2nd International Indian Ocean Expedition 2015-2025

Newsletter

(A basin-wide research program co-sponsored by IOC-UNESCO, SCOR and IOGOOS)

Volume-7, Issue-4
April, 2023

To advance our understanding of interactions between geologic, oceanic and atmospheric processes that give rise to the complex physical dynamics of the Indian Ocean region, and to determine how those dynamics affect climate, extreme events, marine biogeochemical cycles, ecosystems and human populations.

News from Monaco Explorations' "Indian Ocean Expedition"

Monaco Explorations' Indian Ocean Expedition endorsed as IIOE-2 Cruise [IIOE2-EP49] took place from 3 October to 30 November 2022 between Reunion, Mauritius and Seychelles, onboard the South African research and supply ship S.A. Agulhas II. It brought together more than 150 participants of some 20 different nationalities, including scientists, young researchers, and students from an on-board school, filmmakers and photographers, divers, artists, communicators, and the ship's crew, and involved a voyage of 10,000 nautical miles from Cape Town and back (Figure-1). The two months of navigation were dedicated to multiple research and field operations during the transits, around the Aldabra Atoll (Seychelles), on the Saya de Malha Bank, to which 15 days of investigations were devoted, and finally around the island of Saint Brandon (Mauritius).

Figure-1: The Expedition Voyage

The first results and perspectives of the Expedition were discussed at a hybrid event organized on 21 March 2023 during the annual Monaco Ocean Week at the Oceanographic Museum of Monaco. About 150 participants attended on site and more than 1,100 connexions to the live feed were registered.

© *Michel Dagnino, Oceanographic Institute*

Figure-2: Opening of the event by Carl Gustaf Lundin

The event was moderated by Carl Gustav Lundin, CEO and Managing Director of Mission Blue and Chair of the Expedition Advisory Committee (Figure-2). It began with a 20-min video summary of the Expedition followed by a review of the importance of regional knowledge and cooperation in the South-western Indian Ocean complex geostrategic and socio-economic context and an overview of the Expedition itself.

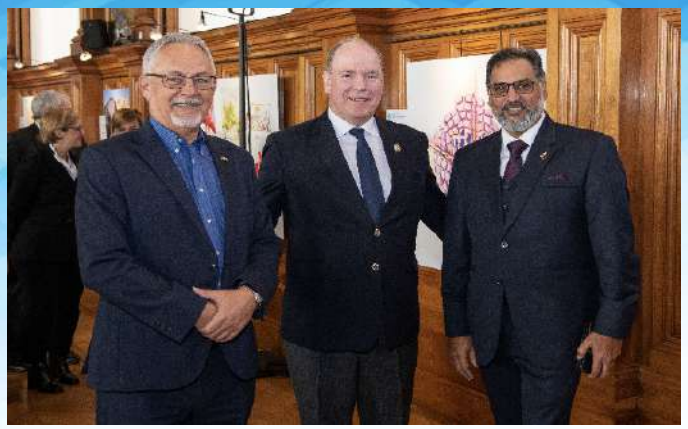


Figure-3: HSH Prince Albert II of Monaco with on His right the Honourable Jean François Ferrari, Designated Minister, Minister of Fisheries and the Blue Economy of Seychelles and on his left Dr. M. Rezah Badal, Director General of the Department for Continental Shelf, Maritime Zones Administration & Exploration, Mauritius Prime Minister's Office

