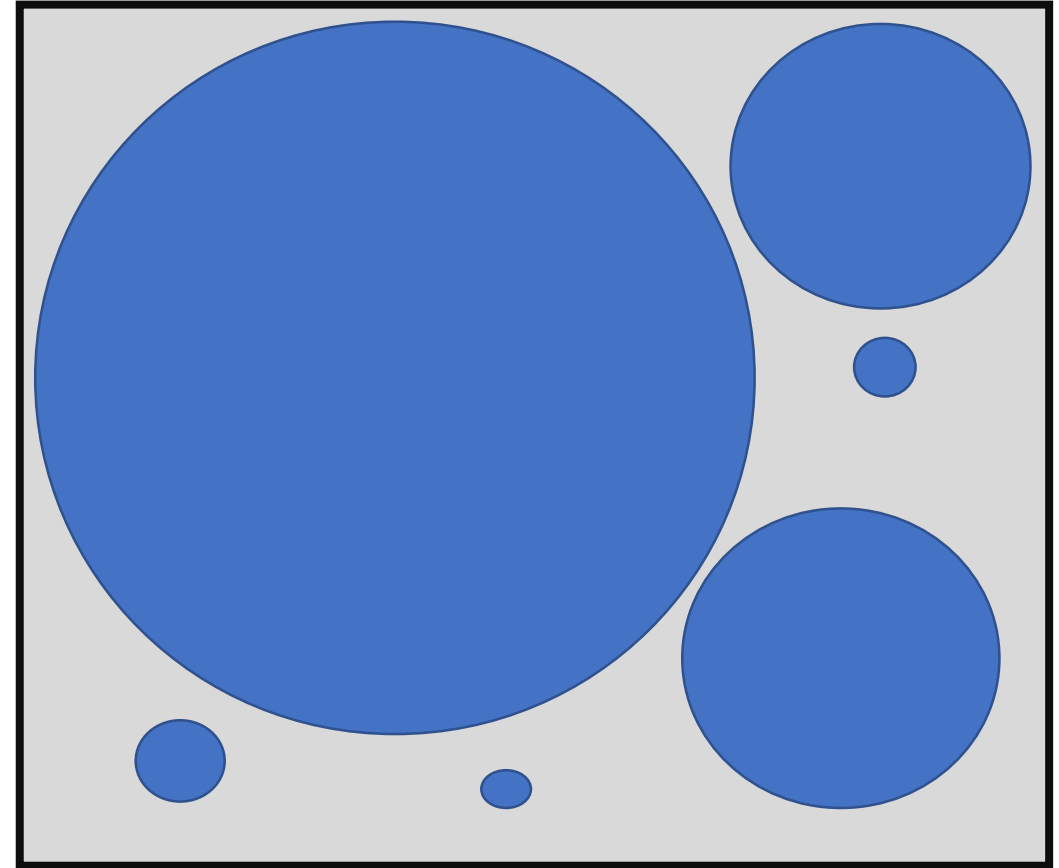


t1

Reef A



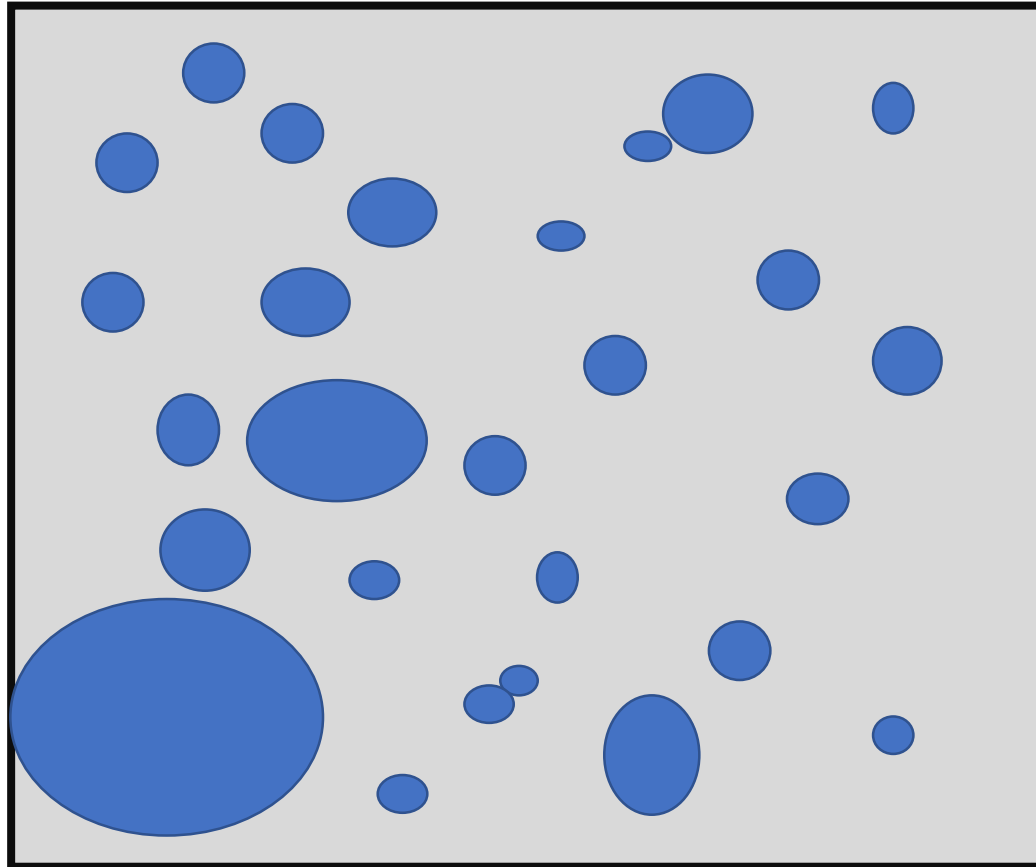
Reef B



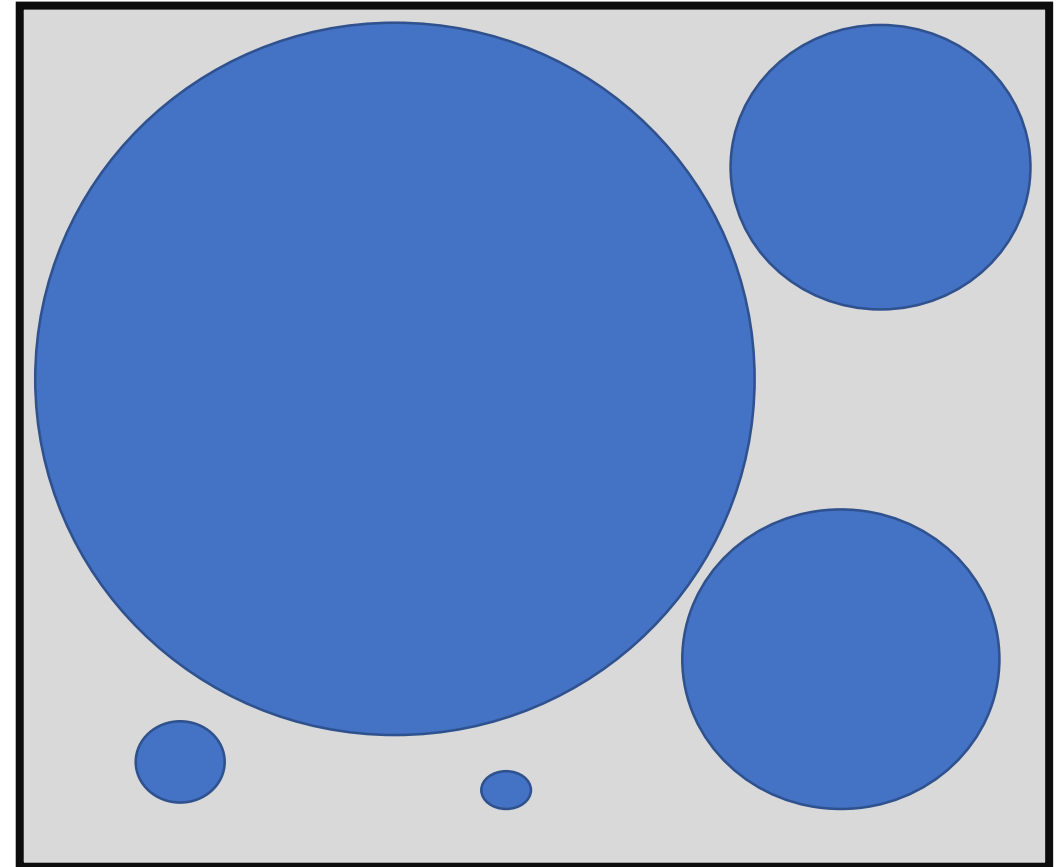
Which has higher coverage of corals?

