



Department of
Primary Industries and
Regional Development

FOO 2021, Thursday 25th November

Climate, Marine Heatwaves and Temperature

Using environmental data and seasonal forecasts to inform stock assessment and fisheries management

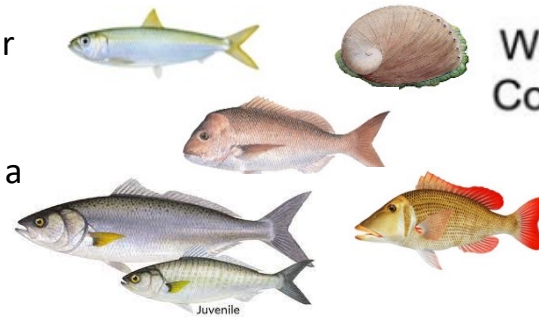
Dr Arani Chandrapavan
Senior Fisheries Scientist
Offshore-Invertebrate Trawl Branch



DPIRD acknowledges the Traditional Owners of Country, the Aboriginal people of the many lands that we work on and their language groups throughout Western Australia and recognise their continuing connection to the land and waters. We respect their continuing culture and the contribution they make to the life of our regions and we pay our respects to their Elders past, present and emerging.

Western Australian Fisheries

- ~ 48 Fisheries (10 MSC fisheries)
- ~200 species
- GVP \$550 million
- Lakes, rivers, estuaries, rocky reefs, nearshore, offshore, deep sea
- Recreational sector
- Commercial sector
- Processing sector
- Aquaculture Sector
- Indigenous fishers
- Ecosystem based fisheries management (EBFM) framework, a risk based approach to assess the stock status using all available information to date
- Understanding recruitment dynamics so we can predict and set an acceptable harvest level to ensure the sustainability of our resource
- Recruitment process is largely a response to breeding stock biomass and the prevailing environmental conditions



Gascoyne Coast

North Coast

Northern Inland

Southern Inland

West Coast

South Coast

27°S

115° 30'E



“Climate change, marine heatwaves and warming oceans “

Shark Bay Blue Swimmer Crab Fishery

- Australia's largest single stock BSC Fishery
- 12-month fishery (Nov-Oct)
 - Trap and trawl sectors
 - Small recreational fishery
- Effort controlled fishery till 2011

WA sweltering through heat waves, cyclones and flooding
 Public enjoying warm waters off beaches
 Rec fishers enjoying catching tropical fish down south
 Fill kills up and down the coast
 Media focused on devastating Brisbane floods and tropical cyclones

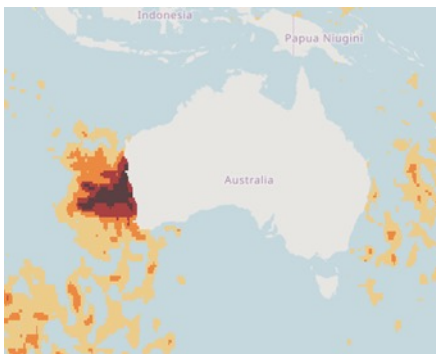
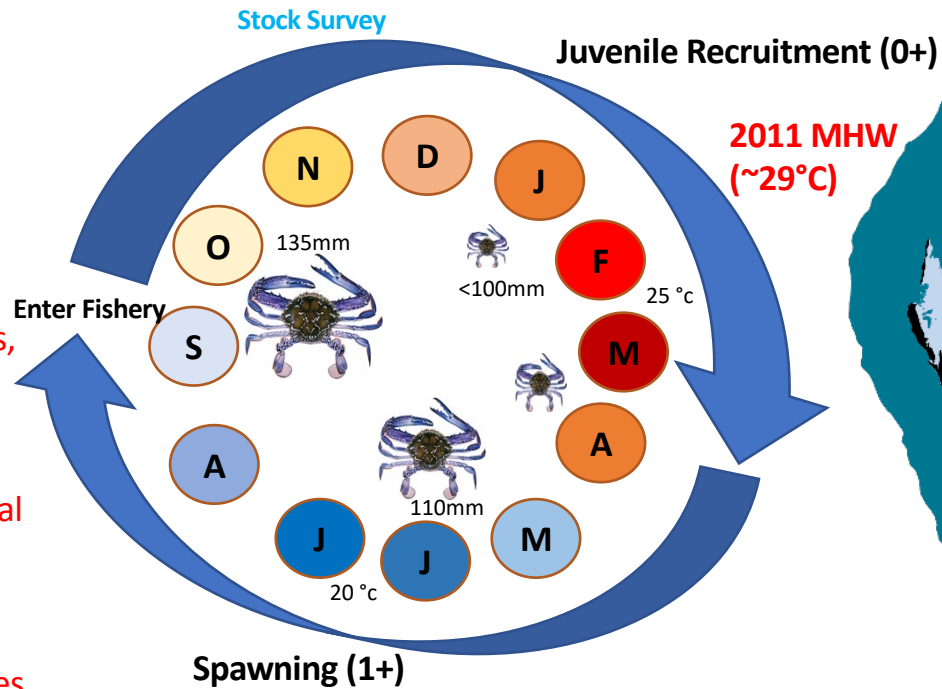