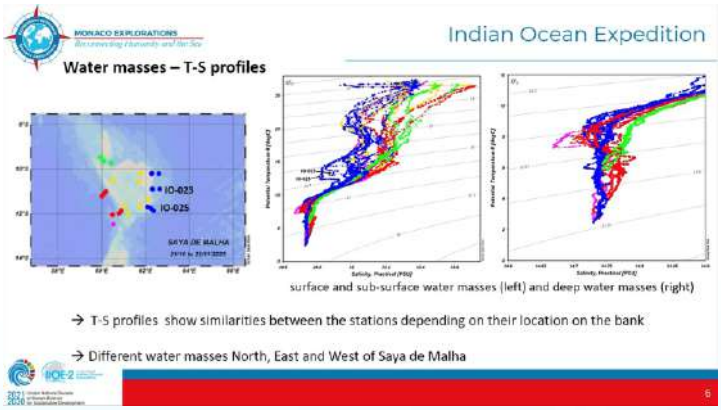
Figure-4: Exhibition Poster

Next, a high-level sequence in the presence of HSH Prince Albert II of Monaco included the views from Mauritius, by Dr. M. Rezah Badal, Director General of the Department for Continental Shelf, Maritime Zones Administration & Exploration, Prime Minister's Office and from Seychelles, by the Honourable Jean François Ferrari, Designated Minister, Minister of Fisheries and the Blue Economy (Figure-3), and the visit of an artistic and photographic exhibition displayed around the Conference Hall to evoke the key moments, places and atmospheres that characterized the Expedition (Figure-4).

© *Didier Theron, Monaco Explorations*

Figure-5: Feedback from Monaco Cours Saint-Maur Primary School

An overview of the UN Ocean Decade and of the IIOE-2 under which the Expedition was conducted followed. Then, the teacher and the pupils of a Monaco primary school that had participated in a live session with the artists and the scientists during the Expedition shared their experience in their own touching words (Figure-5).



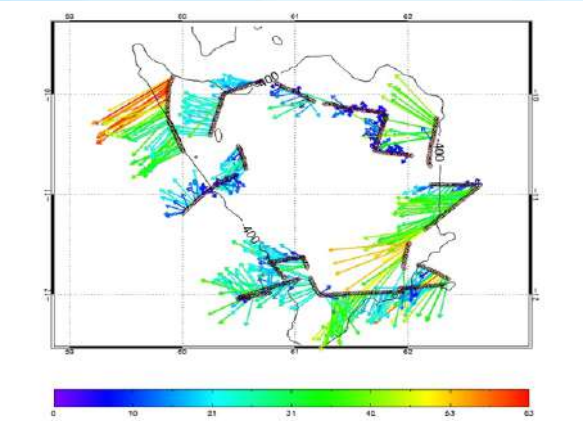
A roundtable devoted to the "The Invisible Island - Saya de Malha" discussed the first results of the investigation of this area in terms of physical, chemical and biological oceanography (Figure-6), bottom characteristics and benthic biodiversity. It concluded the morning session.

© *Dass Bissessur, Department for Continental Shelf, Maritime Zones Administration & Exploration, Mauritius Prime Minister's Office*

Figure-6: Preliminary analysis of the hydrological conditions on Saya de Malha

The first roundtable of the afternoon session discussed the benefit of the onboard school on oceanographic instrumentation and data processing that had taken place during the first phase of the Expedition between Reunion and Seychelles. The second roundtable considered the preliminary results of the different investigations that were conducted around the "Visible Islands" of Aldabra and Saint Brandon.

The observations of the surface currents (Figure-7) and the distribution of microplastics were discussed next.



© *Nuette Gordon, University of Seychelles and Margaux Noyon, Nelson Mandela University*

Figure-7: Current velocity (in cm/s) and direction at 30 m measured by ADCP over Saya de Malha (delimited by isobaths -400 m), from 2 to 17 November 2022

Finally, the presentation of the "Adoptafloat" outreach programme associated with the deployment of Argo floats and of the artistic activities hosted by the Expedition concluded the event.

[Report Courtesy: Gilles Bessero, Monaco Explorations Chief Operation Officer, Expedition Leader, Monaco, E-mail: gbessero@monacoexplorations.org]

The summer monsoon rainfall variability over homogeneous regions of India linked to antecedent Southwestern Indian Ocean capacitance

Agriculture is the backbone of the Indian economy and contributes the ~16% of gross domestic product. A major portion of the Indian agriculture production depends on Indian Summer Monsoon Rainfall (ISMR). Below normal Monsoon rainfall causes significant economic and social damages. Its failure often brings famine to the affected regions, while strong monsoon years can result in devastating floods. Accurate long-range seasonal and intra-seasonal predictions of monsoon rainfall can improve planning to act on monsoon's adverse impacts and benefits. Hence, a better understanding of the monsoon cycle is clearly of scientific and societal value.