t2

Reef A

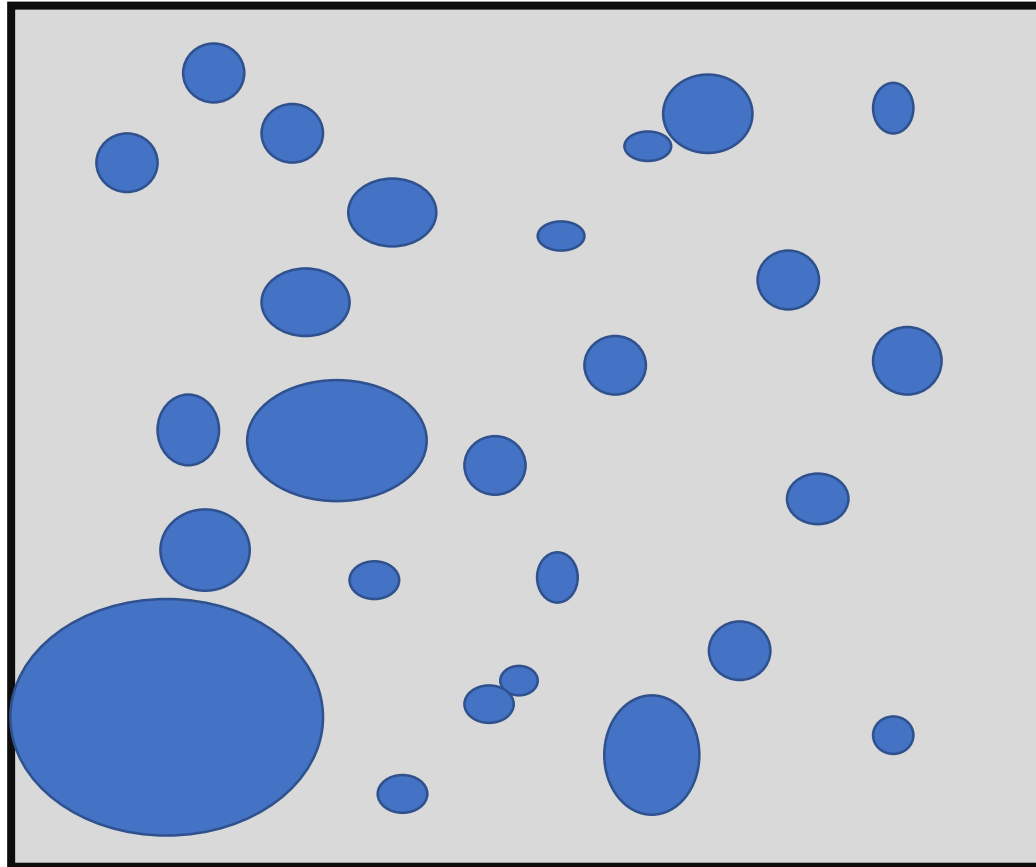


Reef B

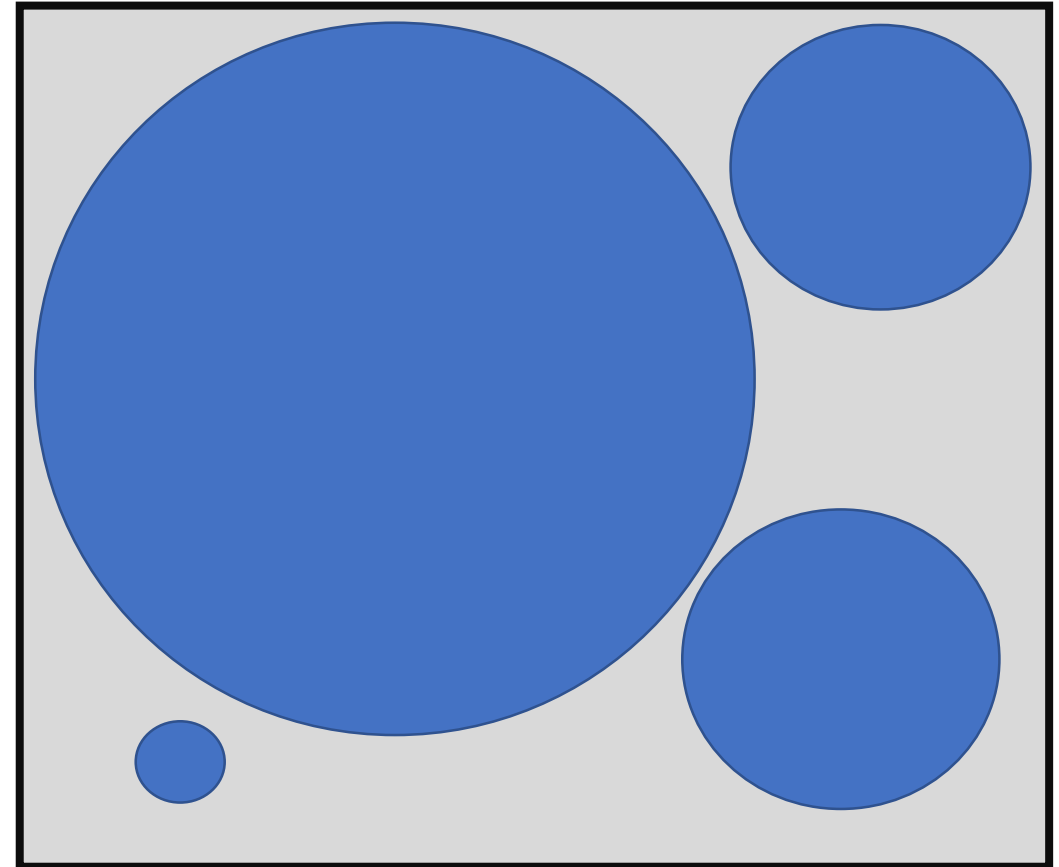


t3

Reef A

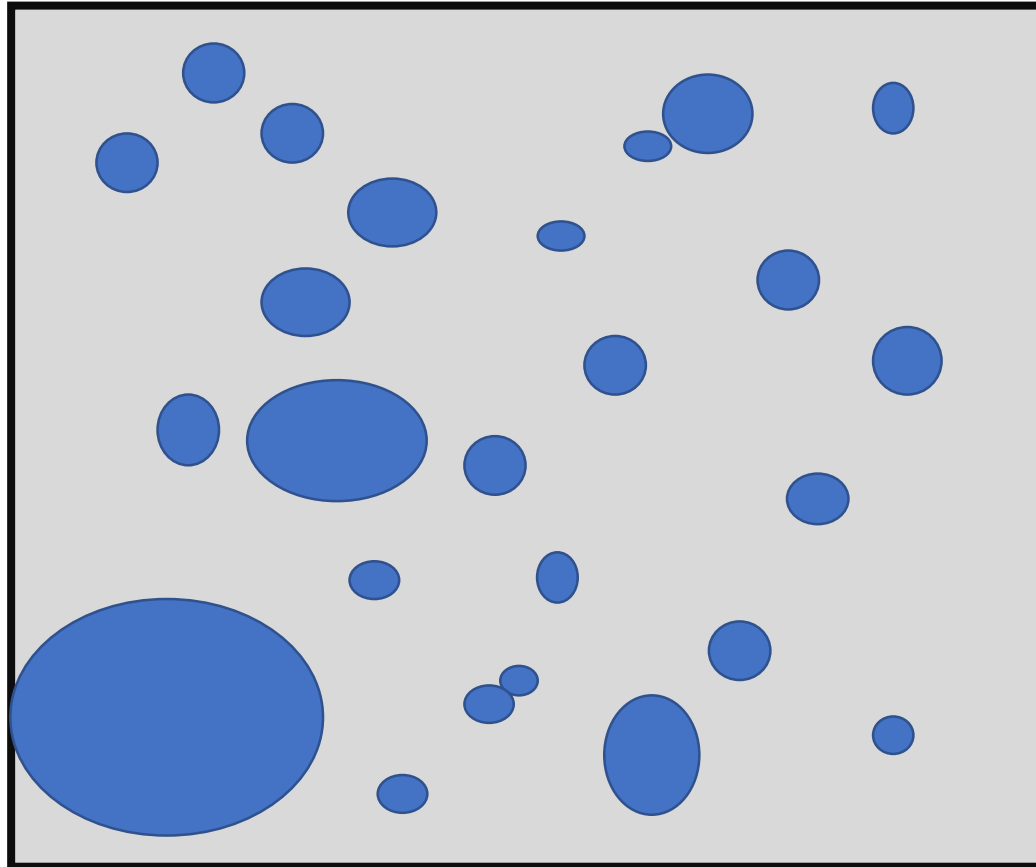


Reef B

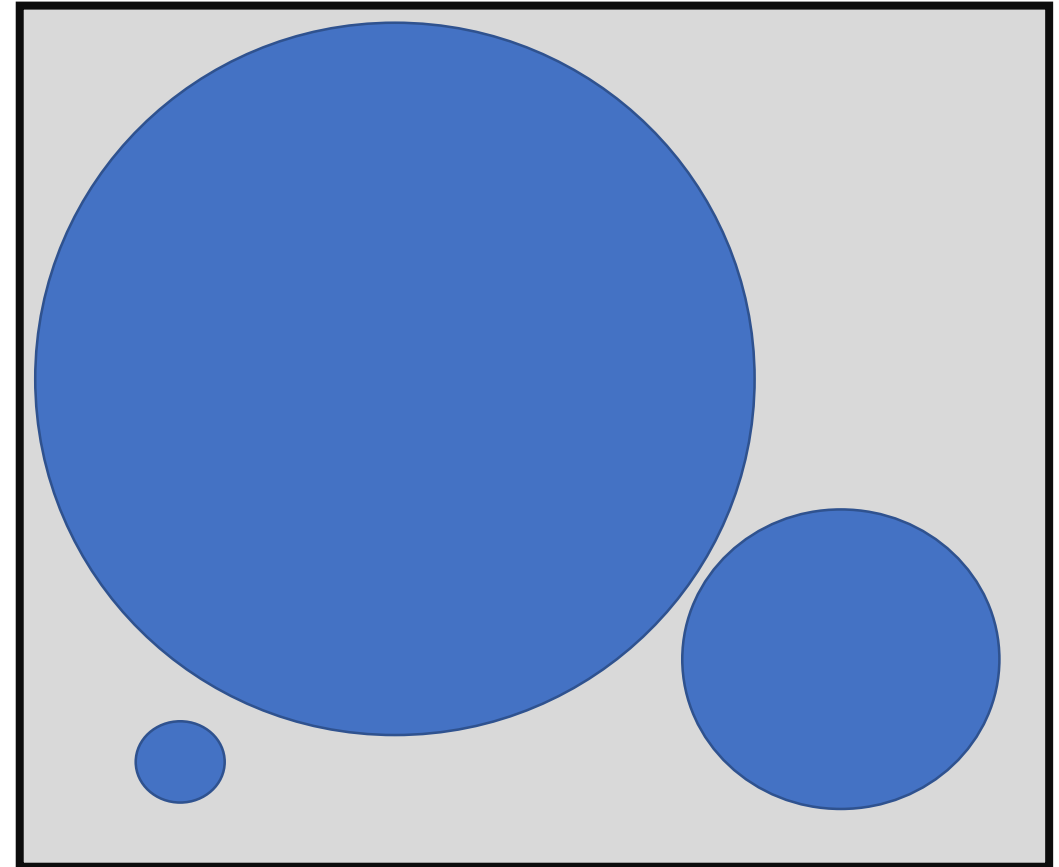


t4

Reef A

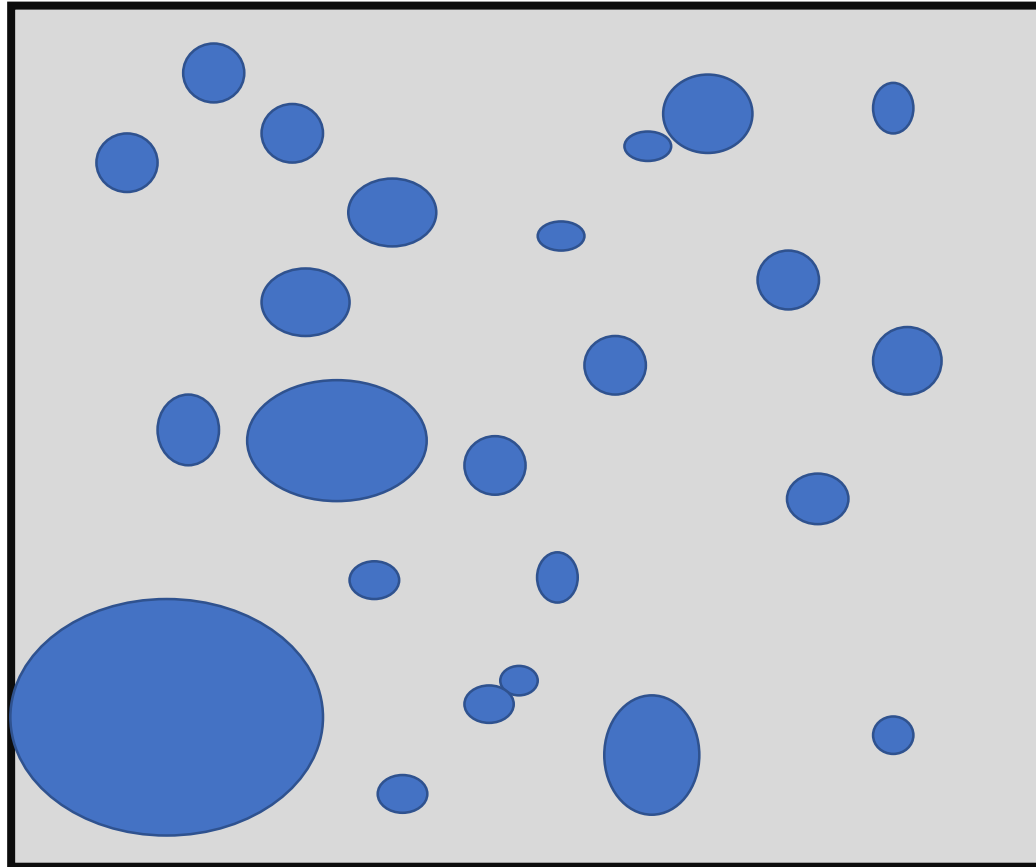


Reef B

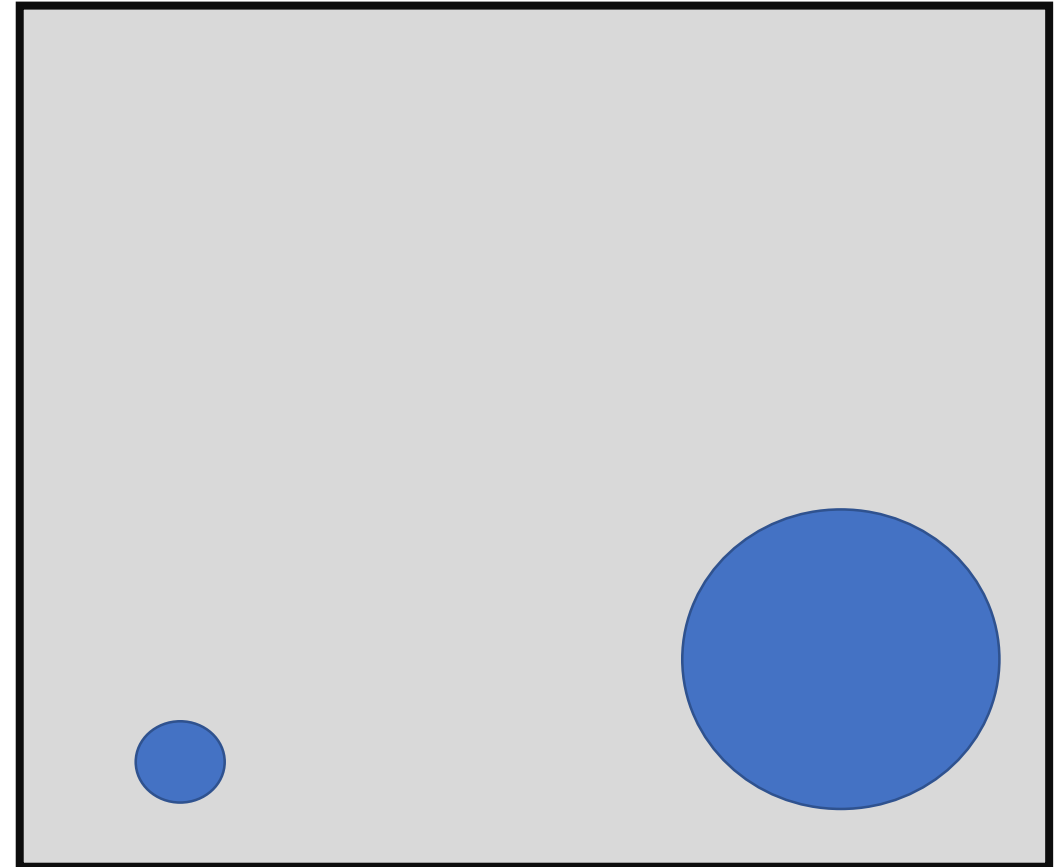


