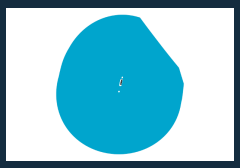
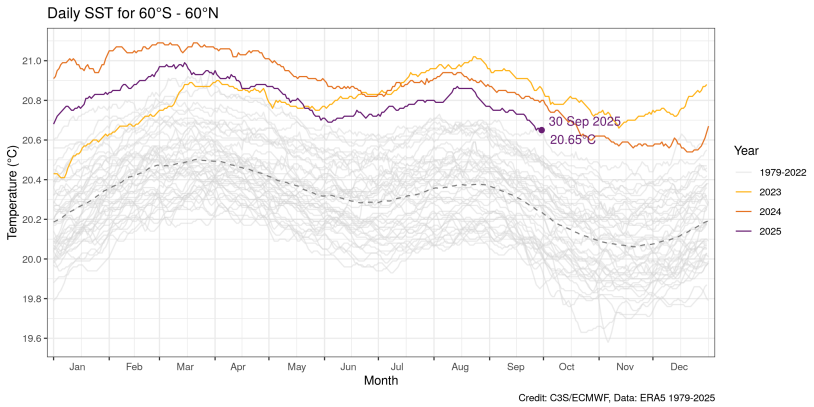
Macquarie Island Toothfish Fishery



October 6, 2025

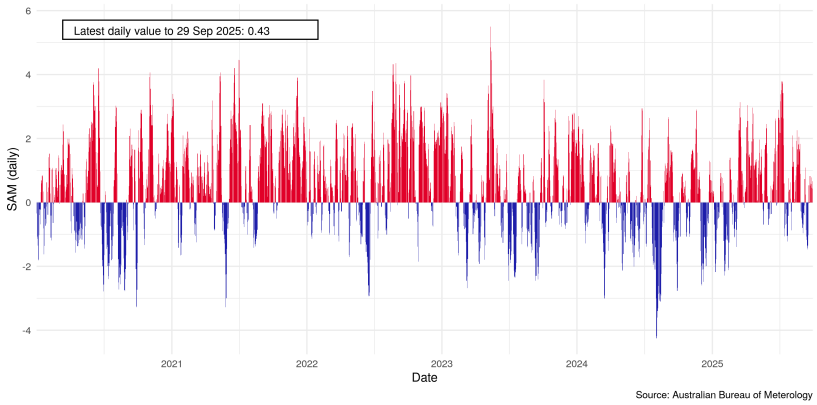
Historical Period

Climate Drivers: Sea Surface Temperature (SST)



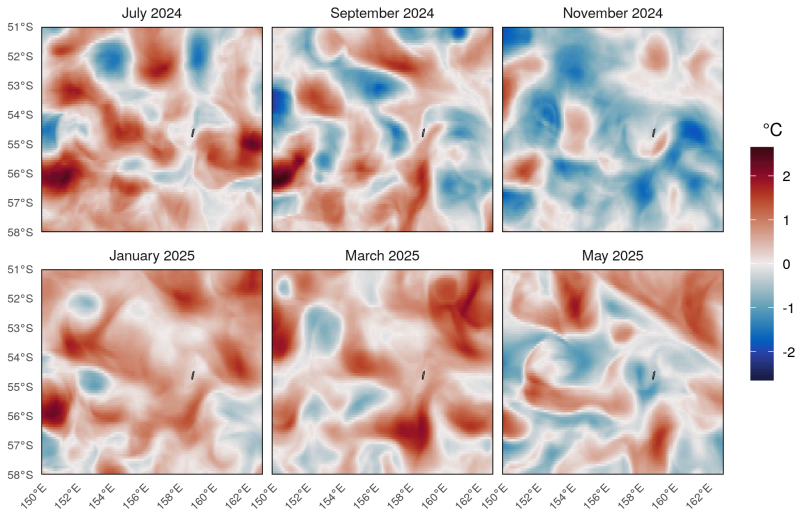
Global Sea Surface Temperatures (SST) have remained at record highs in 2025 (*Copernicus*)[1].

Climate Drivers: Southern Annular Mode (SAM)



Southern Annular Mode (SAM) indicates the N-S movement of westerly winds in the mid-high latitudes. Positive SAM (westerlies move south) have become more common over time and are associated with increased sea ice extent[2]. (*BOM SAM*).

