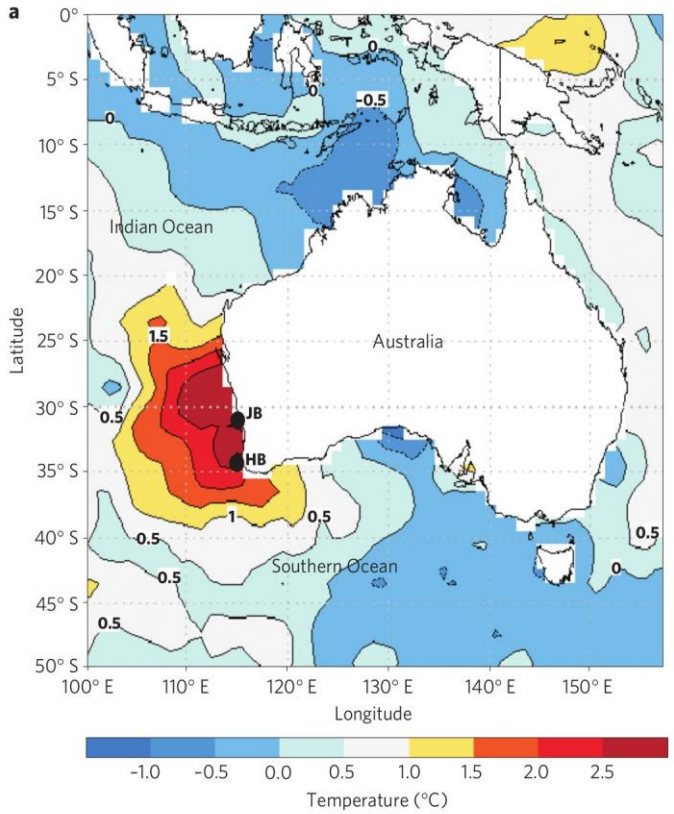
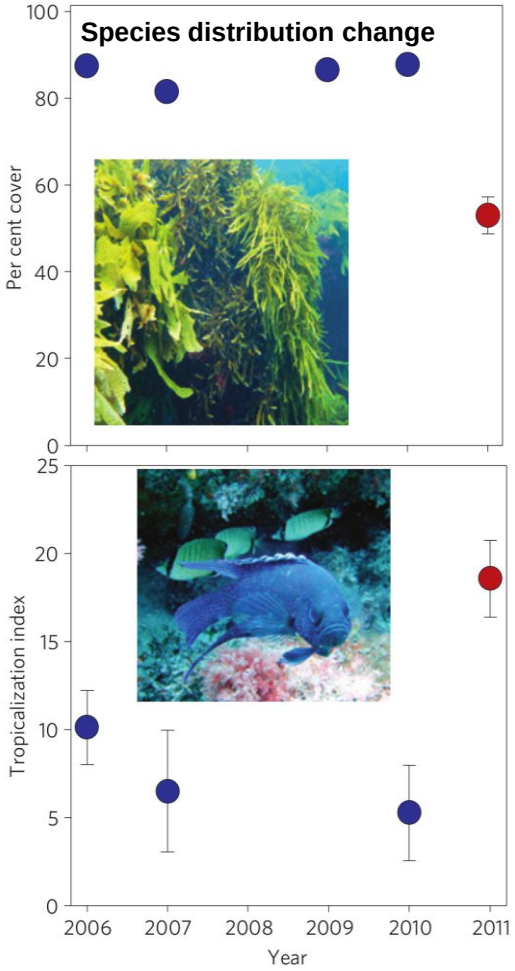
climate extremes
ARC centre of excellence