t5

Reef A

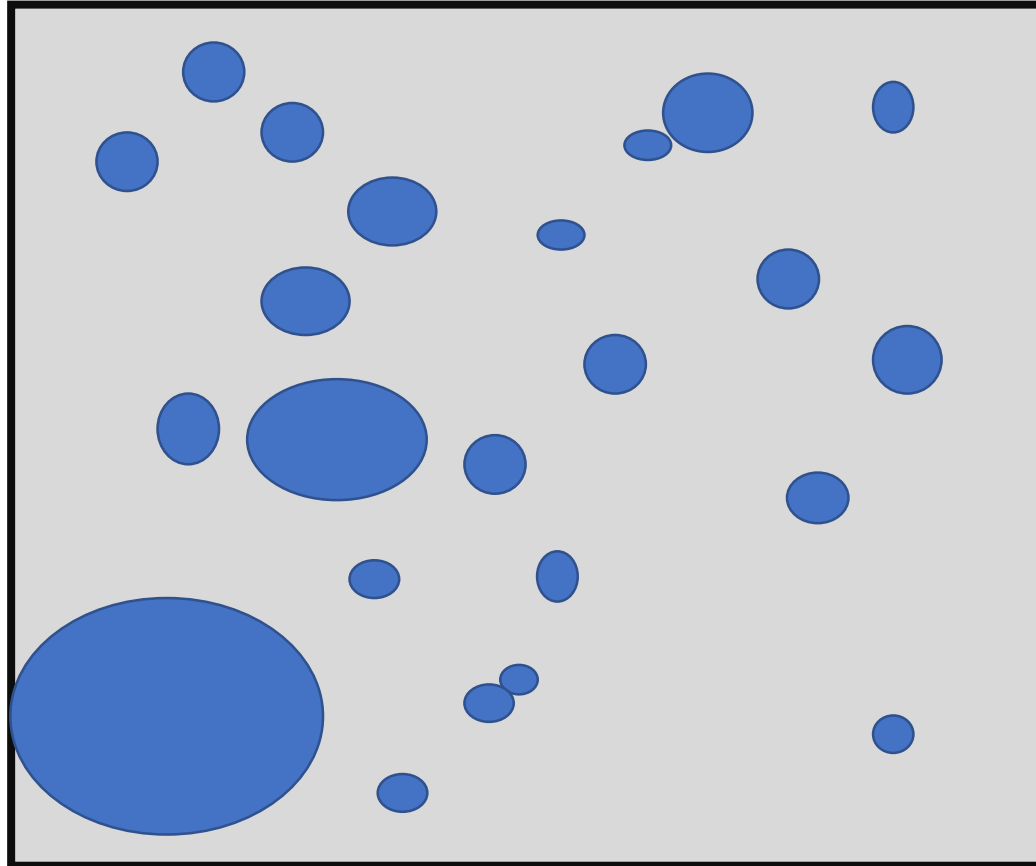


Reef B

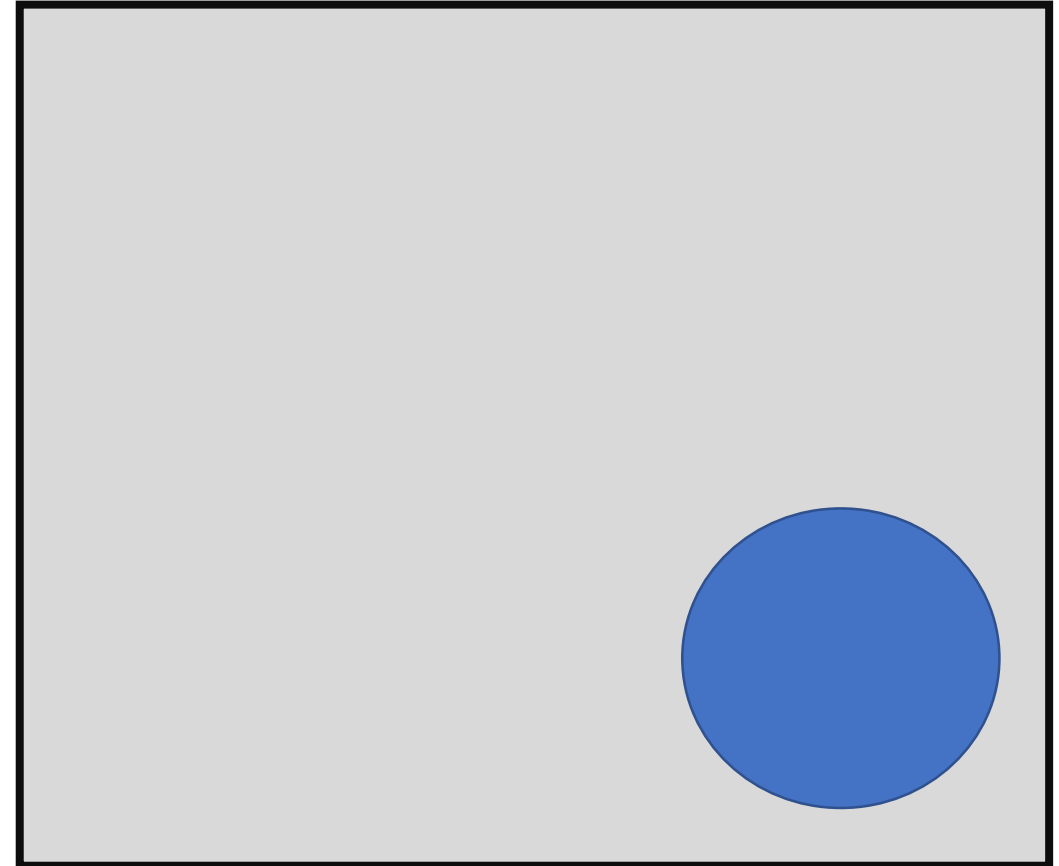


t6

Reef A

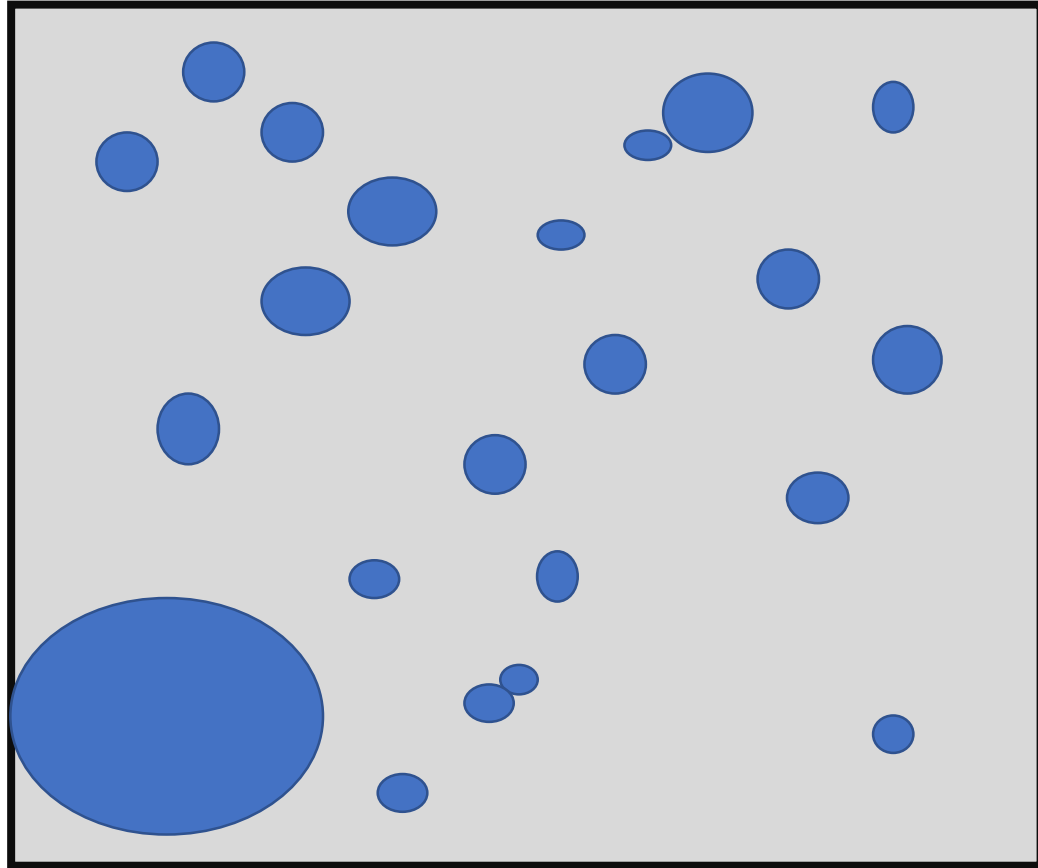


Reef B



t7

Reef A

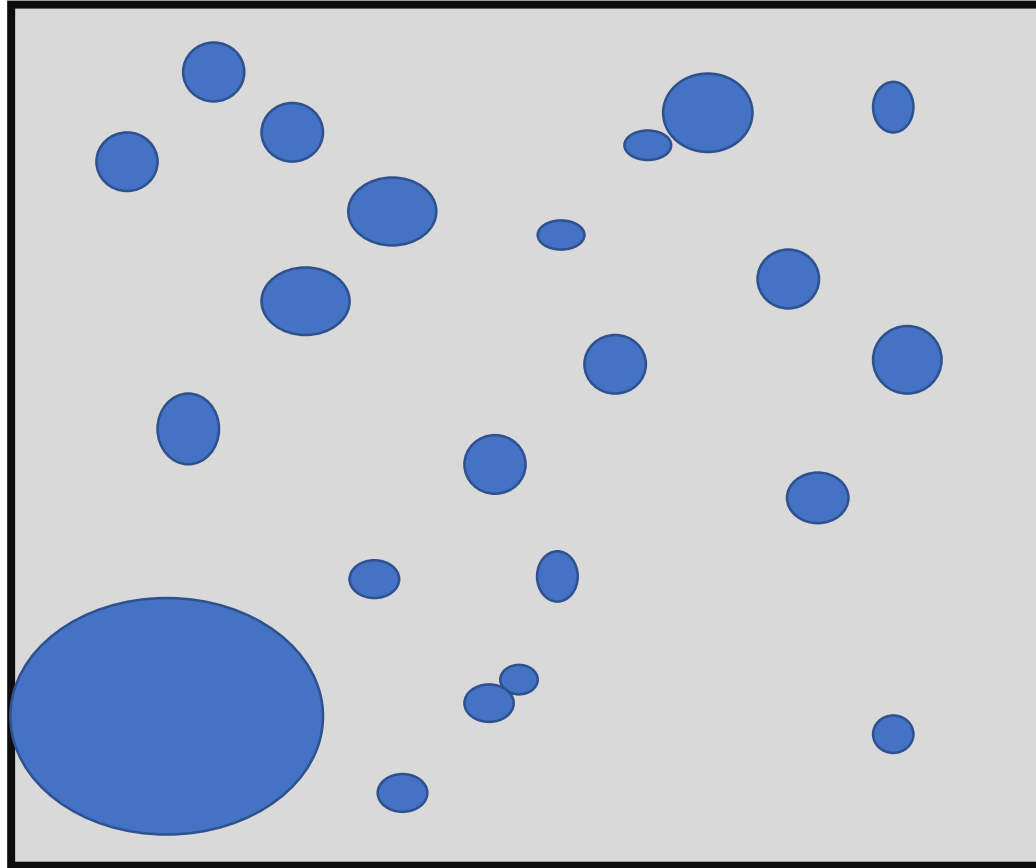


Reef B



t7

Reef A



Reef B



Which was more resilient?