Image : Marine Heatwave Tracker

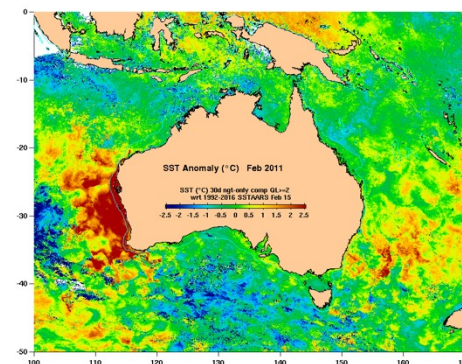
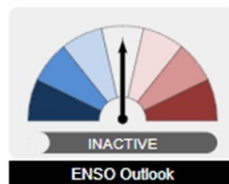
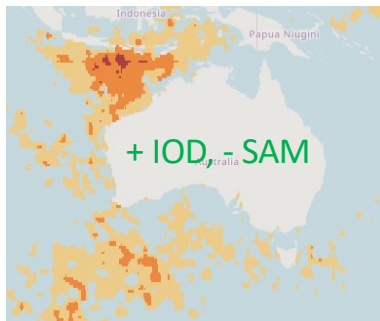


Image : IMOS Ocean Current

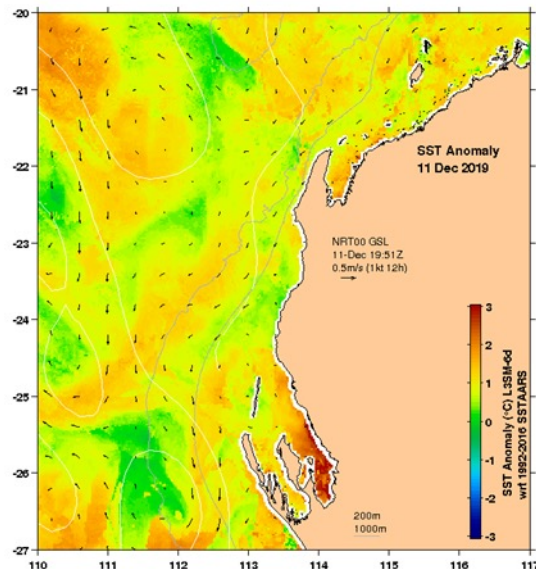
- Significant flooding and discharge into Shark Bay
- Recruitment failure & biomass depletion
- Fishery closed for stock recovery
- Research focus on understanding “what just happened” during the summer of 2010/11 in WA

Stock rebuilding & Adaptive Harvest Strategy

- Increased pre-recruit stock monitoring
- Change to quota management
- Improved stock – environment relationship
- Flexible Harvest Strategy



