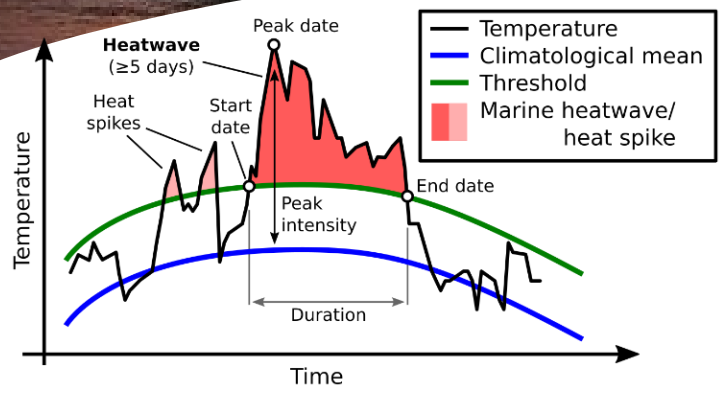
MARINE HEATWAVES



What is a marine heatwave?

A marine heatwave is currently defined as when sea surface temperatures (SST) are in the top 10% of temperatures recorded for that location at that time of year for 5 or more days.

Duration, intensity and area affected are all important characteristics. Events can occur any time of year, though tend have the greatest impacts in summer.

What causes marine heatwaves?

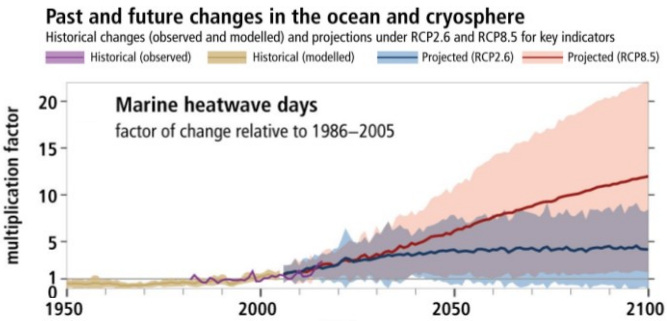
Large climate modes, like El Niño, can cause marine heatwaves to occur. Warm air can drive marine heatwaves by warming the ocean surface, as can ocean currents by moving warm water around.

What's the big deal?

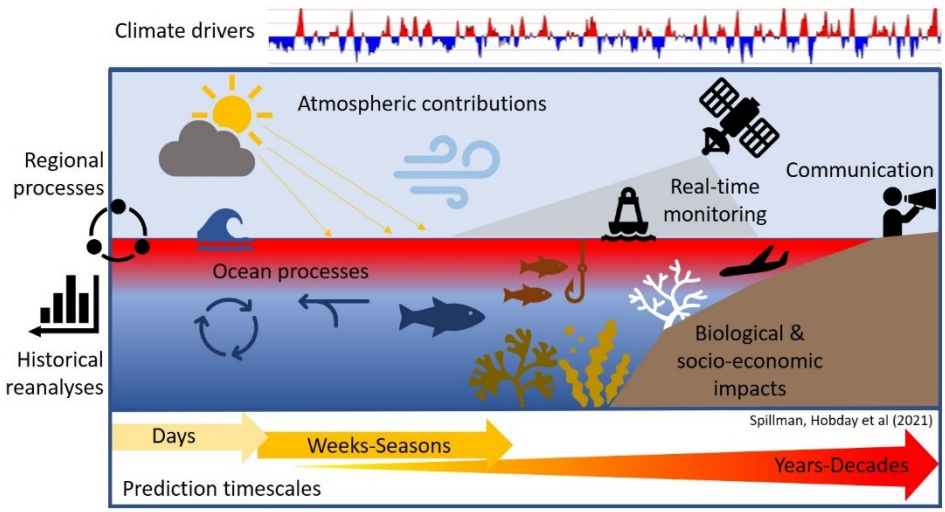
These heat events can have large impacts on marine ecosystems and industries, including:

Mass coral bleaching
Thermal limits exceeded
Changes in growth rates
Increased disease risk
Changing fish habitat distributions
Altered migration & spawning
Altered food availability

Marine heatwaves are projected to increase in frequency, duration and intensity in the future.