Linking population size structure, heat stress and bleaching responses in a subtropical endemic coral

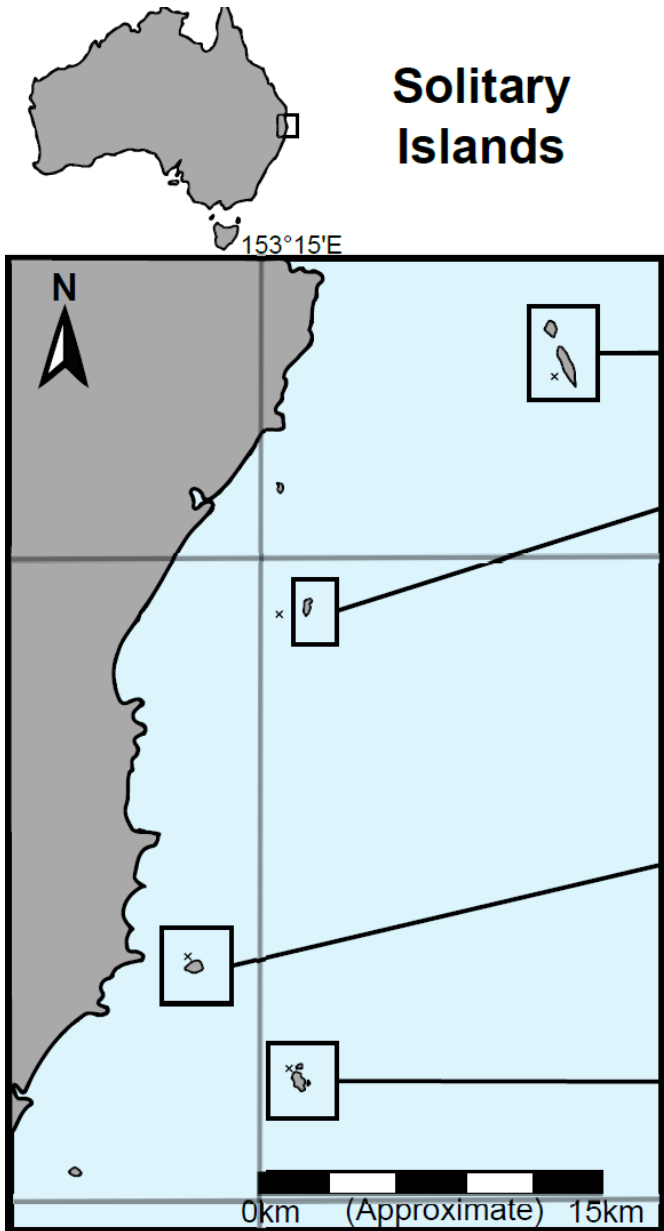
Liam Lachs, Brigitte Sommer, James Cant,
Jessica M. Hodge, Hamish A. Malcolm,
John M. Pandolfi, Maria Beger



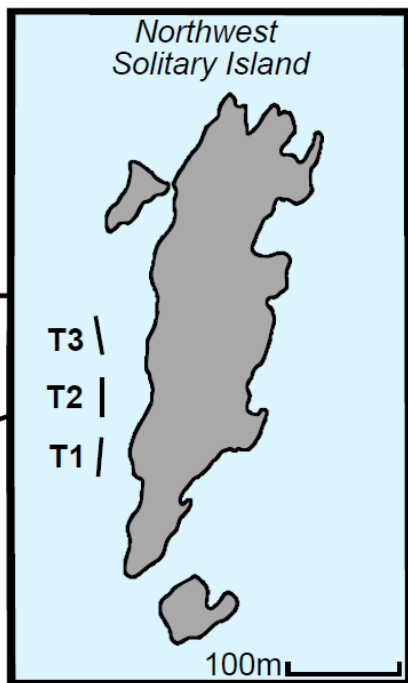
Growth



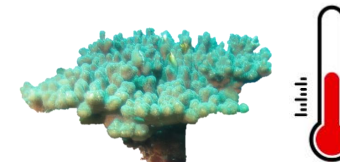
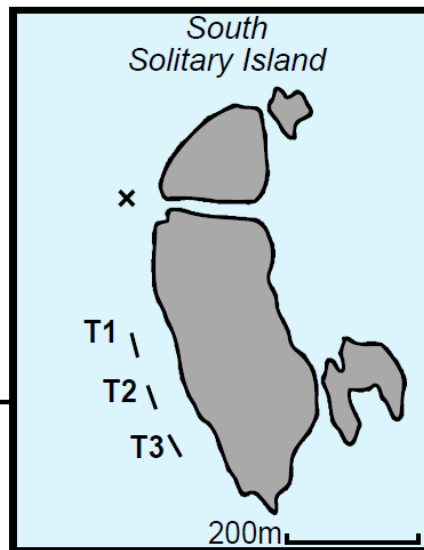
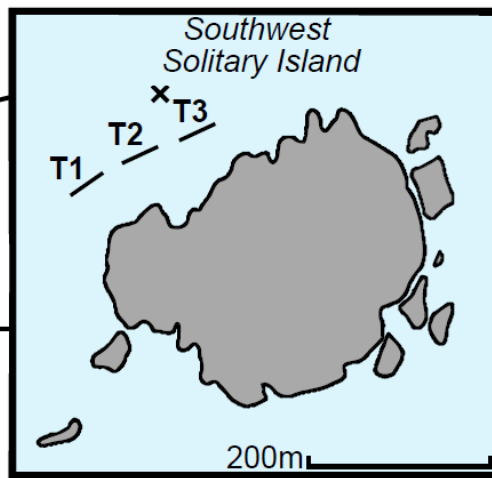
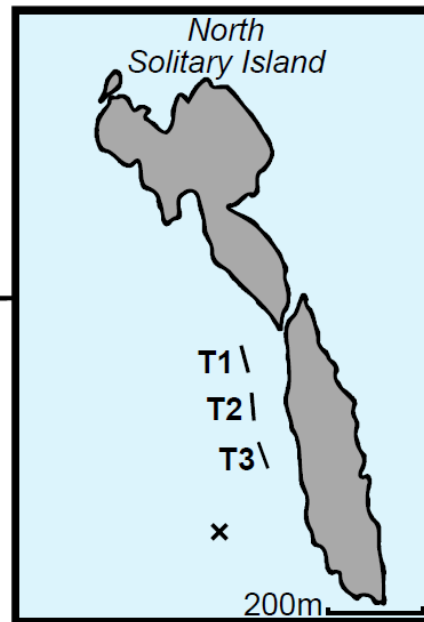
Study Site & Data



Mid-shelf



Offshore



2020

2016

2012

2008

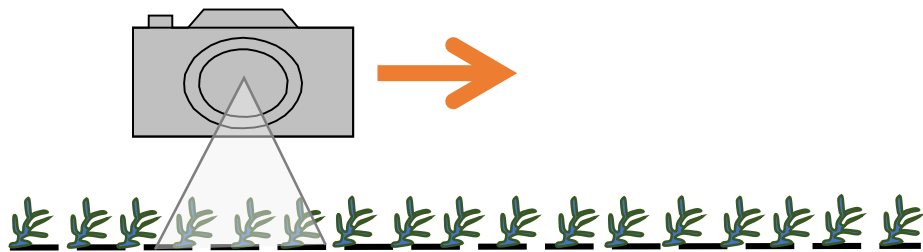
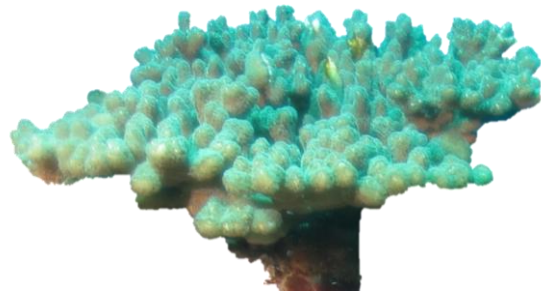
2004