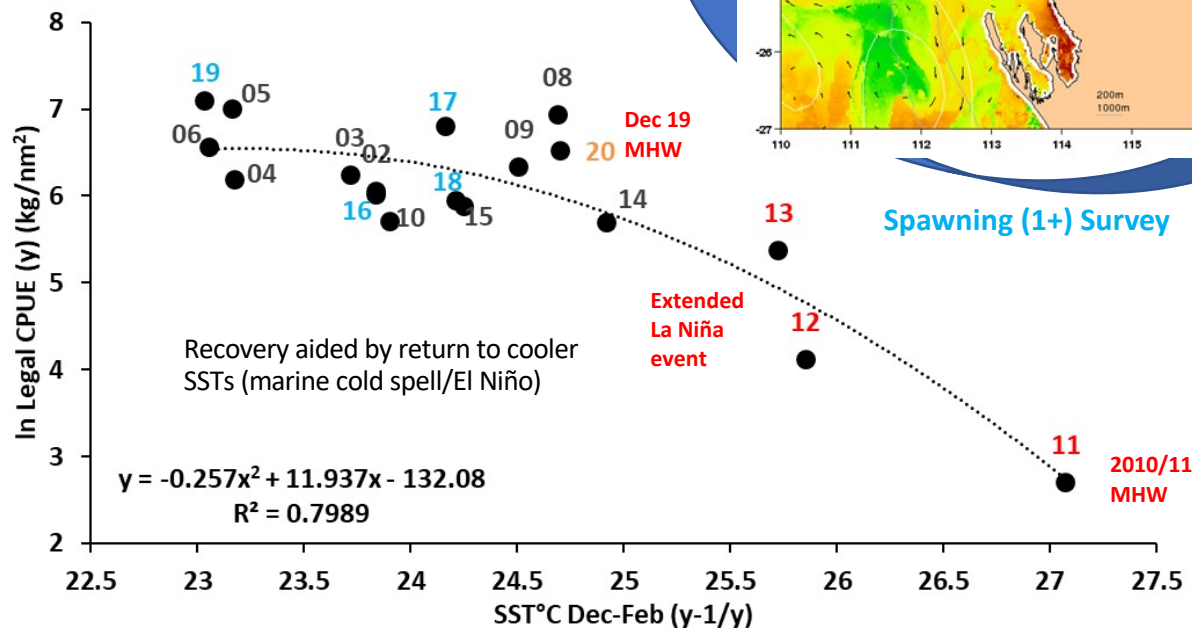
Spring 2019 ENSO forecast
Stock Survey (longest time series)



Seasonal Forecasting (climate + ocean)

- Summer is the critical season
- BoM ENSO Outlook (early warning)
- BoM Seasonal SST Forecasting (ACCESS –V2)- qualitative

Stock - Environment relationship



Juvenile Recruitment (0+) Survey

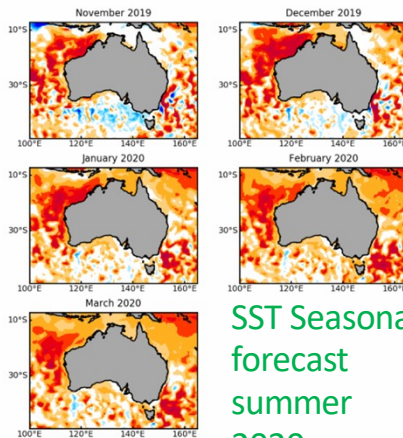
Stock forecasting

Stock Assessment (Quota setting)- stakeholder engagement

Spawning (1+) Survey

Stock forecasting

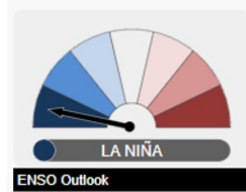
Australia Sea Surface Temperature Anomaly Outlook



SST Seasonal forecast summer 2020

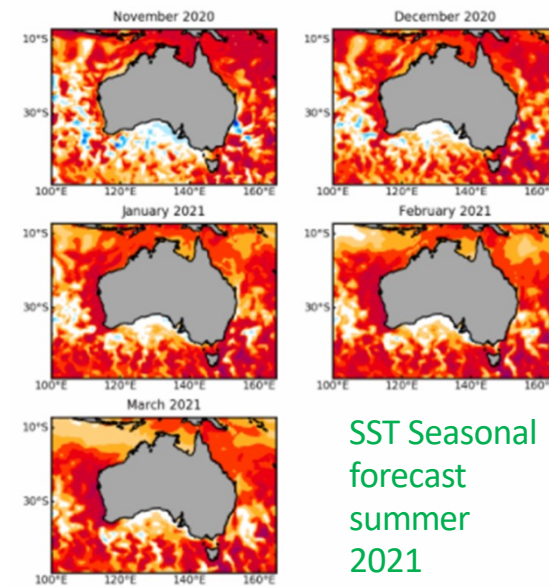
Seasonal Forecasting 2021 summer

- ENSO forecasting – La Niña established in October 2020
- Seasonal SST forecast shows 1-2 °C increase over summer months
- MHW forecasts showing high likelihood of a moderate MHW event off WA
- No sig. impact on recruitment or spawning stock for 2022 fishing season