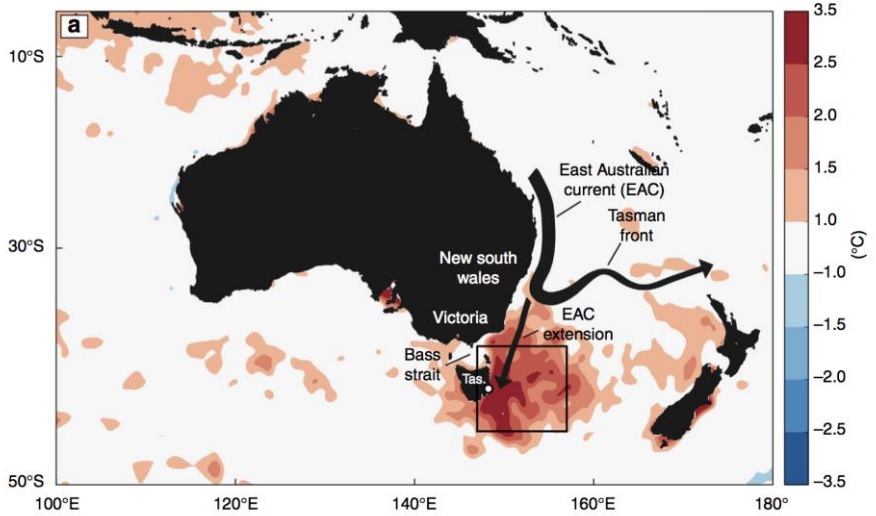
UNIVERSITY of TASMANIA | IMAS INSTITUTE FOR MARINE & ANTARCTIC STUDIES

Marine Heatwaves

Neil Holbrook

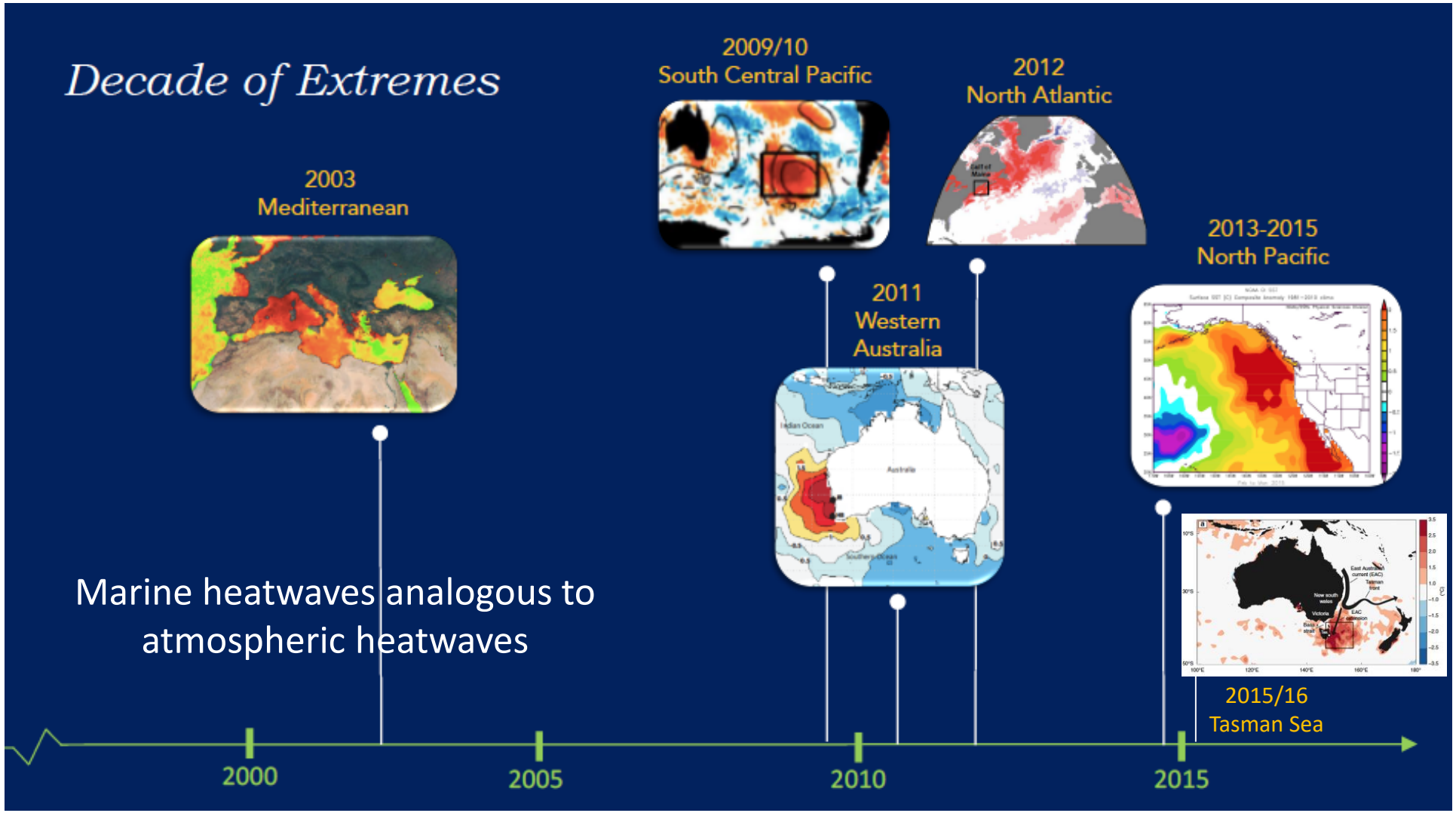






OEH-CLEX Partnership Seminar