2000

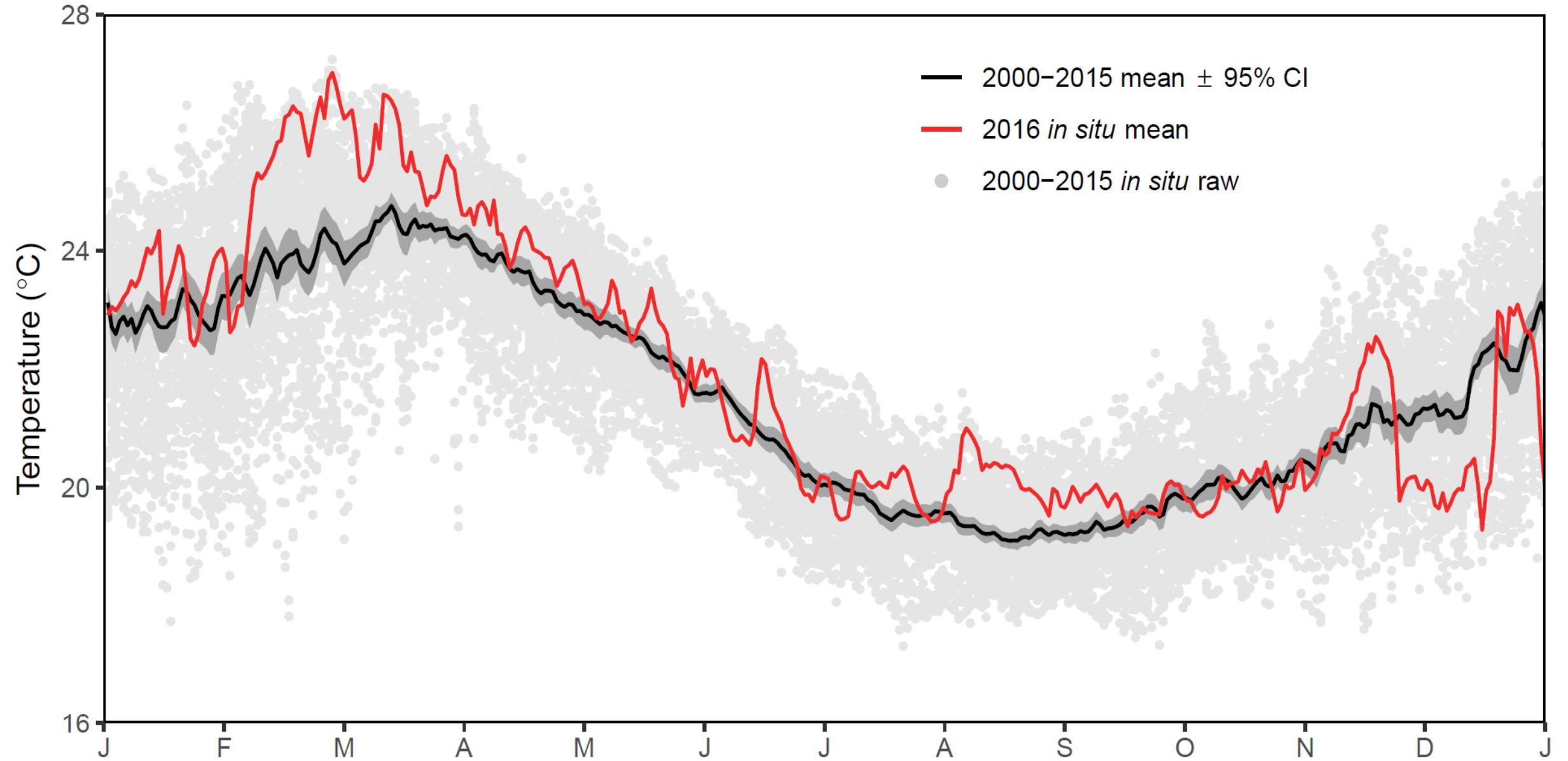


In situ

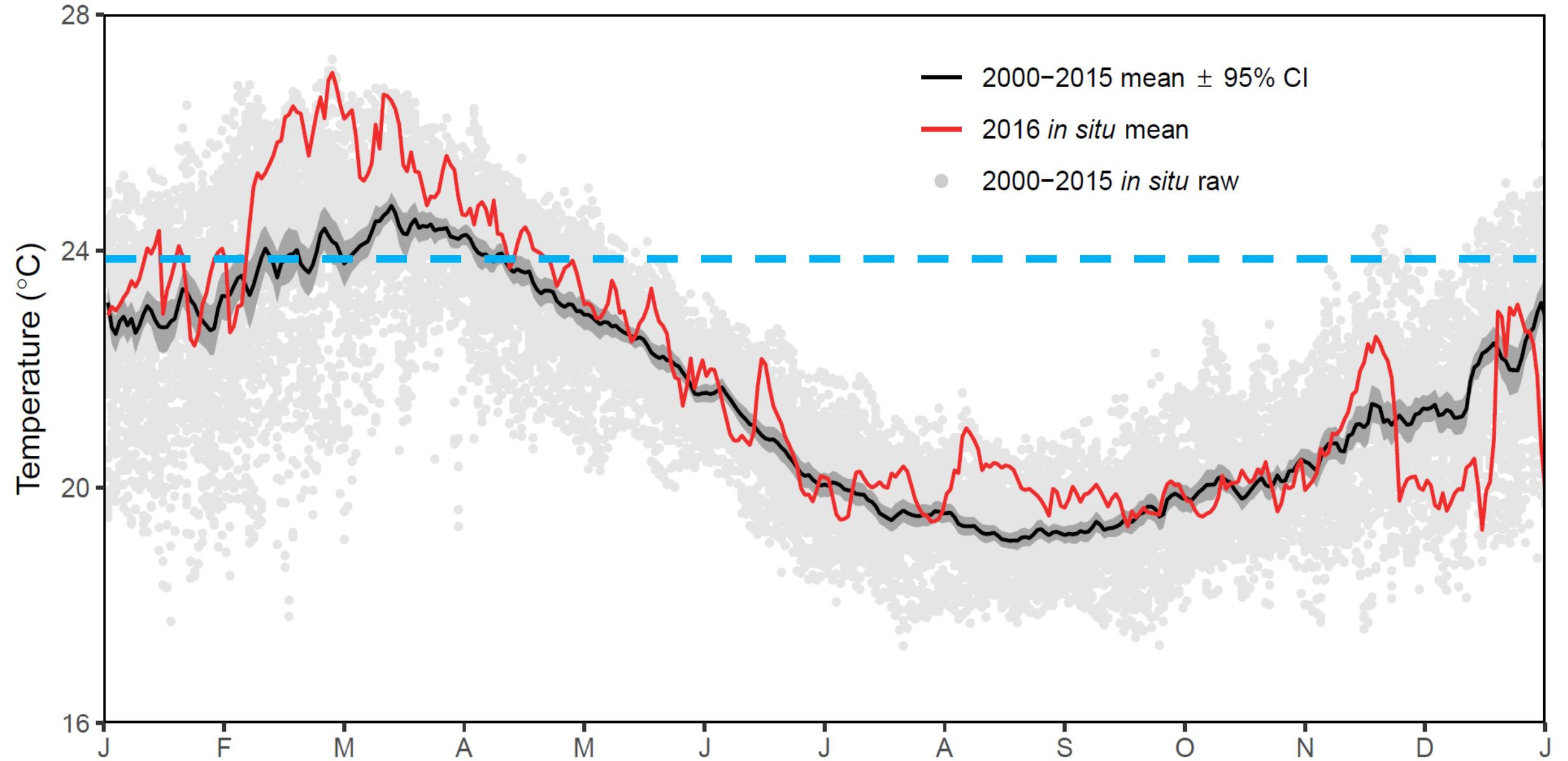




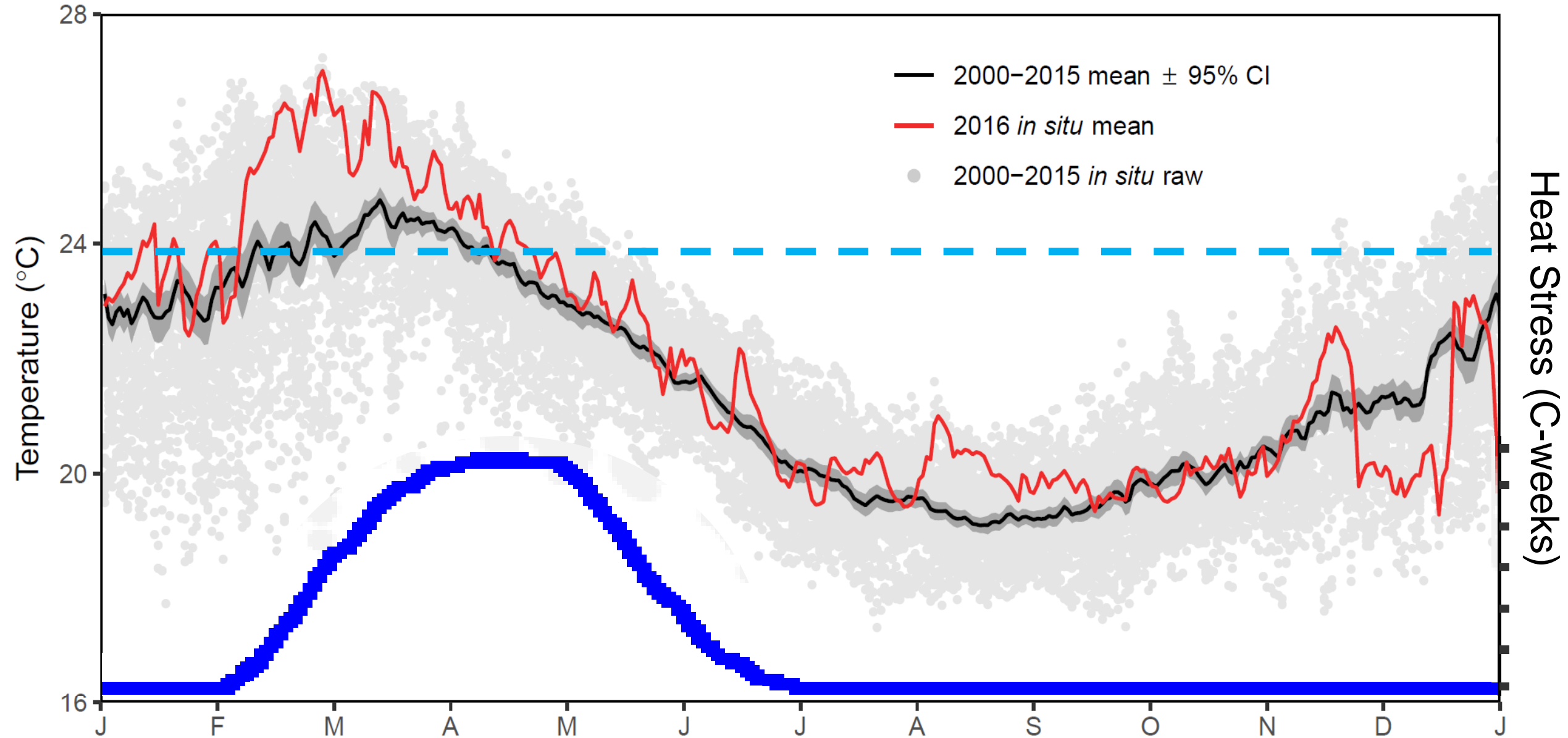
2016 Marine Heatwave



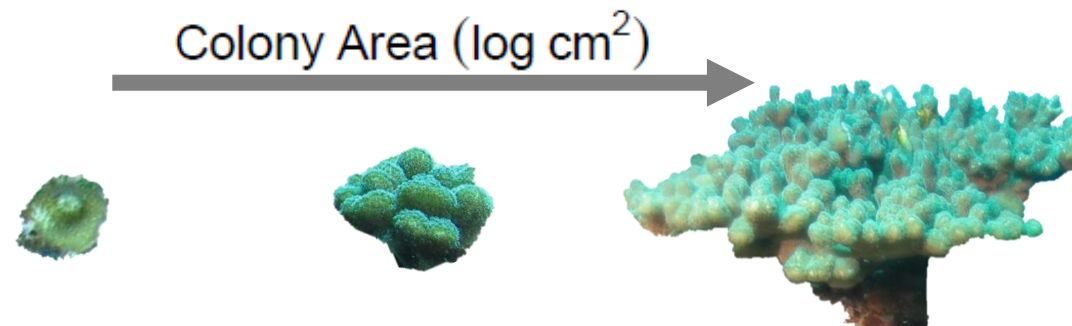
2016 Marine Heatwave



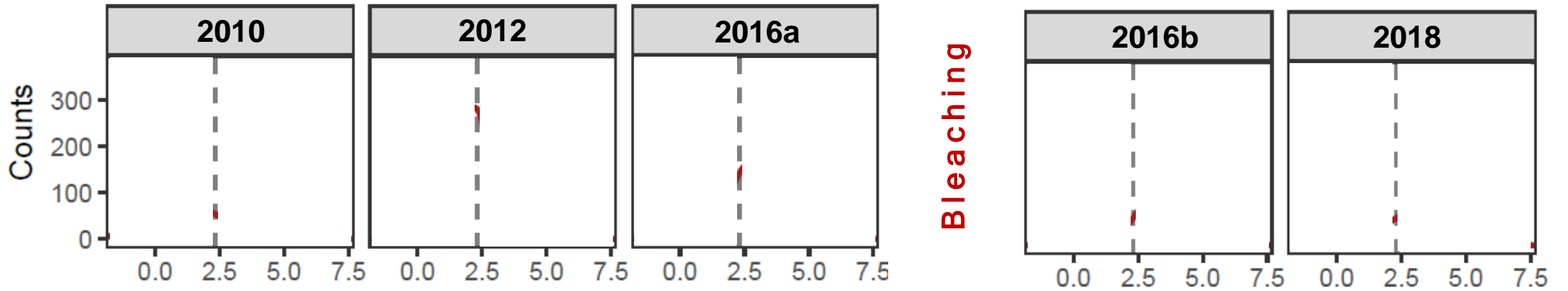
2016 Marine Heatwave



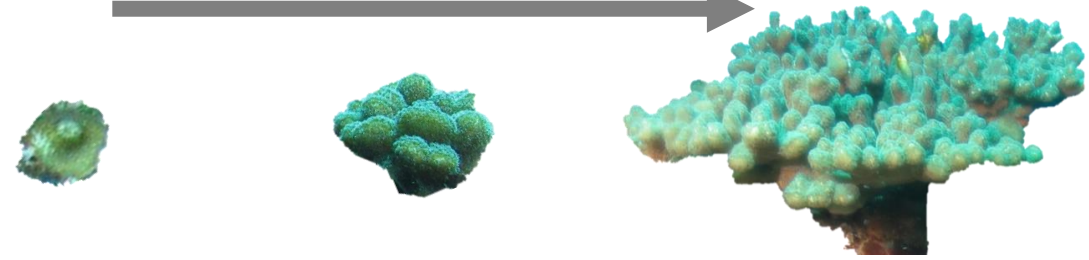




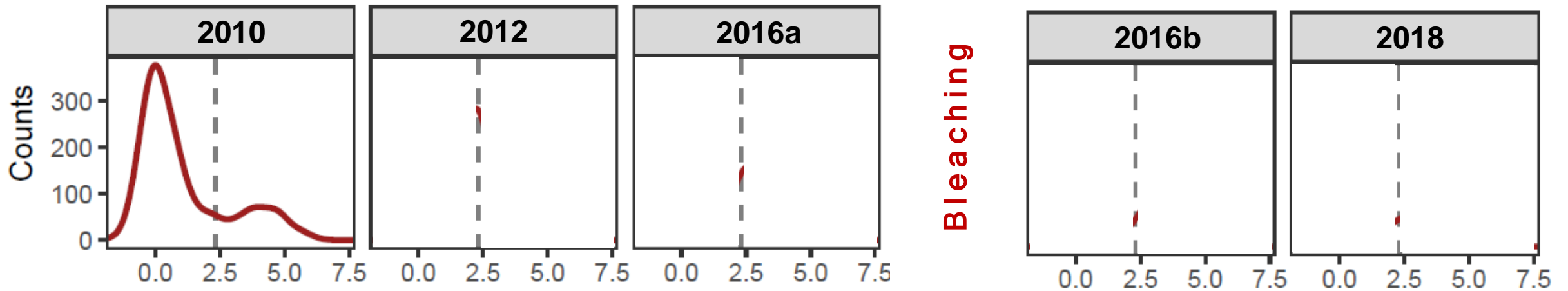
Demographic Time-series



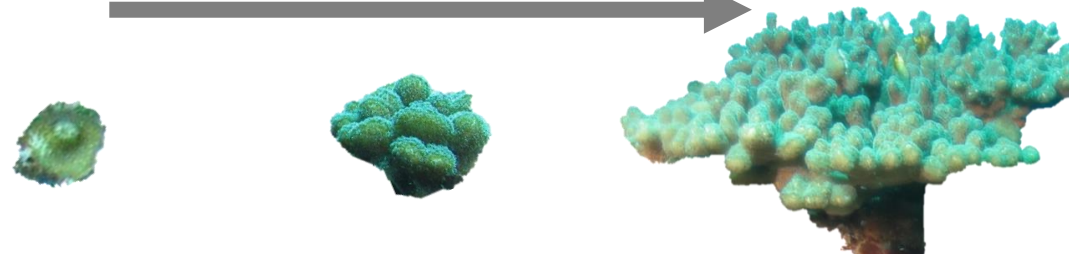
