

climate processes, predictability and impacts *in a warming Indian Ocean*

WAMSI's partners are developing modelling tools to understand and predict future changes in the Leeuwin Current. These tools will be used to assess impacts on the recruitment processes of marine plant and animal communities living on the continental shelf.

The findings will contribute to understanding the social, economic and environmental impacts of climate change on the WA marine environment and inform State agencies and local communities of future challenges.

Our research aims to:

- understand the dynamics of variability and change;
- create scientific models that predict future climate changes; and
- assess the impacts of climate change on the WA marine environment, especially for the Ningaloo Reef.

The Western Australian Marine Science Institution (WAMSI) is a consortium of 15 State and Commonwealth government, academic and private partners undertaking multi-disciplinary marine research. It is Australia's first collaborative research facility dedicated to understanding the marine environment and resources, and to contributing to policy and management decisions on the future use of oceans.

WA State Government provided a \$21 million five-year investment with a \$60 million co-investment by member partners. WAMSI's strategic projects address climate change, its likely impacts, how marine and coastal ecosystems function and how science can be used to understand the impacts of human activity in the marine environment.

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Images courtesy of CSIRO's Wealth from Oceans National Research Flagship, the Department of Fisheries Western Australia and the Bureau of Meteorology.



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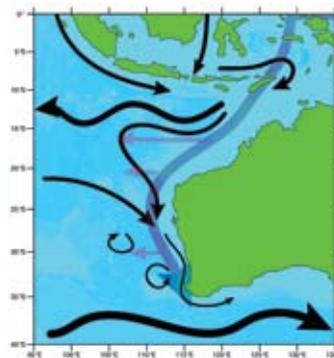
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Changes in ocean temperatures are having far reaching impacts on the Western Australian (WA) marine ecosystem.

Unlike the upwelling currents that flow towards the equator from the western coasts of the Americas and Africa, the Leeuwin Current flows towards the South Pole against prevailing winds. It transports warm and fresh water south along the subtropical WA coast, enabling many aquatic species to exist at latitudes much further south than normal and giving rise to productive benthic communities off the WA coast.

During the past 50 years the ocean surface temperature off WA has risen by 0.6 to 1.0°C – faster than the average warming trend across the rest of the Indian Ocean.

Figure 1: Ocean circulation in the East Indian Ocean and the pathway of El Niño Southern Oscillation (ENSO)



A five-year, \$7 million, multi-partner Western Australian Marine Science Institution (WAMSI) project is identifying ocean processes that affect the variability and changes in the Leeuwin Current, making predictions of WA's marine environmental future, climate change and the long-term changes in the Ningaloo Reef.

CSIRO's Wealth from Oceans National Research Flagship, the Bureau of Meteorology and the Australian Institute of Marine Science (AIMS) are working with the WA Department of Fisheries, The University of Western Australia and Murdoch University to undertake this research.

WAMSI's research between the Kimberley region and Perth has found:

- Indonesian Throughflow and Leeuwin Current flow rates have reduced by 25 to 30 per cent since 1960 – a decline probably caused by more frequent El Niño events in the Pacific in recent decades, and the impact of climate change;
- an enhanced warming trend off WA is probably linked to changes in regional atmospheric circulation, while reduced storm activity off south-west WA with rising levels of carbon dioxide and other greenhouse gases are expected to contribute to this during the next century; and
- predictions of the strength of the Leeuwin Current can be made two to three seasons in advance – timely notice for fisheries and other aquatic businesses.