Yet, all India summer monsoon rainfall (AISMR) variability on the inter-annual and intra-seasonal time scales have puzzled the scientific community due to its complex and regional heterogeneity. With innovative technological advancement and many years of research, most dynamical and statistical models still fail to predict the seasonal and intra-seasonal AISMR variability and associated extremes with reasonable accuracy. This could be due to the unpredictable variability within the AISMR and the lack of understanding of the ocean's role in AISMR variability. This would also imply persistent ambiguity on the impact of the slowly responding ocean surface to the extreme atmosphere–ocean coupled phenomena such as El Niño-Southern Oscillation (ENSO) during the antecedent months (Figure-1) and its imprint on the rainfall variability of the following year.

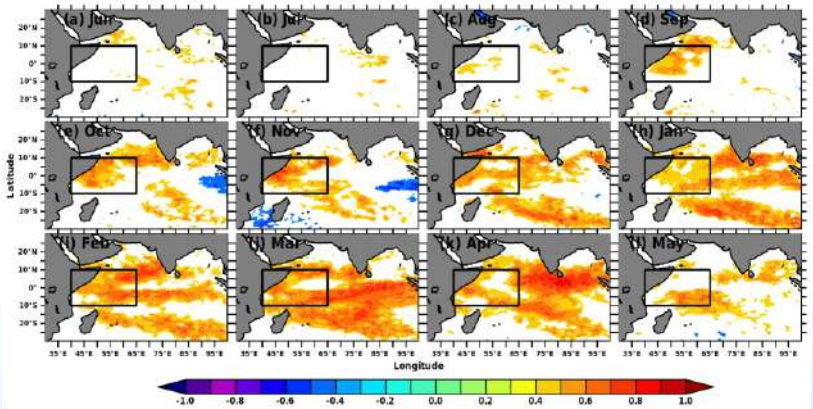


Figure-1: Simultaneous monthly correlations between detrended Indian Ocean Sea Surface Temperature Anomaly (SSTA) and Nino3.4 SSTA indices. Areas of correlations at 95% significance are shown.

A recent study by researchers at Uppsala University, Sweden; INCOIS, Hyderabad and Ministry of Earth Sciences, New Delhi looked into improving our understanding of the impact of ENSO and Indian Ocean variability during antecedent months on monsoon precipitation in the following year over various parts of India. This work showed that April-May Sea Surface Temperature (SST) and mean sea level anomaly (MSLA) over the southwest Indian Ocean affects the next All India Summer Monsoon Rainfall (AISMR). However, this impact is limited to the west coast of India (WCI), north India (NI) and central India (CI) rainfall; the rest of the land mass is not affected by the SWIO variability. This association even becomes stronger with the removal of ENSO, which suggests that SWIO variability even independently impacts WCI, NI and CI rainfall variability. The ENSO effect becomes prominent through SWIO over the north east (NE) and eastern India (EI) rainfall variability. In most of the previous studies it has been reported that ENSO affects AISMR as a whole. But in this study we show that ENSO affects mostly the Northeast and Eastern India's monsoon rainfall through the SWIO. It has been also reported in many earlier studies that ENSO affects the south West Indian Ocean. This study further links the impact of ENSO on AISMR in a more quantified way. Furthermore despite increasing April–May SSTA and MSLA trends over SWIO and the western Indian Ocean, AISMR does not show any long-term secular change. However, the effects of long-term pre-monsoonal SSTA and MSLA are indicated in the form of decreasing rainfall trend over NI, NE, and EI in the recent time. No such trends were observed over WCI and CI, thus making the rainfall excess or normal in the recent decade. Furthermore, the cooler SST (warmer) anomaly over the western Indian Ocean affects rainfall variability adversely (favourably) due to the reversal of the wind pattern during the pre-monsoon period (Figure- 2).