Colony Area (log cm²)



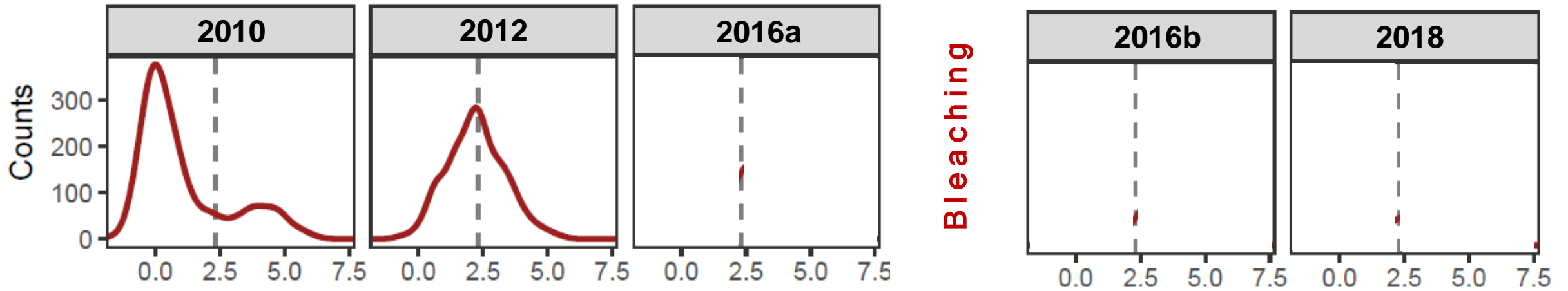
Demographic Time-series



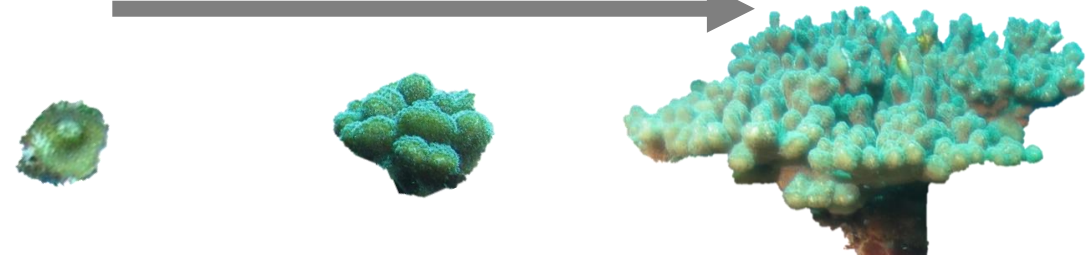
Colony Area (log cm²)



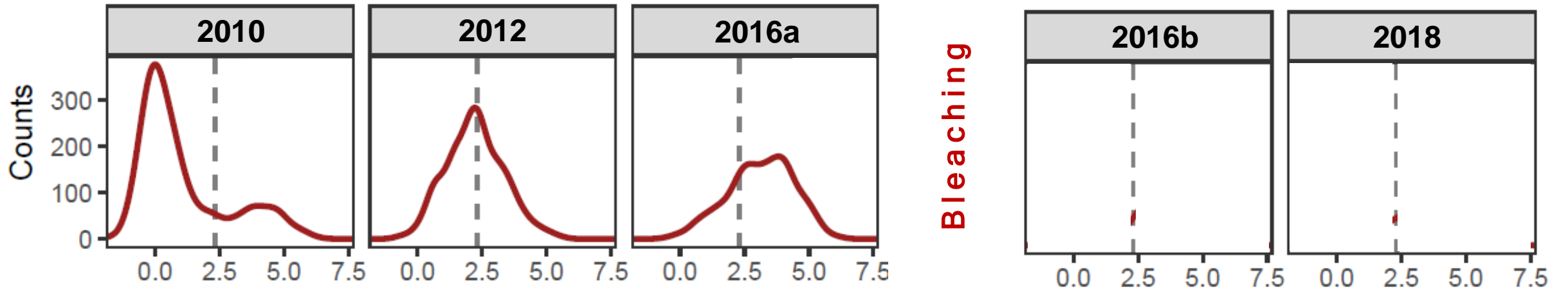
Demographic Time-series



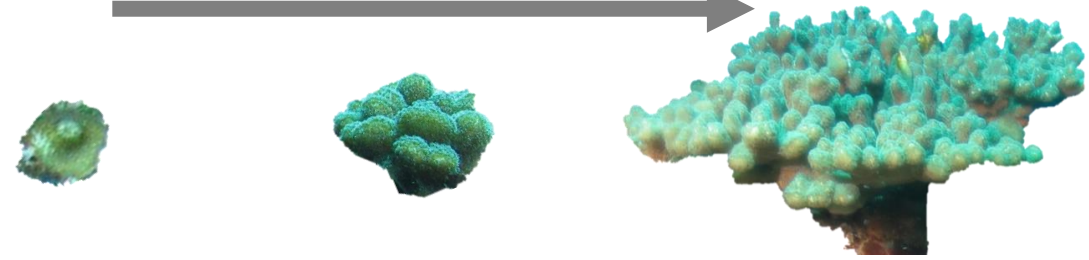
Colony Area (log cm²)

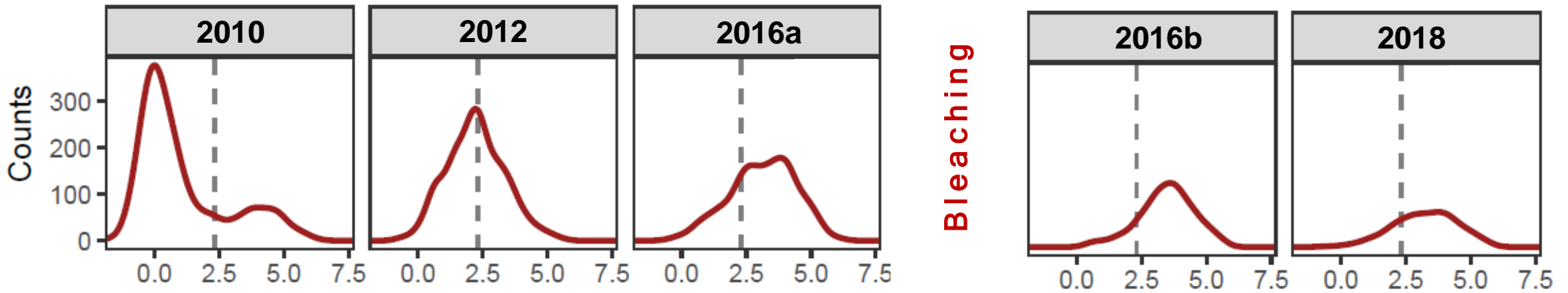


Demographic Time-series

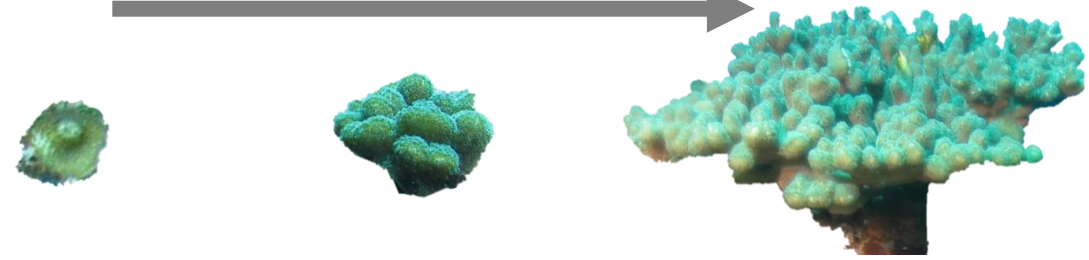


Colony Area (log cm²)

