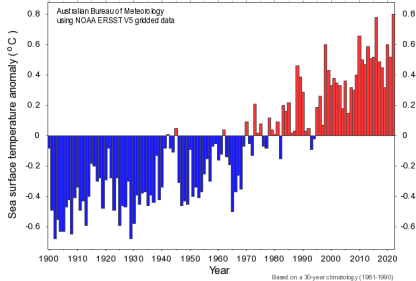
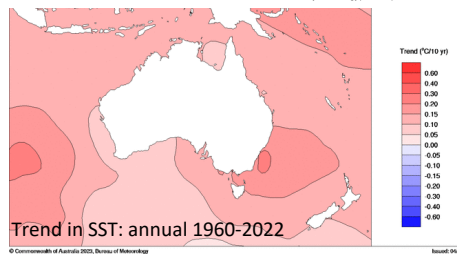


Historical Period

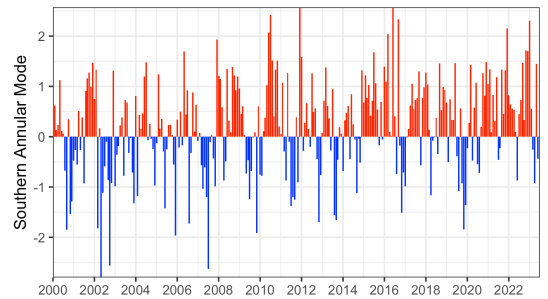
Climate Drivers



Australian waters have warmed significantly over time ([link](#))¹. The last decade has been ~0.5°C warmer than the 1960-1990 average.

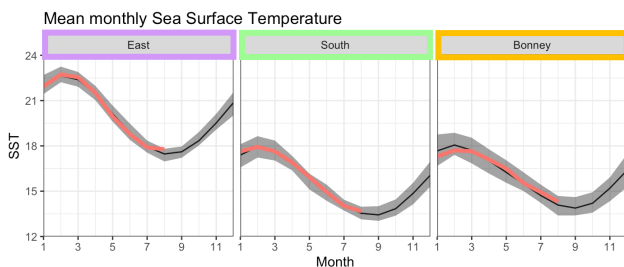


South-east Australia has warmed more rapidly than other regions ([link](#))¹.

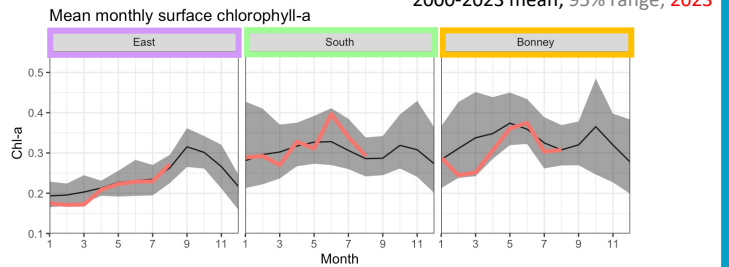


Southern Annular Mode (SAM) indicates the north-south movement of westerly winds that bring storms to southern Australia. Positive phases have become more common over time, where westerlies move poleward and bring more stable, dry conditions ^{1,2} ([link](#)).

Regional Dynamics: Sea Surface Temperature and Chlorophyll-a

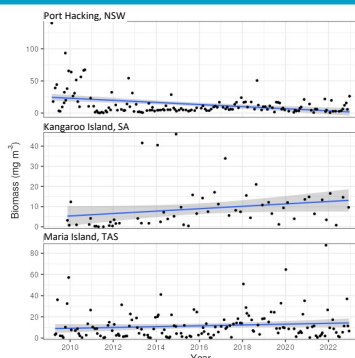


Regional dynamics of SST from year 2000, with red showing 2023³. Temperatures in 2023 have been similar to conditions since 2000. Bonney SST in summer was slightly cooler than average. East SST has been slightly warmer than average in August.



Regional dynamics of surface chlorophyll-a from year 2000, with red showing 2023³. Chl-a during the 2023 summer was lower than average on the East and Bonney coasts.