CCRC UNSW, 18 March 2019

Recent history/timeline



Modified after Hillary Scannell (2017)

Marine Heatwave Definition

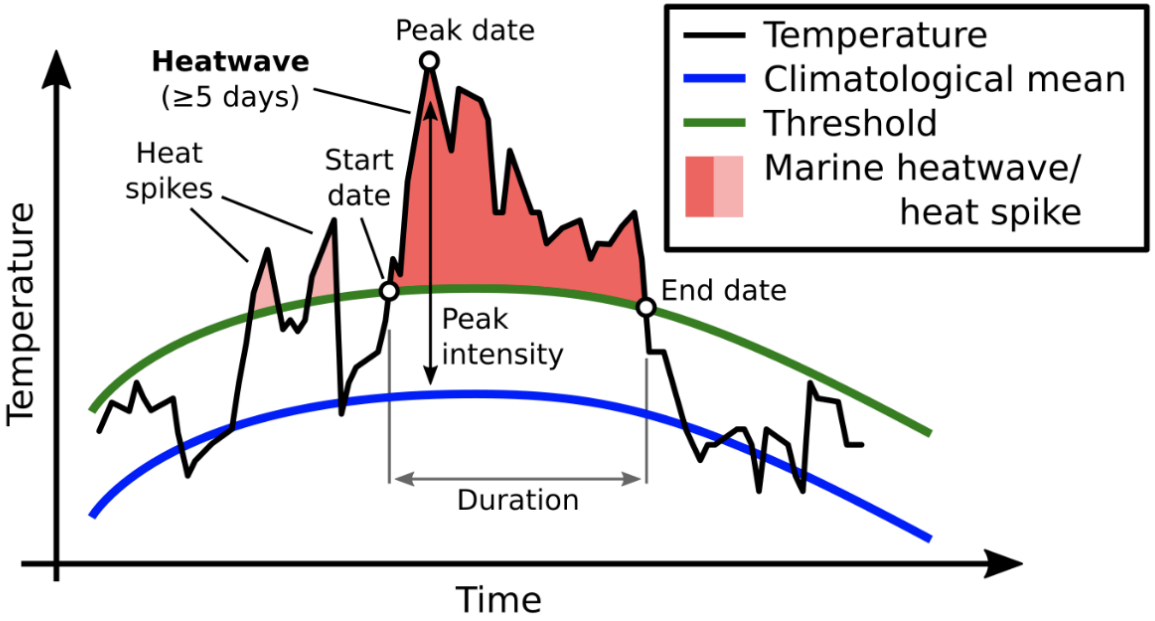
- The definition of a **marine heatwave**:

A prolonged discrete anomalously warm water event in a particular location

persistence for at least five days

well-defined start and end dates

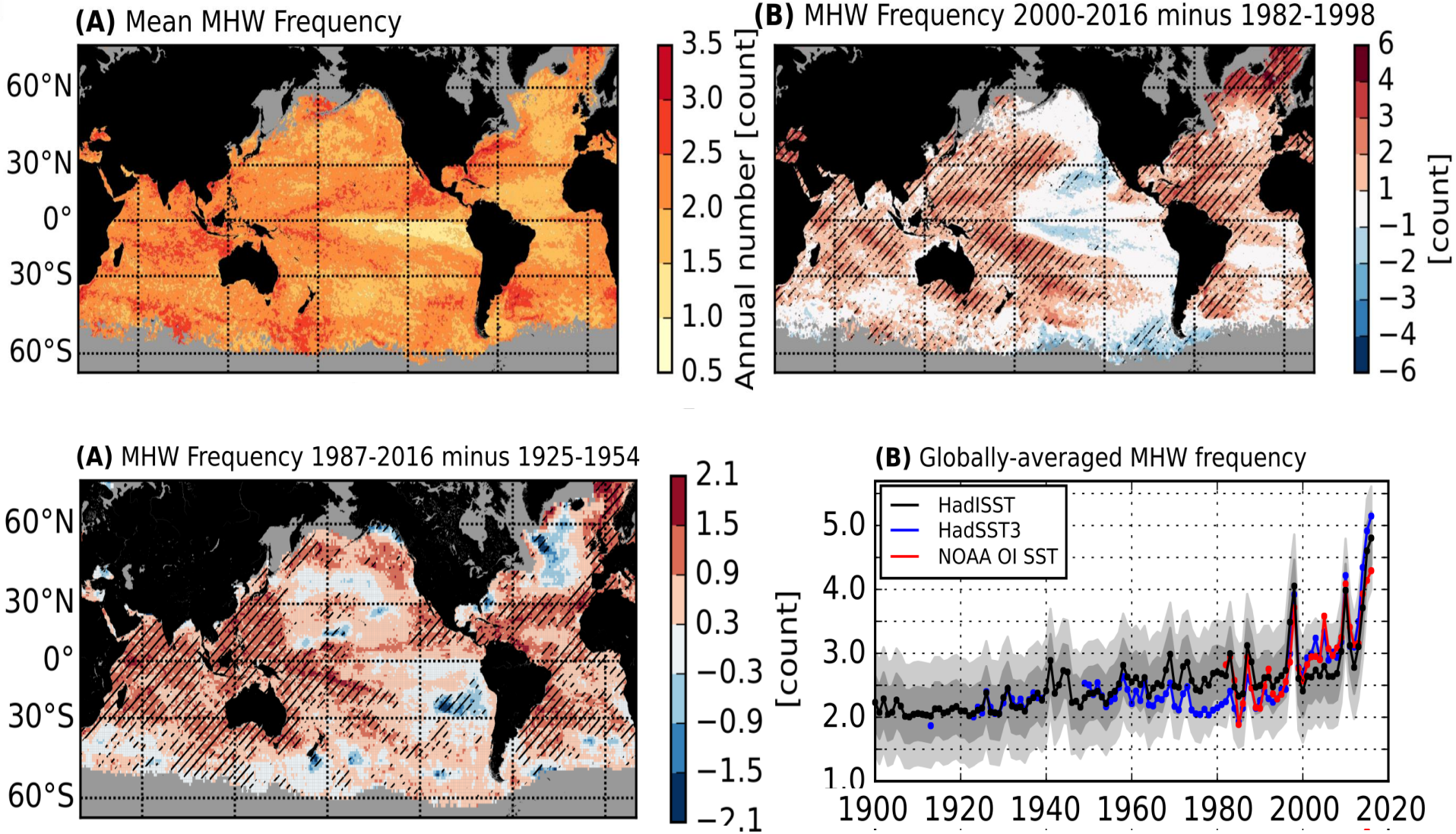
warmer than 90th percentile in a 30-yr baseline climatology