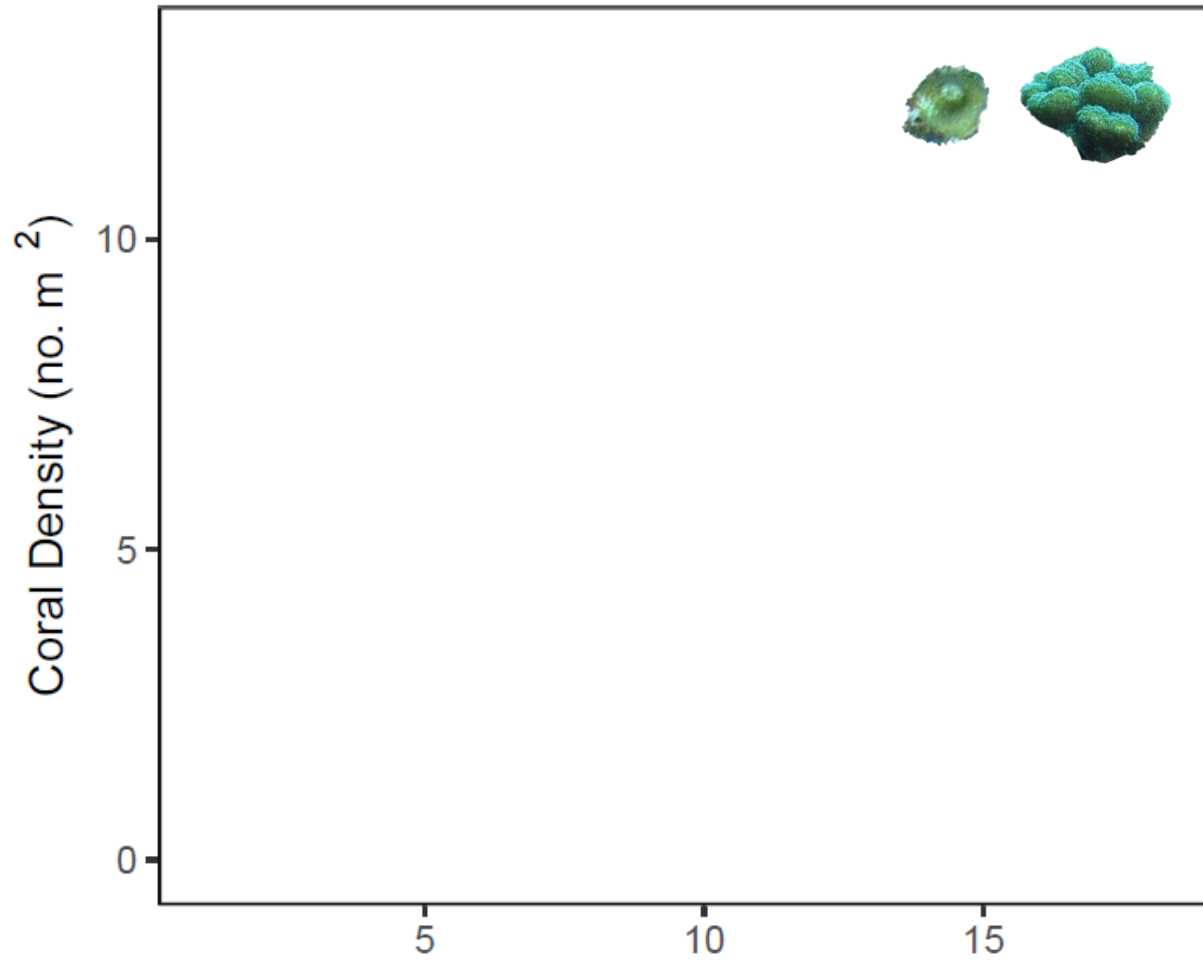




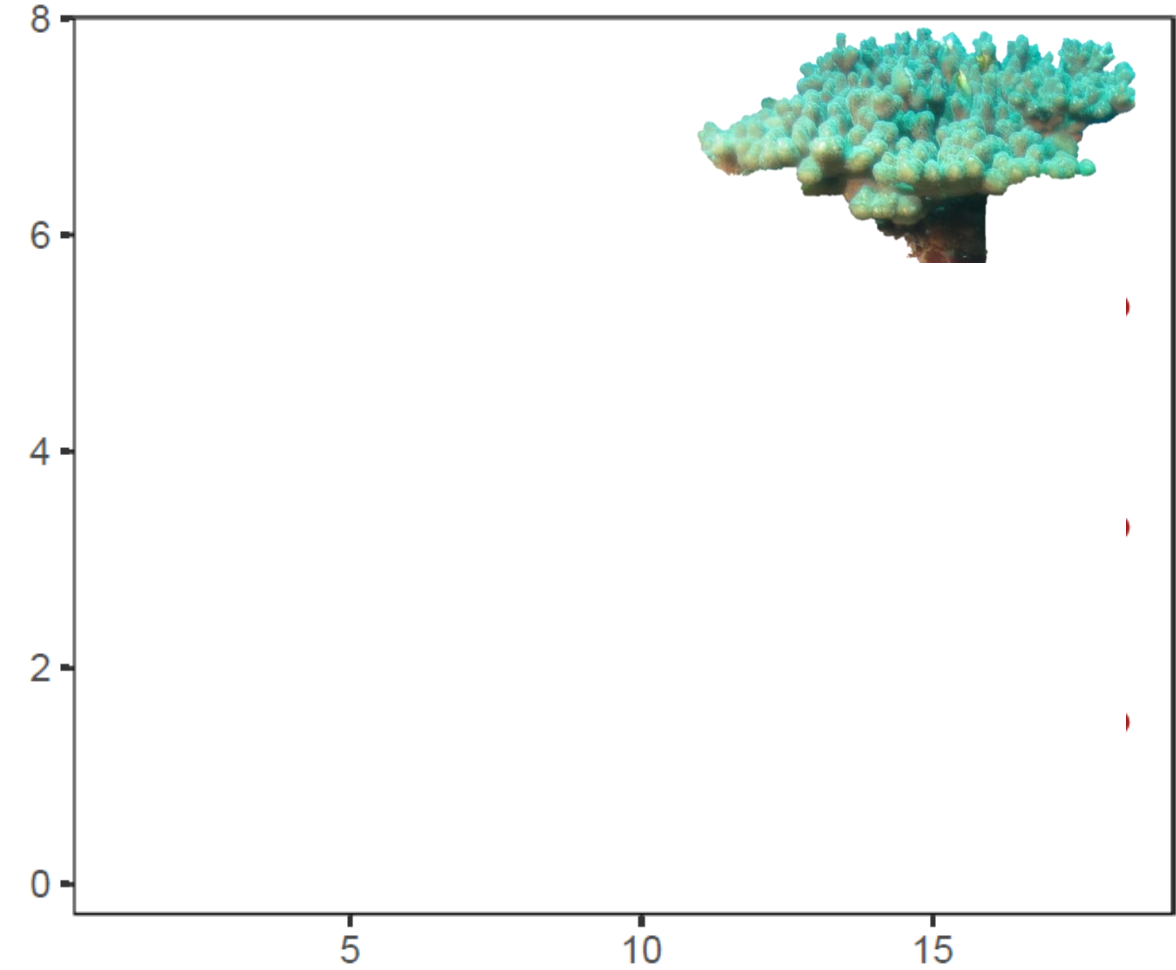
Colony Area (log cm²)



