

Marine science collaboration in the Indian Ocean sector: from bi-lateral to multi-lateral collaboration

So Kawaguchi^{1,2} and Andrew Constable^{1,2}

¹ *Australian Antarctic Division*

² *Antarctic Climate and Ecosystems Cooperative Research Centre*

There is a long and successful history of bilateral collaborations and friendship between Australia and Japan in Antarctic science. Since the 1960s, numerous intellectual exchanges and visits by scientists from both countries have been made, leading to a number of research collaborations at various levels, from individual to organization level *i.e.* Southern Ocean Continuous Plankton Recorder (SO-CPR) Survey, 2001/02 time serial four-ship survey, Collaborative East Antarctic Marine Census (CEAMRC), Collaboration in physical oceanography in the East Antarctica, Collaborative geological investigations in Mawson Station, Enderby Land and the Prydz Bay region and collaboration in developing the Southern Ocean Sentinel in the Indian Sector. Further, France have been operating in the region for a number of years in collaboration with Australia and Japan bilaterally.

More recently Antarctic Climate and Ecosystem Research Cooperative Centre (ACE-CRC), by involving 6 vessels from 4 nations (Japan, France, USA, and Australia), undertook a major campaign in Kerguelen-Axis to understand the environmental drivers of krill and ecosystem distribution and dynamics. This an excellent demonstration of what a multi-national coordinated survey can accomplish in this region. Gathering information in a systematic way is one of the powerful ways of increasing our knowledge, but the designs of monitoring and observations that are fit for purpose, along with standardisation of observation protocols are the key to their success.

There is an increasing number of countries interested in the Indian Ocean sector. China is rapidly increasing the scale and intensity of its operations in the region; Korea is actively operating towards the east of the region using its new icebreaker, and has the Jang Bogo Station in the Ross Sea; and India is expressing interest in taking part in observations involving the second Bharati Station.

Multi-national coordination/collaboration could increase efficiency of the logistics, bring financial benefits, and complement strengths and overcome weaknesses in research disciplines and technology between various nations. Three areas of work in the Indian Sector of the Southern Ocean would benefit from the leading role of Japanese and Australian research activities have already played in the region – (i) observing the status and trends of the marine ecosystem in the region, (ii) assessing the current state of the region and (iii) understanding the role and key ecological drivers of the marginal sea-ice zone. Further work in these areas would provide an important foundation to the marine ecosystem assessment of the Southern Ocean (MEASO) at the Hobart Conference in 2018. Japan and Australia could also play leading roles in the Indian Sector regional working group of the Southern Ocean Observing System, and contribute to the design of the Benchmarking of Southern Ocean ecosystems in 2022.