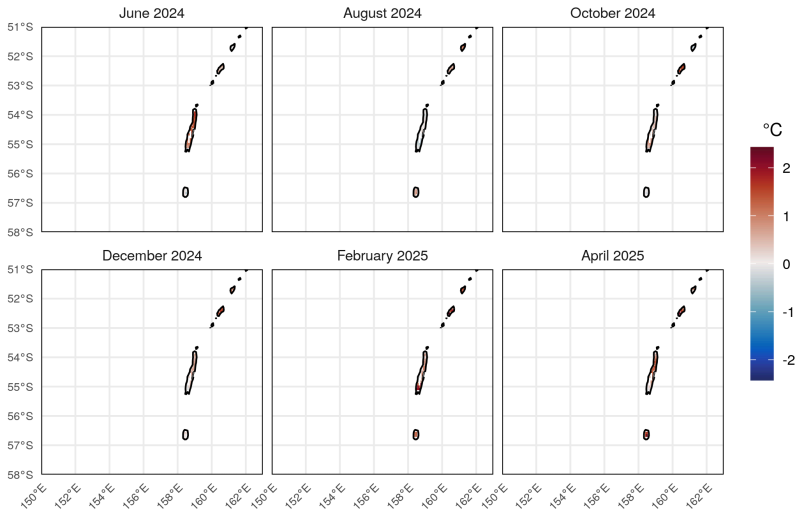
Regional Dynamics: SST Anomaly



Source: CMEMS

Bi-monthly maps of SST anomalies show the MACA region has seen a series of both anomalously cool and warm waters over the last year[3]. Anomalies are relative to 1993-2016.

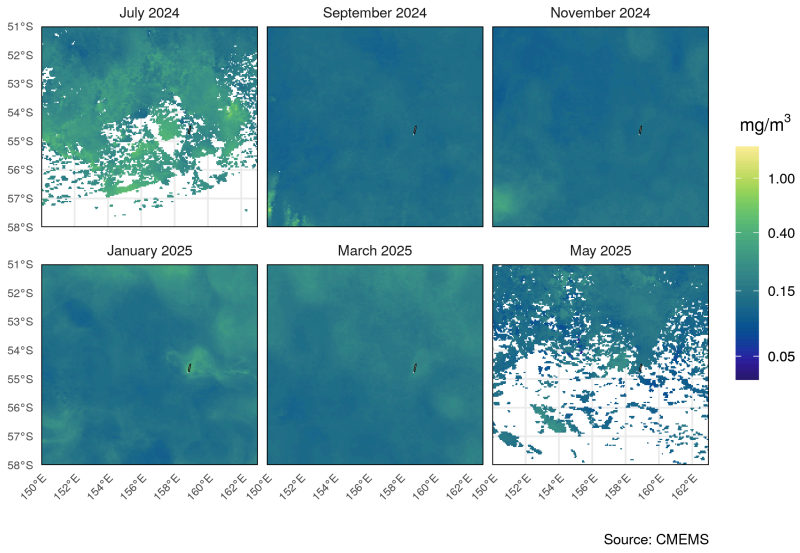
Regional Dynamics: Bottom Temperature Anomaly



Source: CMEMS, Climatology: 1993-2016

Bi-monthly maps of bottom temperature anomalies, with the 1000 m contour shown in black. Bottom temperatures of the broader MACA region have been, in general, slightly warmer than average. More intense anomalies are seen in waters shallower than 100 m, with this region often anomalously warm over the past year[3]. Anomalies are relative to 1993-2016. Low (high) temperatures can decrease (increase) toothfish catchability at a lag of ~6 months[4].

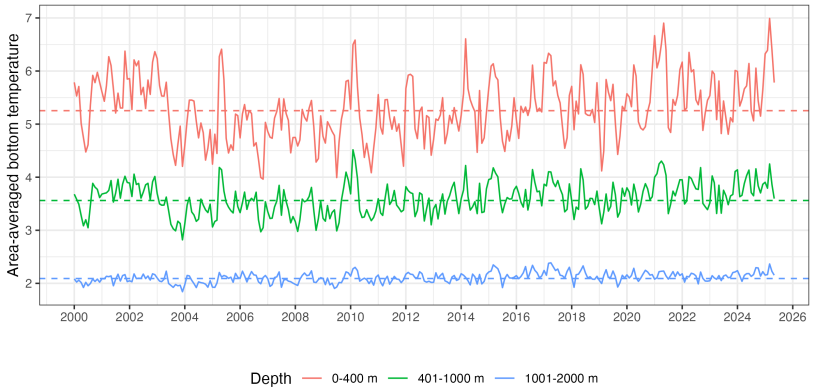
Regional Dynamics: Chlorophyll-a



Source: CMEMS

Bi-monthly maps of surface chlorophyll-a (log scale; mg/m3)[3]. Surface chl-a is a proxy for ecosystem productivity. Elevated surface chl-a is patchy, with higher values seen in summer and around the island. White values indicate cloud cover.