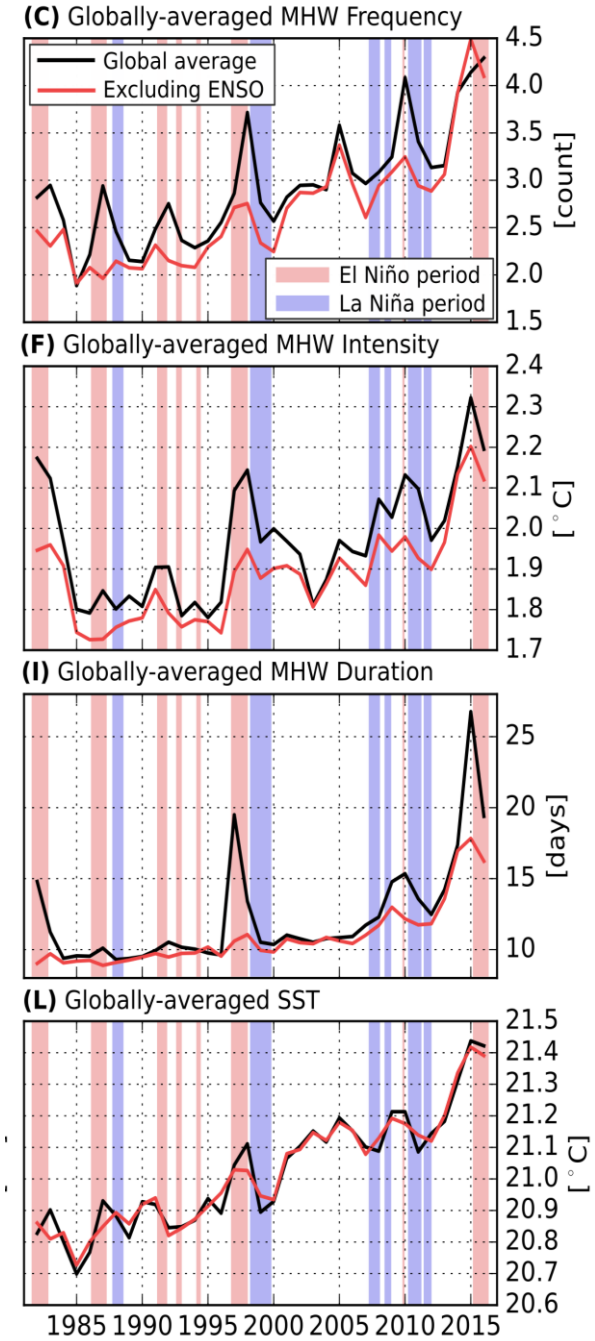


http://www.marineheatwaves.org/all-about-mhws.html

Hobday et al. (2016) *Progress in Oceanography,* **141**, 227-238 AND **www.marineheatwaves.org**