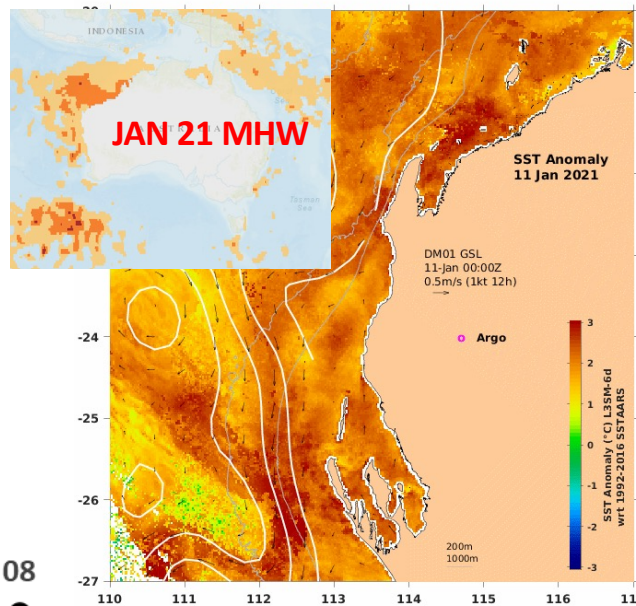


Spring 2020 ENSO forecast
La Niña

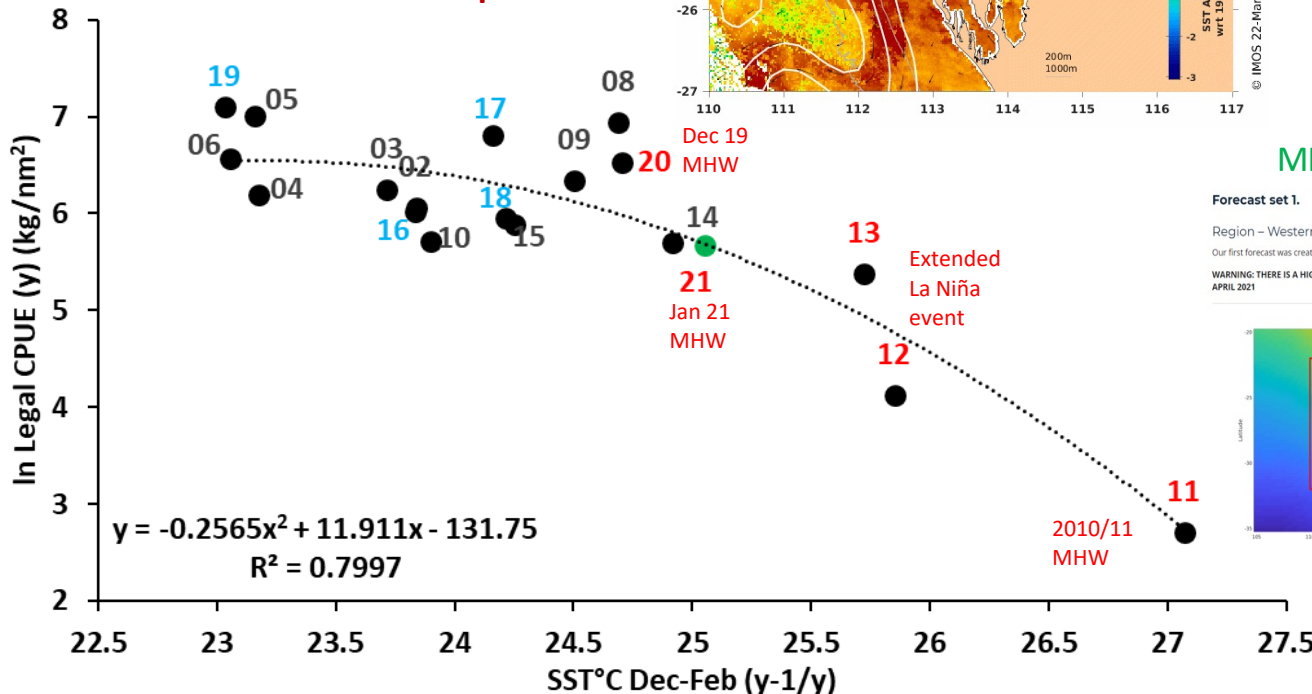
Australia
Sea Surface Temperature Anomaly Outlook