Regional Dynamics: Bottom Temperature Time-series



Area-averaged monthly bottom temperature at three depth bins from Jan-2000 to May-2025[3]. The past year has been warmer than the longterm average (solid line) across all depth bins. 2℃ is the lower preferred temperature of Patagonian toothfish.

Observations

2025 observations

- Slow start to the season but catches improved.
- Good catches in areas that hadn't been fished previously.
- One occurrence of sperm whale depredation.
- Boats reporting the worst winter weather in a long time.

2024 observations

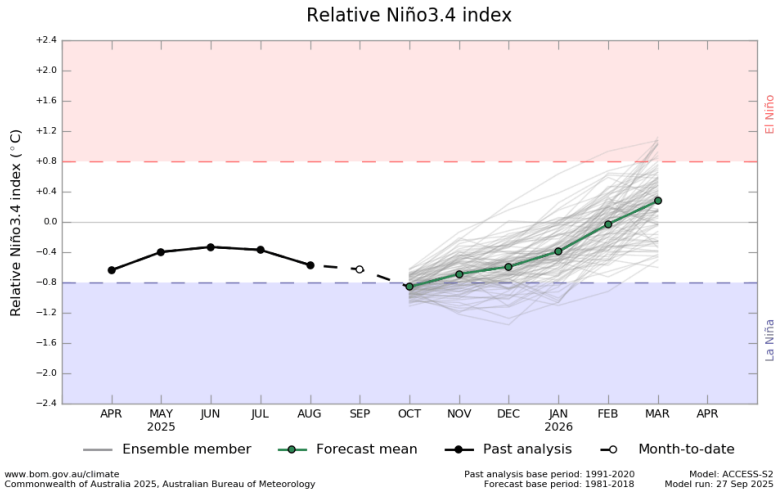
- None recorded.

2023 observations

- Initial fishing efforts finding good sized fish.
- No obvious signs of the impact of low sea ice extent.
- The interaction and location of currents in this region are of interest, and a better indicator of ecosystem and fishing conditions compared to sea ice extent.

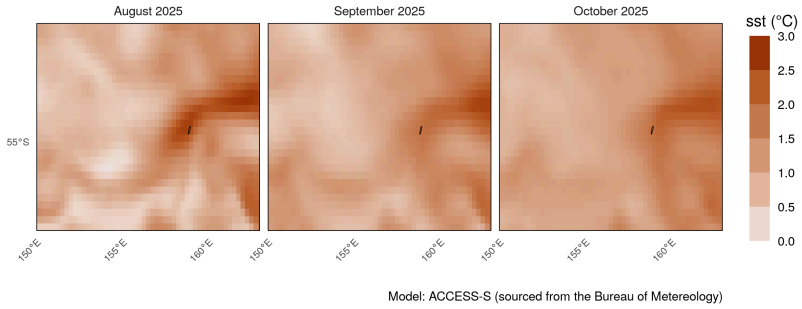
Future Outlook

Climate Drivers: Nino3.4



ENSO is forecast to remain neutral until December. During La Niña, the Southern Annular Mode tends to shift to positive phases, where westerly winds move south and result in strong circumpolar westerlies (*BOM*)[5].

Regional Dynamics: SST Anomaly



Forecasts of SST anomalies for the next three months indicate anomalously warm conditions across most of the region (*BOM*)[6]. Forecasts are updated regularly.

Sources:

(1) https://pulse.climate.copernicus.eu/.

(2) http://www.bom.gov.au/climate/sam/

(3) Copernicus Marine Service.

(4) https://www.frdc.com.au/project/2019-169

(5) http://www.bom.gov.au/climate/ocean/outlooks/?index=nino34

(6) https://access-s.clide.cloud/