Trends in marine heatwaves

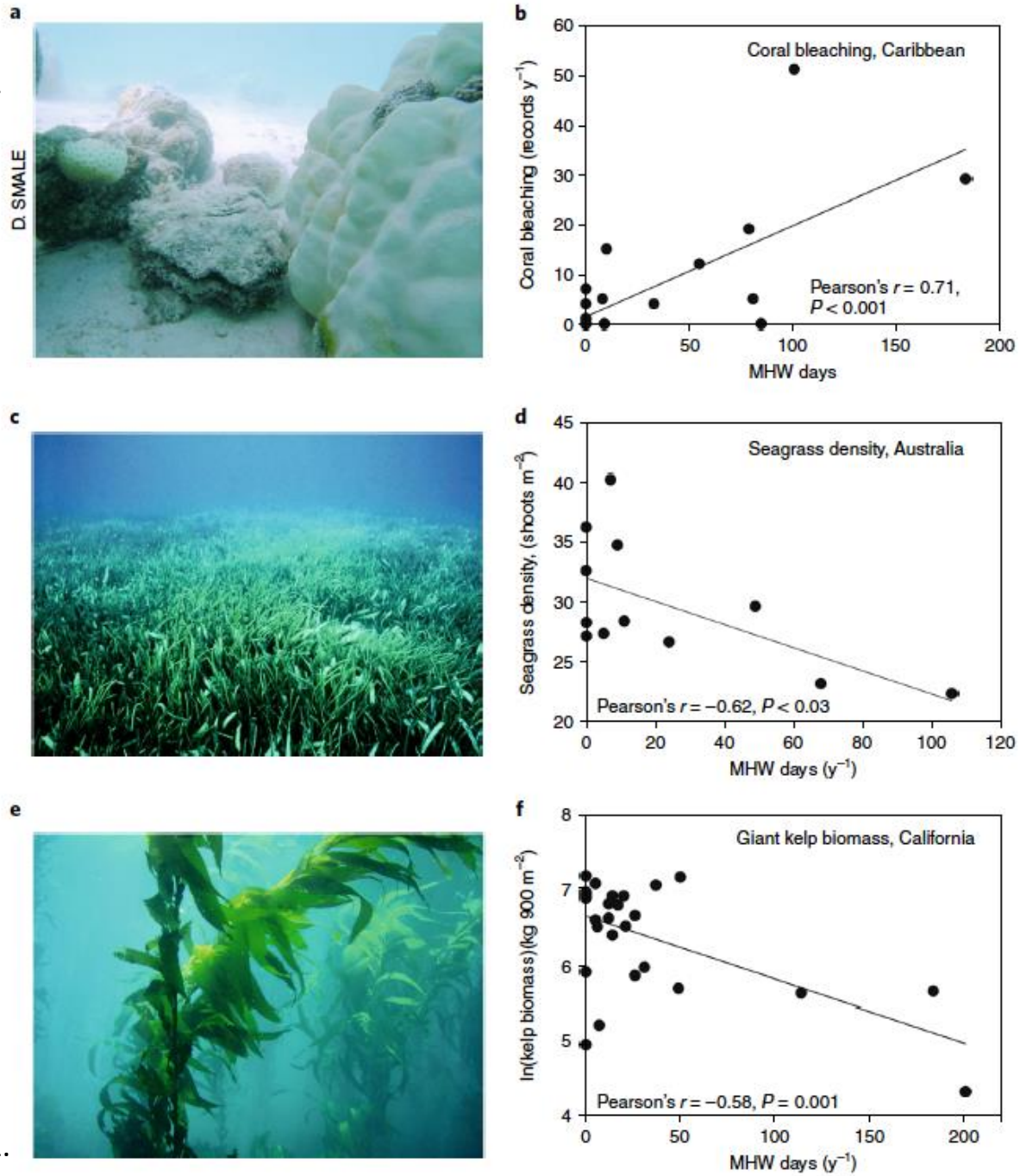




Oliver ECJ et al. (2018) *Nature Communications*, DOI:10.1038/s41467-018-03732-9.