SST Seasonal forecast summer 2021



Stock - Environment relationship



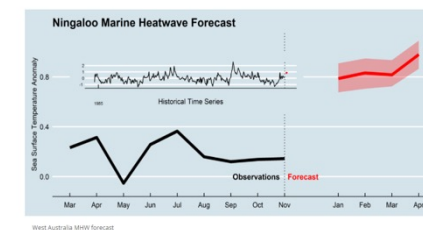
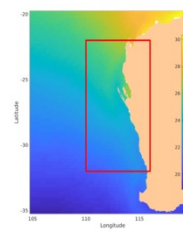
MHW forecast (experimental product)

Forecast set 1.

Region – Western Australia

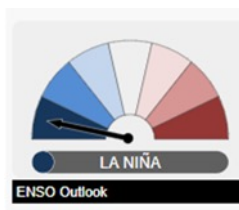
Our first forecast was created in December 2020, and was based on historical data up to November 30, 2020.

WARNING: THERE IS A HIGH LIKELIHOOD OF MARINE HEATWAVE DEVELOPMENT BETWEEN JANUARY AND APRIL 2021



High likelihood of a MHW

Seasonal Forecasting 2022 summer

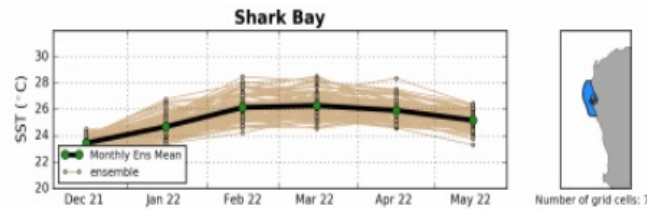


Spring 2021 ENSO forecast
La Niña Established

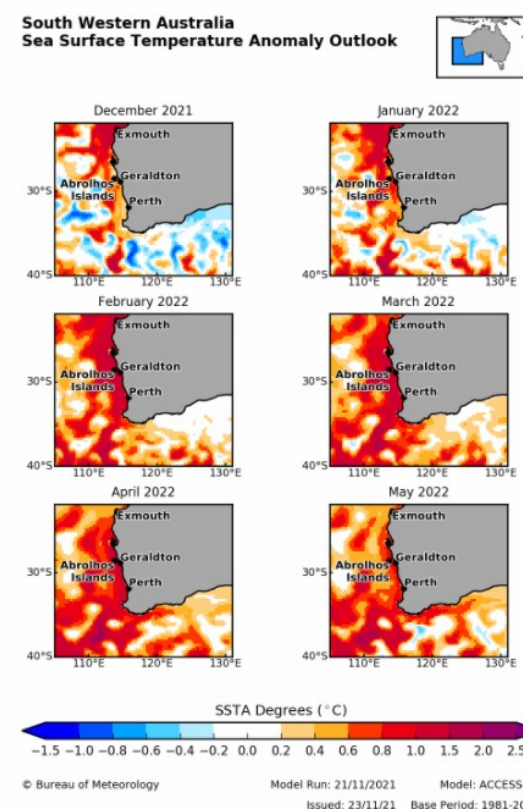
Climate informed resource management

- Provides early –warning of ocean conditions
- Plan stock monitoring
- Management decisions will still be based on actual impacts not predictions
- Climate and environmental information is critical to understanding productivity, distributional and biological changes

Coral Bleaching Risk Outlook- (quantitative and regional)

