

## 2<sup>nd</sup> International Indian Ocean Expedition: Australian progress (2019-2021)

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### Summary

Since the last meeting of IIOE-2 committee in March 2019, Australian progress has continued despite the disruption caused by the global COVID pandemic which included reduced access to laboratories and vessels.

In May/June 2019, the IIOE-2 endorsed RV *Investigator* voyage along 110°E (led by Prof Lynnath Beckley) successfully repeated one of the original IIOE lines. Twenty-nine scientists from nine countries participated and 20 stations were occupied at 90 nautical mile intervals from 39.5°S – 11.5°S. Daily deep and shallow CTD casts were undertaken and attention was focussed on physical oceanography, nutrients, biogeochemistry, microbes, pigments, phytoplankton, zooplankton, mesopelagic fishes and bio-optics. Ancillary projects included seafloor mapping, underwater sound, deployment of JAMSTEC Deep Argo floats, BoM and NOAA drifters, and use of a Triaxus undulating CTD on the return voyage to examine the Eastern Gyral Current. Analysis of data is in progress and the first papers from the voyage have been published.

An IIOE-2 endorsed voyage with the RV *Falkor* (led by Dr Nerida Wilson) took place in March/April 2020 to explore the marine biodiversity of two deep canyons located off the Ningaloo coast. Using 181 hours of dive time with the ROV *SuBastian* they investigated 12 stations in the Cape Range Canyon and four stations in the Cloates Canyon. Over 1,000 biological samples were collected during the voyage and are now undergoing analysis at the Western Australian Museum. Considerable eDNA samples, multi-beam bathymetry data (11,318 km<sup>2</sup>) and some small cores of sediments were also collected.

In July/August 2021, another IIOE-2 endorsed voyage of the RV *Investigator* (to be led by Dr Tim O'Hara) will assess the biodiversity of 21 seamounts in the vicinity of Christmas and Cocos Islands. They will undertake multi-beam seafloor mapping, towed underwater video, and benthic sampling using trawls and sleds in this poorly studied part of the Indian Ocean.

Much other research continues to take place, particularly in coastal and shelf waters of the Indian Ocean adjacent to Western Australia, though most of it is not under the auspices of the IIOE-2. Nevertheless, it is worth mentioning that another voyage of the RV *Falkor* (led by Dr Julie Trotter) took place in February 2020 to explore the Bremer, Leeuwin and Perth Canyons for biodiversity and post-voyage high resolution elemental and isotope analyses of deep-water fauna are underway.

With respect to IIOE-2, it is relevant to report briefly on the important ocean observations of Australia's Integrated Marine Observing System (IMOS). IMOS experienced some disruption of field activities during COVID-19 (particularly, ships of opportunity and monthly sampling at national reference stations) but most activities are now back on track. Some new or pending IMOS investments of relevance to IIOE-2 include expansion of ocean radar (including at Ningaloo), development of a database of annotations from benthic imagery collected by Autonomous Underwater Vehicles and technology proving of low-cost wave buoys, enhanced satellite ocean colour products and microplastic sampling at coastal reference stations.