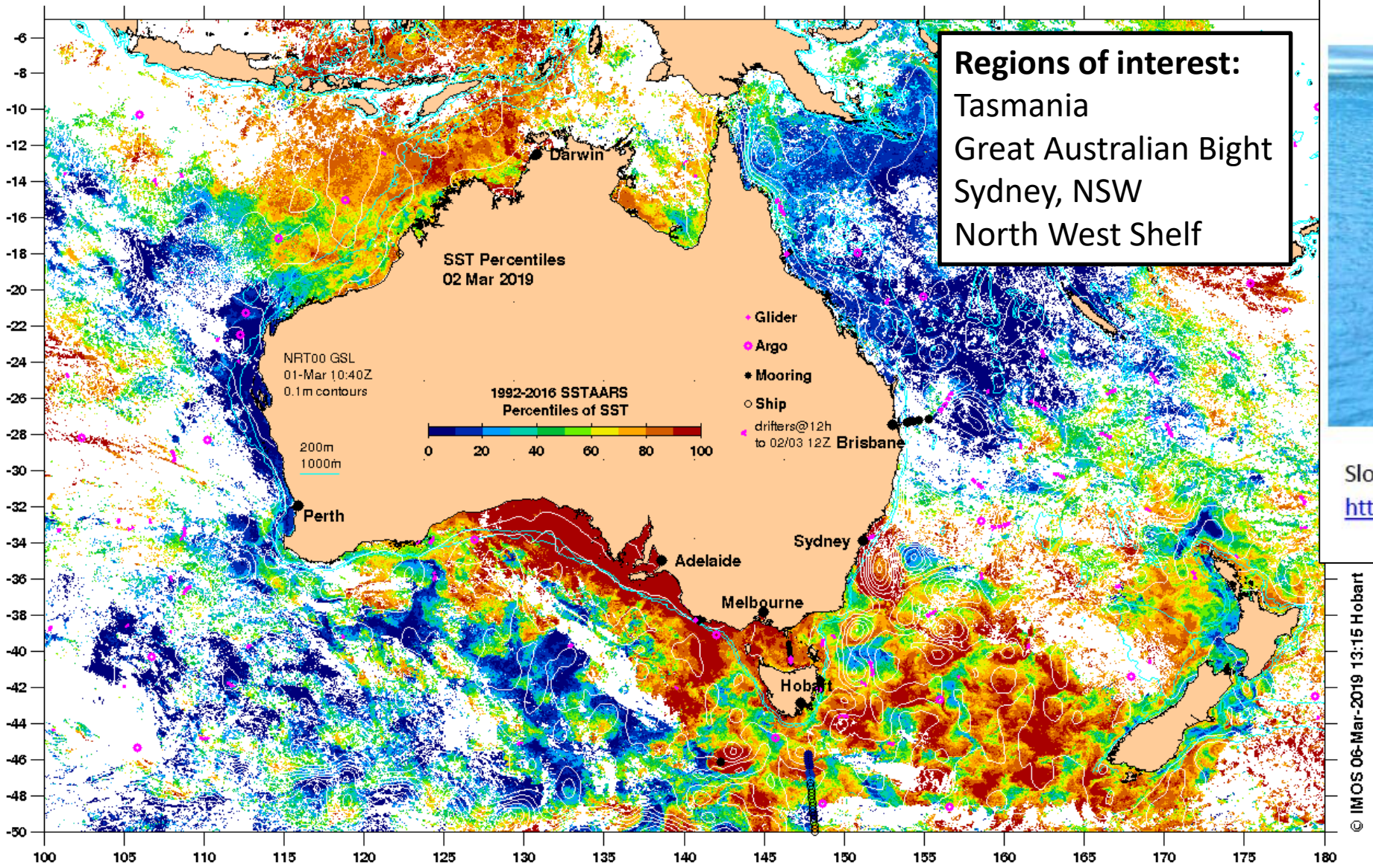
MHWs threaten global biodiversity

"To date, the main focus of ecological research has been on trends in mean climate variables, yet discrete extreme events are emerging as pivotal in shaping ecosystems, by driving sudden and dramatic shifts in ecological structure and functioning."



Smale DA, Wernberg T, Oliver ECJ, Thomsen M, Harvey BP, Straub SC, Burrows MT, Alexander LV, Benthuysen JA, Donat MG, Feng M, Hobday AJ, Holbrook NJ, Perkins-Kirkpatrick SE, Scannell HA, Sen Gupta A, Payne BL, Moore PJ, 2019: **Marine heatwaves threaten global biodiversity and the provision of ecosystem services.** *Nature Climate Change,* doi:10.1038/s41558-019-0412-1.

SST Percentiles: 2 March 2019
IMOS OceanCurrent



Regions of interest:
Tasmania
Great Australian Bight
Sydney, NSW
North West Shelf

Measuring in-situ ocean conditions: autonomous gliders

Slocum glider
http://imos.org.au/facilities/oceangliders/

http://imos.org.au/

http://oceancurrent.imos.org.au/

Source: Jessica Benthuysen (AIMS)

CLEX Marine Heatwave Directions

Upcoming Publication

Holbrook NJ, Scannell HA, Sen Gupta A, Benthuysen JA, Feng M, Oliver ECJ, Alexander LV, Burrows MT, Donat MG, Hobday AJ, Moore PJ, Perkins-Kirkpatrick SE, Smale DA, Straub SC, Wernberg T, 2019: **A global assessment of marine heatwaves and their drivers.** *Nature Communications* (accepted subject to revisions).

CLEX Directions

- Understanding subsurface MHWs (Gabriela Pilo)
- Understanding the importance of model resolution on MHW characteristics (with ANU)
- Theoretical understanding => desirable
- Role of El Nino – Southern Oscillation on MHWs (Review AGU Book: Holbrook et al; Zeya Li (PhD), IMAS/UTAS + CSIRO)
- Impact on Toothfish fisheries South Indian Ocean (UTAS Hons project)
- Eddy-permitting regional modelling of MHWs (UNSW Hons project)

MARINE HEATWAVES A CLEAR AND PRESENT THREAT TO OUR OCEANS

by Alvin Stone | Mar 5, 2019 | News, RP2 Heatwaves and cold outbreaks

The increase in frequency and intensity of ocean heatwaves over the past 30 years has had profound impacts on certain marine ecosystems and significantly impacted the industries that depend on them. According to new research in Nature Climate Change, marine heatwaves are now a clear and present threat to global biodiversity.

I welcome questions!