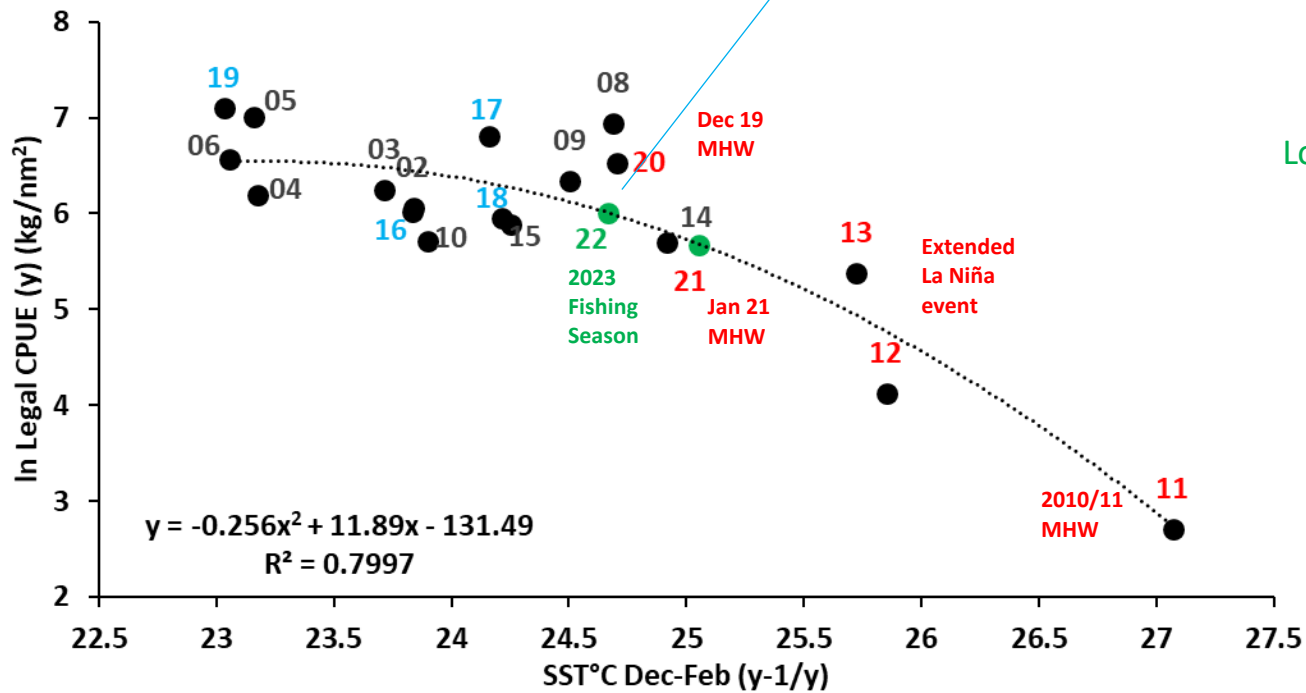


Downscaled regional SST forecast

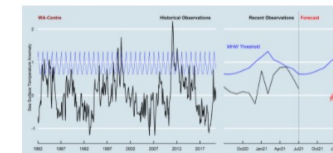


MHW forecast (experimental product)
Low likelihood of a MHW but also low skill

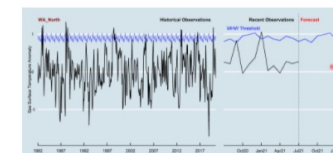
Stock - Environment relationship



8. West Australia



9. North-west Australia



“Marine environments in transition: Planning and responding to changes across daily to seasonal and decadal timescales.”



WESTERN AUSTRALIAN
MARINE SCIENCE
INSTITUTION



Australian Government
Bureau of Meteorology



WAFIC
WESTERN AUSTRALIAN FISHING
INDUSTRY COUNCIL INC



recfishwest



GOVERNMENT OF
WESTERN AUSTRALIA

CHALLENGE 1
Greater engagement between the
marine/fisheries science and
ocean/climate science communities



FRDC
FISHERIES RESEARCH &
DEVELOPMENT CORPORATION



AUSTRALIAN INSTITUTE
OF MARINE SCIENCE



THE UNIVERSITY OF
WESTERN
AUSTRALIA

OCEANS
INSTITUTE



Earth Systems and
Climate Change
Hub

National Environmental Science Programme



Australian Meteorological
& Oceanographic Society



“Marine environments in transition: Planning and responding to changes across daily to **seasonal** and decadal timescales.”

