Revisiting 110°E during the IIOE-2: an overview

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Abstract

In the 1960s, during the first International Indian Ocean Expedition (IIOE), many countries made the initial explorations of this poorly understood ocean basin. Five decades later, in a warming Indian Ocean, the second IIOE commenced. As one of the contributions to this initiative, in May-June 2019, a multi-disciplinary team revisited the 110°E line off Western Australia with the RV Investigator. Notably, modern equipment, techniques and electronic technology had superseded most of the original methods employed during the first expedition. The 3,000 km transect was characterised by a strong latitudinal temperature gradient ranging from cool Sub-Antarctic Mode Water in the south to warm tropical surface waters derived from the Indonesian Throughflow in the north. We explored multi-decadal change in physical, chemical and biological properties of the water column, examined biogeochemistry, microbes, genomics, functional diversity, ecological processes and the pelagic food web from pico-plankton through to meso-pelagic fishes. The voyage also enabled measurements of bio-optical quantities and ground truthing of satellite remote sensing of ocean colour by quantifying algal pigments, as well as acoustic tracking of whales. A special issue of Deep-Sea Research II (2022) and many other papers have been published, and this talk will present highlights from a selection of these. The 110°E voyage has underscored the complex oceanography, biological diversity and trophic processes in the region. It has demonstrated a low nutrient ecosystem, dominated by recycling processes supporting picophytoplankton, small mixotrophic zooplankton, predatory copepods and mesopelagic fishes. Overall, the research reflects a stepwise improvement in the understanding of the pelagic ecosystem in the oligotrophic south-east Indian Ocean.

Keywords: South-east Indian Ocean, unique features, oceanography, biogeochemistry, ecology, change

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