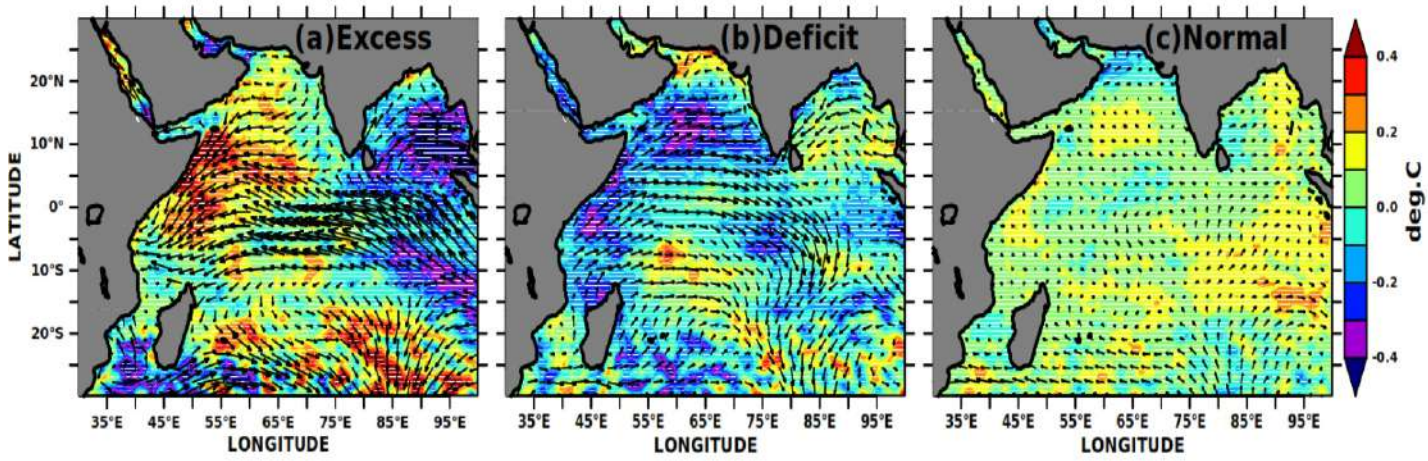


Figure-2: Composite of May month's detrended SSTA composite (shaded) overlayed with detrended ERA5 wind anomalies (vectors) over the Indian Ocean during (a) excess, (b) deficit, and (c) normal monsoon years

Citation: Thandlam, V., Rahaman, H., Rutgersson, A. et al. Quantifying the role of antecedent Southwestern Indian Ocean capacitance on the summer monsoon rainfall variability over homogeneous regions of India. Sci Rep 13, 5553 (2023). https://doi.org/10.1038/s41598-023-32840-w

[Report Courtesy: Venugopal Thandlam, Uppsala University, Sweden, E-mail: venux4@gmail.com and Hasibur Rahaman, INCOIS, Hyderabad, India, E-mail: rahman@incois.gov.in]

Coastal Vulnerability to Oceanogenic Multi-hazards along the Coast of Andhra Pradesh, India

An assessment of coastal vulnerability to oceanogenic multi-hazards is focused on estimating the coastal zones exposed to different hazards along Andhra Pradesh, the maximum extent of coastal inundation during an extreme event due to high waves of cyclone & Tsunami, shoreline change, sea-level change and coastal elevation was carried out. The vulnerability impacts up to the village level were assessed based on future projections (return period) of multi-hazard impact using a holistic approach with geospatial techniques. The shoreline change rate calculated using Landsat data pertaining to 48 years during 1972-2019 reveals variations in the rate of erosion and accretion across the coast. The highest erosion recorded in a stretch of 66.3 km along West Godavari, East Godavari and Krishna districts (Figure-1) is predominantly due to the dynamic coastal processes in and along the headlands and low-lying regions.