Current marine heatwave research



Predicting marine heatwaves

The Bureau of Meteorology and CSIRO have a 3 year project to research and develop prototype seasonal marine heatwave forecast tools.

Forecasts will be used to help predict the likelihood, location and intensity of marine heatwaves in the coming months.

https://research.csiro.au/mri-research-portfolio/home/climate-impacts-adaptation/marine-heatwaves/dynamical-forecasting-of-marine-heatwaves/

References: Hobday et al 2016, IPCC SROC, Holbrook et al 2020

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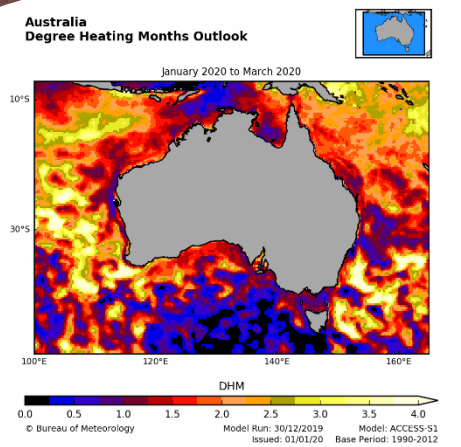
Marine Heatwaves

Ocean Temperature Outlooks

The Bureau of Meteorology provides an operational seasonal ocean temperature and coral bleaching risk outlook service for Australian waters.



Real-time sea surface temperature (SST) based ACCESS-S1 forecasts for up to 6 months into the future are produced at 25km grid resolution. Products include:

- Mean corrected SST
- SST anomalies
- Degree Heating Months (accumulated thermal stress)
- Forecast accuracy (skill)

These forecasts are used by reef, fisheries and aquaculture managers to plan for the upcoming season.

www.bom.gov.au/oceanography/oceantemp/sst-outlook-map.shtml

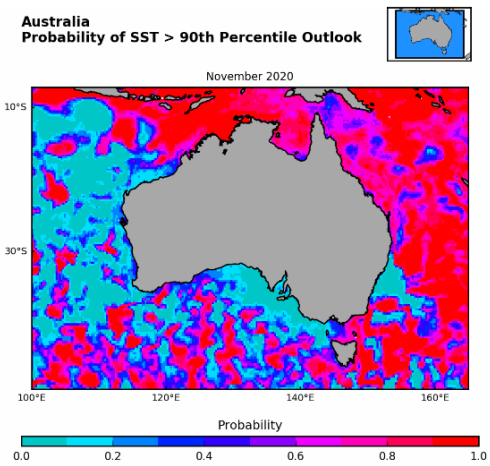
Impacts of recent marine heatwaves

Recent marine heatwaves include the Tasman Sea 2016 event, the 2013 'Blob' on the California coast and the 2011 WA marine heatwave. These extreme events heavily impacted fisheries and aquaculture, as well as led to coral bleaching and seagrass mortality in WA.

Can we use seasonal forecasts to help marine managers & industries better cope with marine heatwaves?

Yes! New seasonal marine heatwave prediction tools in development will enhance the Bureau's existing operational ocean temperature outlook service.

These will provide advance warning of marine heatwaves, allowing for proactive management and response by marine managers & industries.



Skilful marine heatwave forecasts can help inform management decisions such as:

- Where do we survey?
- Should we harvest/seed early/late?
- When do we leave port?

ACCESS-S

ACCESS-S is the Bureau of Meteorology's new operational seasonal ensemble prediction system. It includes a global coupled ocean-atmosphere model, with an ocean grid resolution of 25 km.

ACCESS-S1 has been running daily since late 2018. ACCESS-S2 will be operational in 2021. S2 will have a 1981-2020 hindcast and realtime forecasts produced daily out to 6-8 months into the future.

References: Hudson et al 2017, Smith & Spillman 2019

Decision timescales and forecast usefulness