Ecosystem and Fishery

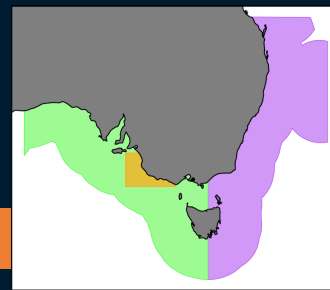


Zooplankton biomass at National Reference Stations can indicate ecosystem productivity.

Over time, zooplankton biomass has declined off NSW, but increased off SA and TAS^{4,5} ([link](#)).

Observations

- Across all regions, fisheries effort has shifted to deeper waters (~90m to ~130m) to follow squid.
- Catches higher during El Niño.
- Catch drops off very quickly after spawning occurs.
- Noted that tuna have moved inshore and hypothesized a potential link to offshore shifts in squid aggregations.

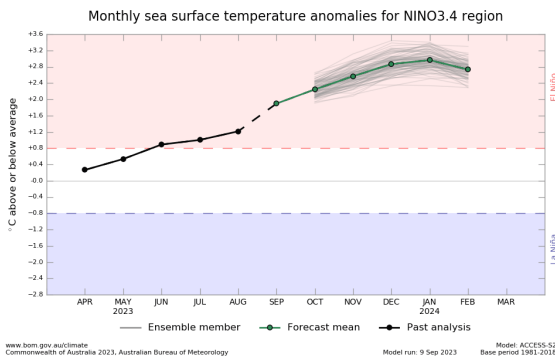


Future Outlook for 2023

Climate Drivers: ENSO



Currently transitioning to El Niño¹ ([link](#))

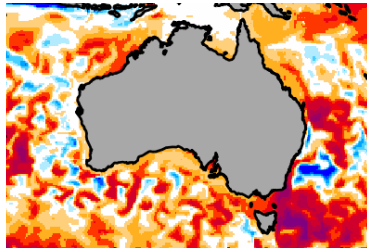


El Niño is predicted ([link](#))¹. These conditions:

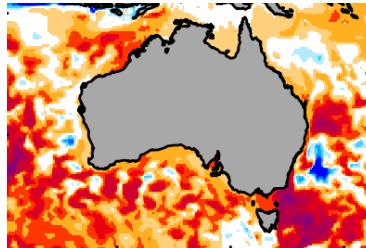
- Weaken the Leeuwin Current, which lead to a cooler GAB.
- Raise the thermocline along southern Australia.
- Strengthen upwelling intensity, which may increase squid biomass.
- favour a negative Southern Annular Mode, where westerly winds shift north.
- Strengthen the EAC.

Sea Surface Temperature Forecasts

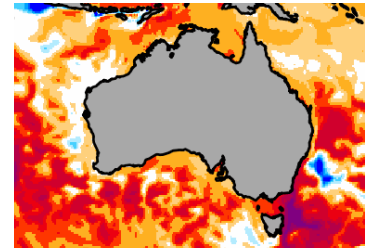
October 2023



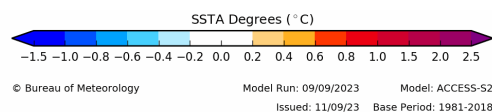
November 2023



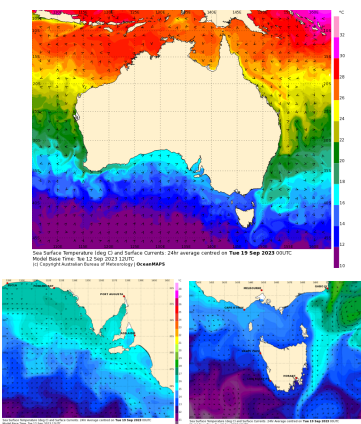
December 2023



Forecasts of SST anomalies indicate warmer conditions for much of Australia. Notably, the south-east coast will exceed 2°C anomalies, while the GAB and Bonney coast will be ~0.5 °C warmer than average from October¹ ([link](#)).



Regional Dynamics



10-day forecasts of SST and currents around Australia ([link](#))¹ may be useful during the Bonney upwelling season (November-May) to identify upwelled waters.

Bonney upwelling can be indicated by cool sea surface temperatures. Upwelling is an important driver of squid prey (krill) and squid abundance in this region

SAM is negative but forecast to become neutral by Oct 2023¹. Negative phases bring more storms. SAM can change quickly and forecasts are updated regularly ([link](#)).

