Marine Heatwaves: The Ningaloo Niño Event

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Introduction

Many of us are familiar with atmospheric heatwaves that often occur during the summer months; a period of unusually high temperatures that persists for three or more days. Just as we experience heatwaves on land, the ocean is susceptible to an extreme increase of sea surface temperature known as marine heatwaves (Frollicher and Laufkotter 2018). Marine heatwaves may occur at any time of the year and are measured relative to the typical season temperatures of the area, and for this reason, a consistent definition is hard to establish. Hobday, et al. (2006) describes marine heatwaves as a warm ocean event with sea surface temperatures well above the usual temperature range for the season, persisting for five consecutive days or longer.

El Niño vs La Niña

The El Niño Southern Oscillation is a major driver of sea surface temperature extremes such as MHWs and cold spells (Heidemann and Ribbe 2019). The El Niño Southern Oscillation is a climate phenomenon of three phases that influences sea surface temperatures (L’Heureux 2014):

- El Niño phase is the warming of the sea surface temperatures and an increase of rainfall in the central and eastern tropical Pacific Ocean.
- La Niña phase is the cooling of the sea surface temperatures in the central and eastern tropical Pacific Ocean, resulting in warmer west-pacific waters and increasing sea surface temperatures around Papua New Guinea and Indonesia.
- The neutral phase is when neither El Niño nor La Niña are in effect.

Marine heatwaves are mostly caused by atmospheric temperatures warming the ocean surface or a build-up of warm water carried by ocean currents (Marine Heatwaves International Working Group 2020).
Ningaloo Niño

In 2011, a record-breaking marine heatwave swept along the West Australian coastline, sea surface temperatures increased by 3-5 degrees above average and persisted for over 8 weeks (Pearce, et al. 2011). Scientists have named this event the Ningaloo Niño relating to the El Niño Southern Oscillation events (Pearce, et al. 2011).

![March 2011: The Ningaloo Nino Marine Heat Wave](image)

The Leeuwin Current is a naturally warm ocean current that flows all year round, from the Indonesian Throughflow in a southward direction along the coast of WA. In 2011 the Leeuwin Current surged due to a strong La Niña event (Marino 2017). Powerful easterly winds built up a warm body of water around Indonesia bringing an unseasonably warm Leeuwin Current down the coast of Western Australia (Marino 2017).

Impacts on marine ecosystems

The Ningaloo Niño event caused significant impacts to 2,000km of marine ecosystems off the west coast; bleaching coral reefs, causing fish mortalities and affecting the West Australian fisheries industry (Caputi, Kangas, et al. 2019). Bleaching with high subsequent mortality of Acropora corals occurred within areas of Ningaloo Reef and Abrolhos Island (Caputi et al. 2014). Western rock lobsters were affected with mortalities recorded at the Abrolhos Islands and Leeman (Caputi, Kangas, et al. 2019) (Pearce, et al. 2011).

Following the Ningaloo Niño event, Abrolhos Island and Shark Bay scallop stocks decreased, forcing fisheries to close for 3-5 years. An 18 months closure of Shark Bays crab fishery occurred due to adult mortalities recorded of the blue swimmer crab stocks (Caputi, Kangas, et al. 2019).
Roe’s abalone stocks suffered most significantly. Due to their immobility, abalone are less able to avoid unfavourable conditions (Pearce, et al. 2011). The Ningaloo Niño event resulted in a major stock reduction of abalone around Perth. Kalbarri is located in the Murchison region where the centre of the warming event peaked over 24–31° resulting in total mortality of Kalbarri’s abalone stocks. Fishing for abalone in all areas north of Moore River is banned indefinitely. Effects of the MHW have been long-lasting, after 7 years only parts of the ecosystem have shown signs of recovery due to restricted fishing and increased protection of spawning stock (Caputi, Kangas, et al. 2019).

References

Caputi, Nick, Gary Jackson, and Alan Pearce. 2014. "The marine heat wave off Western Australia during the summer of 2010/11 - 2 years on." Fisheries Research Report No. 250.