a) Juveniles

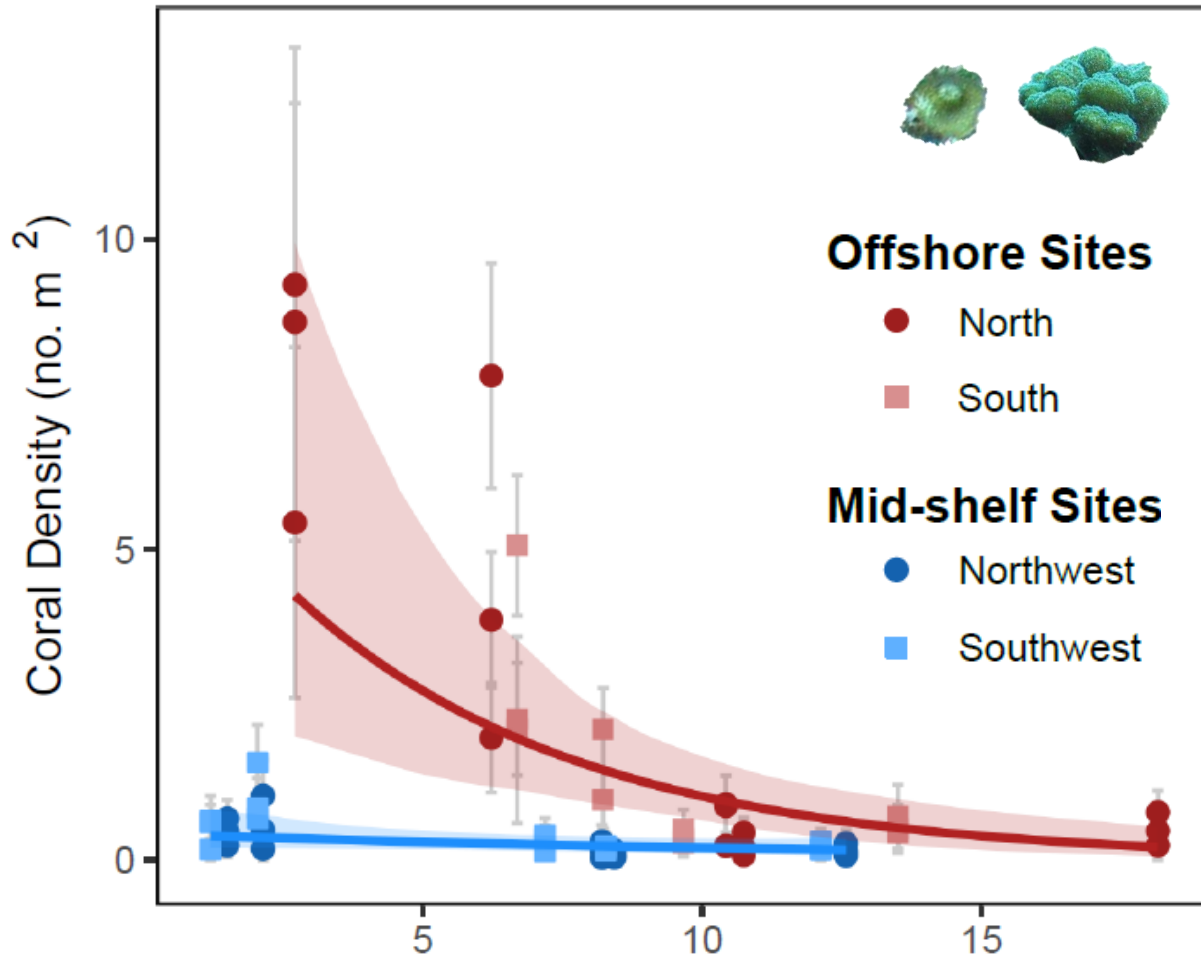


b) Adults

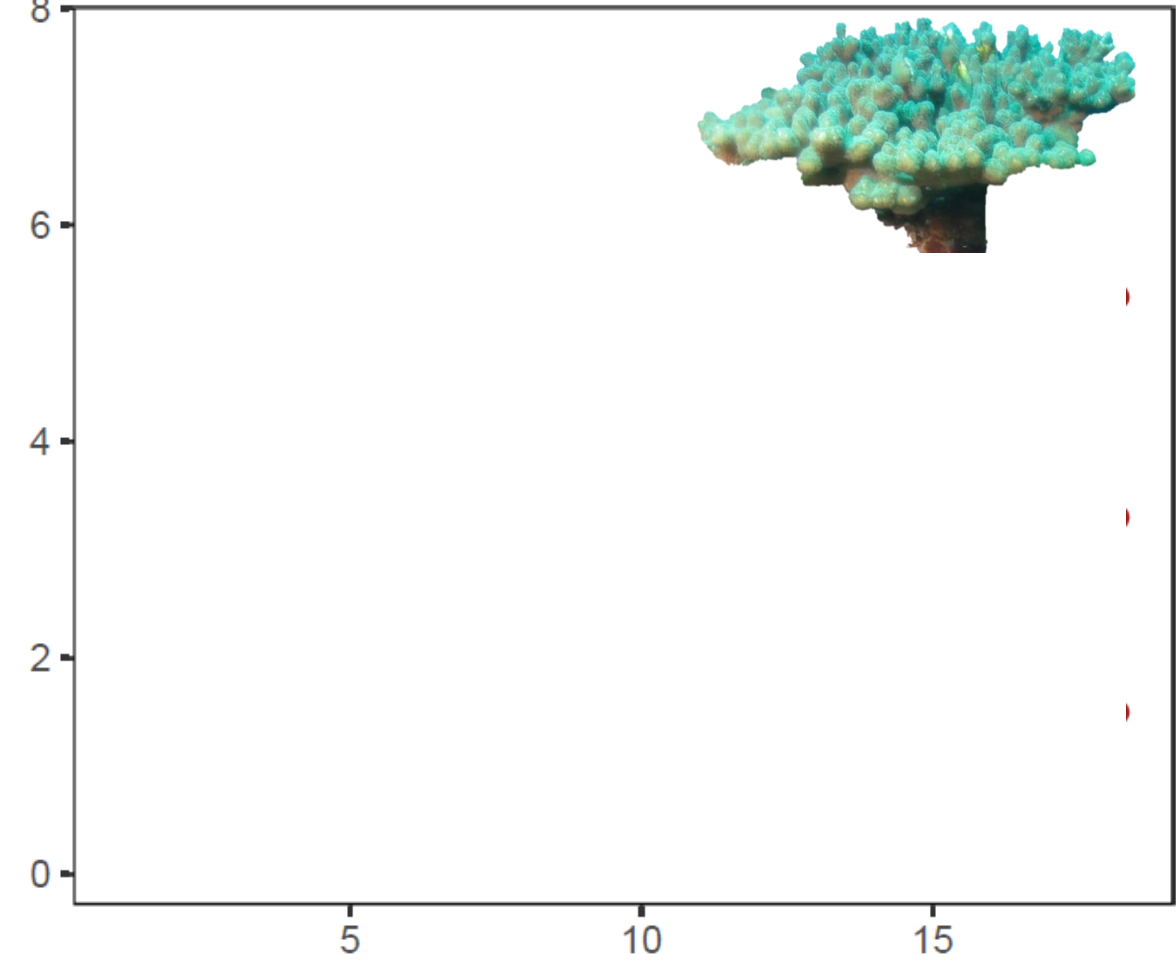


Heat Stress maximum (C-weeks)

a) Juveniles

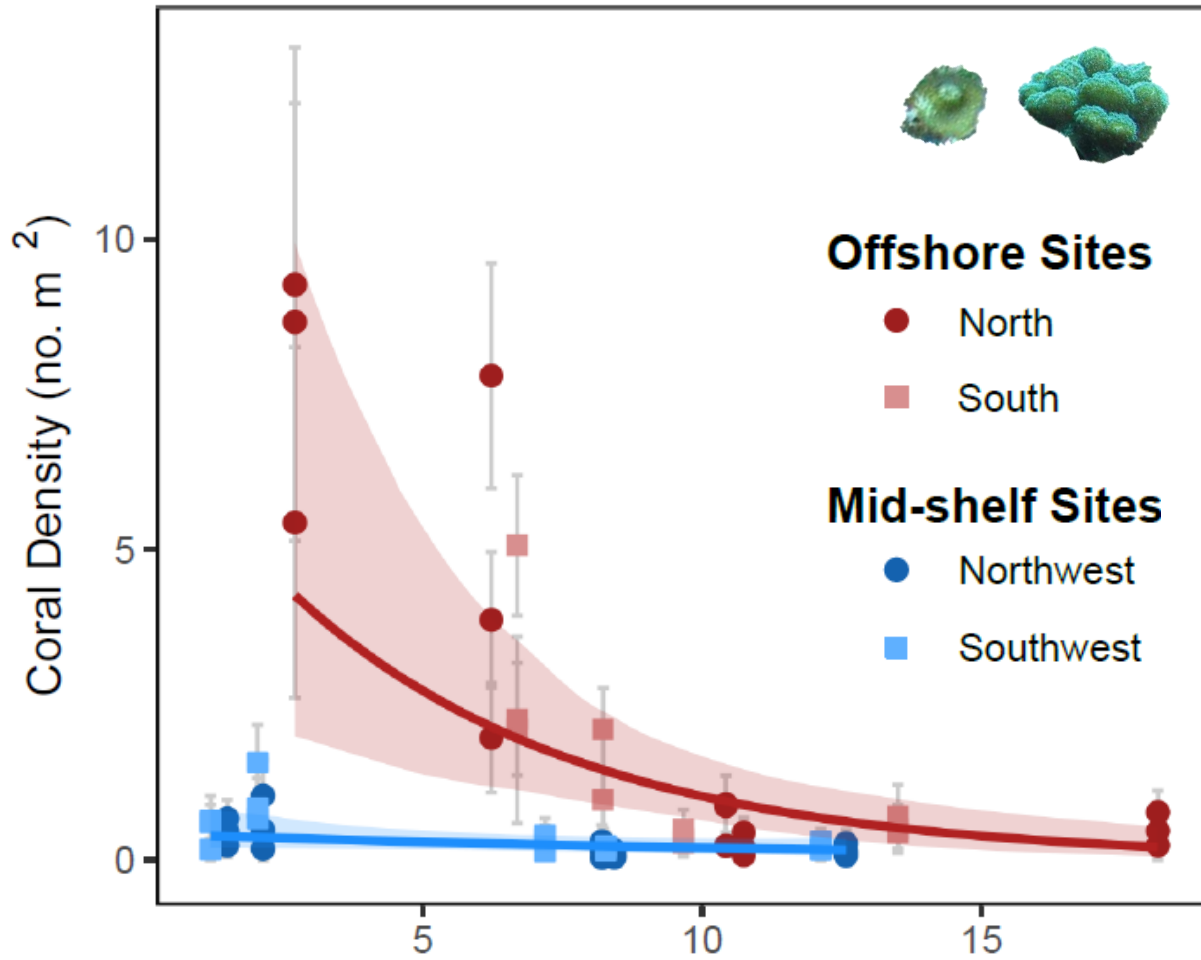


b) Adults

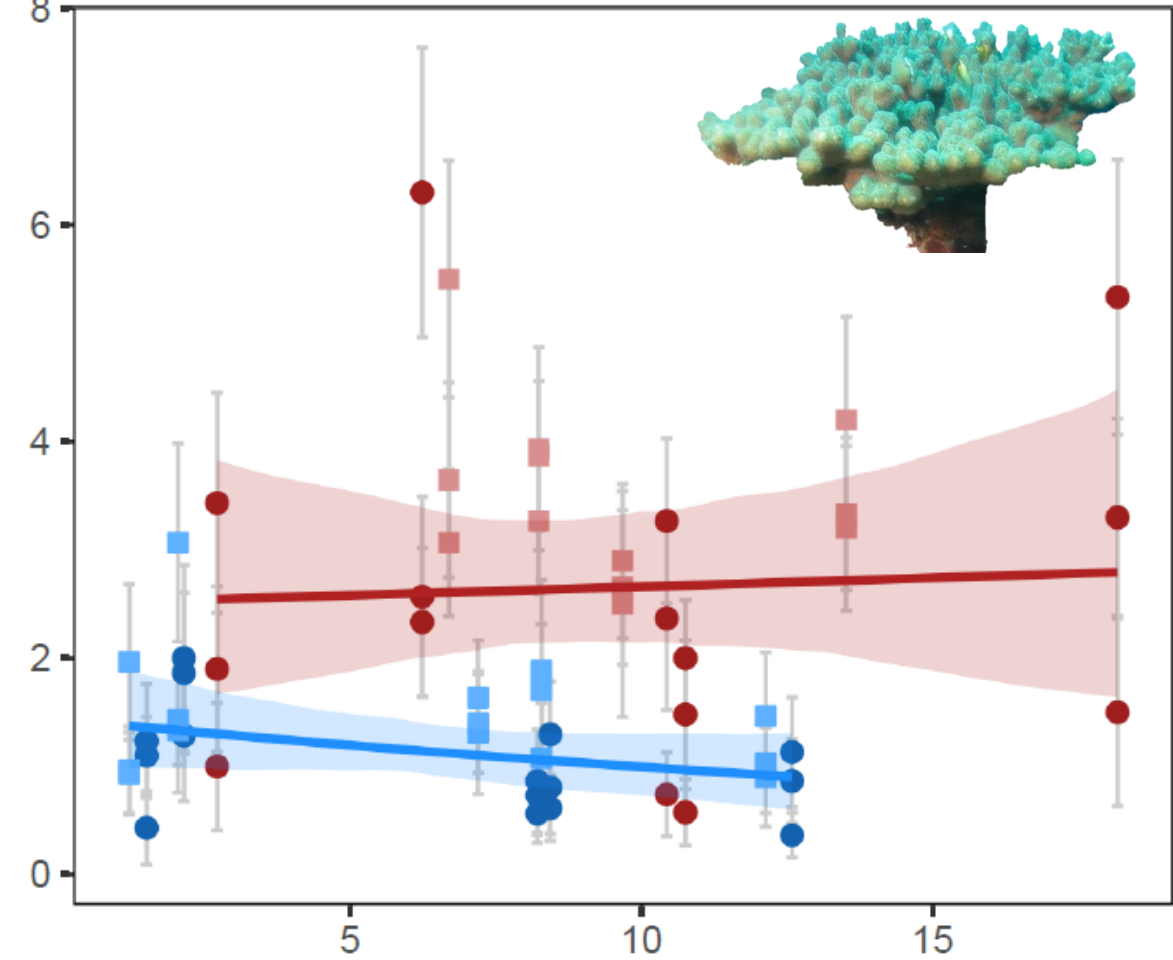


Heat Stress maximum (C-weeks)

a) Juveniles



b) Adults



Heat Stress maximum (C-weeks)

- Coral bleaching declines across all sizes
- Recruitment dependent on low heat stress
- Population viability under climate change?

Benefit

Ability to monitor
population processes

Drawback

Highly time-consuming
image analyses

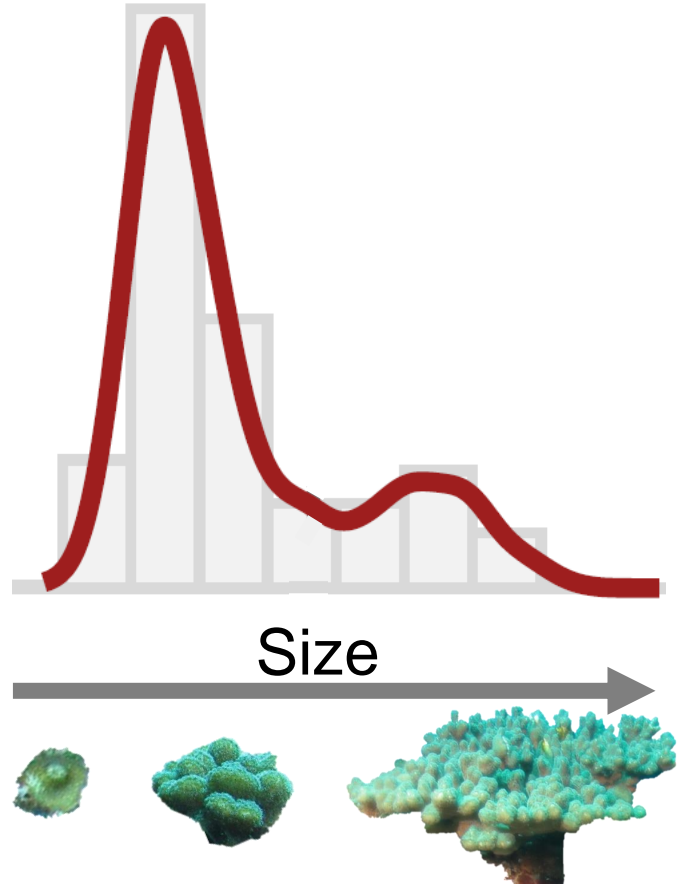
Demographic Surveys

Machine Learning

Improved real-time understanding of marine ecosystems



Better management & governance



- Co-authors:
Brigitte Sommer, James Cant,
Jessica M. Hodge,
Hamish A. Malcolm,
John M. Pandolfi &
Maria Beger
- PhD supervisors:
James Guest, John Bythell,
Peter Mumby & Holly East
- Support from:
c.f. logos, Winifred Violet Scott
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