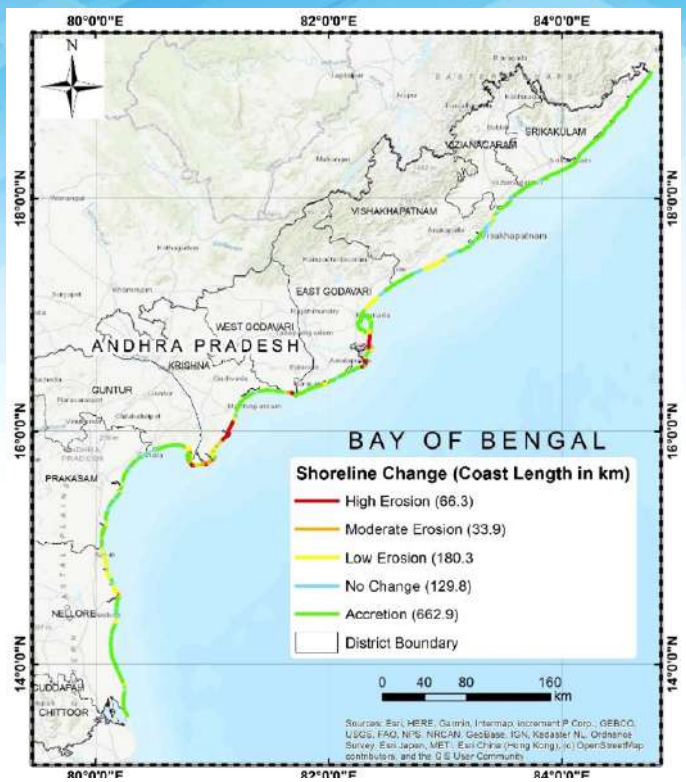


Figure-1: Shoreline change along the Andhra Pradesh Coast

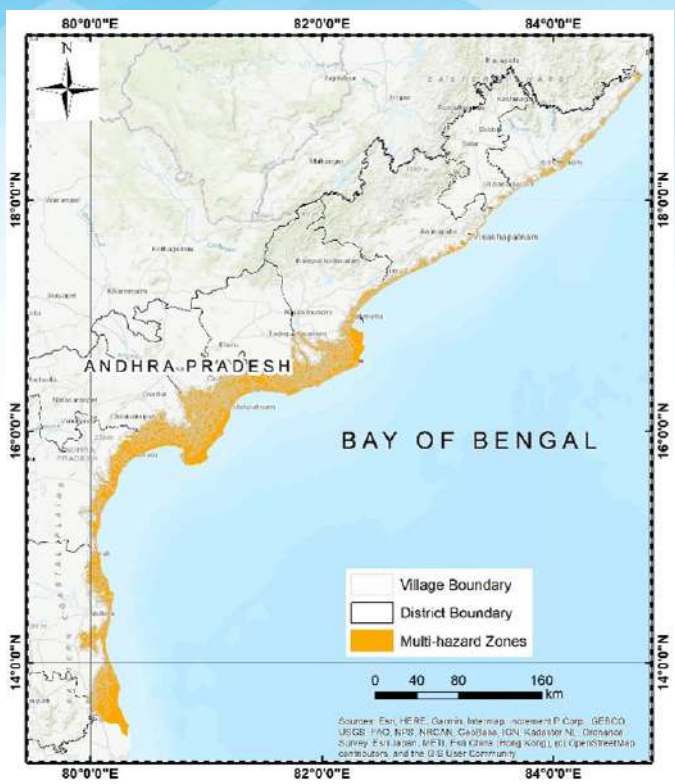


Figure-2: Coastal Multi-hazard zones

Coastal Multi-hazard zones (CMZ) derived using the holistic approach adopted in the study depict the low-lying coastal areas prone to be inundated by oceanogenic hazards in a 100-year interval recurrence. Large areas of the coastal stretches were recorded under CMZ in the Krishna-Godavari delta as these areas are highly exposed (Figure-2). The coastal zones of east Godavari Krishna, West Godavari, Guntur, Prakasham and Nellore districts are highly Vulnerable.

The overlay analysis of coastal villages with CMZ reveals 1420 census villages and 15 towns falling under CMZ associated with 8.3 million people (Census Data 2001). Out of these, more than 90 percent geographic area of 706 villages and 8 towns falls under CMZ and hence is under very high vulnerability (Figure-3). Over 3.2 million people and their assets falling in these 706 villages are at high risk. The outputs and maps produced here provide vital basis for coastal disaster management and necessary policy interventions.

Citation: Mahendra, R.S., Mohanty, P.C., Francis, P.A., Sudheer Joseph, Balakrishnan Nair T. M. and Srinivasa Kumar T. (2021). Holistic approach to assess the coastal vulnerability to oceanogenic multi-hazards along the coast of Andhra Pradesh, India. Environ Earth Sci, 80, 651.

https://doi.org/10.1007/s12665-021-09920-z

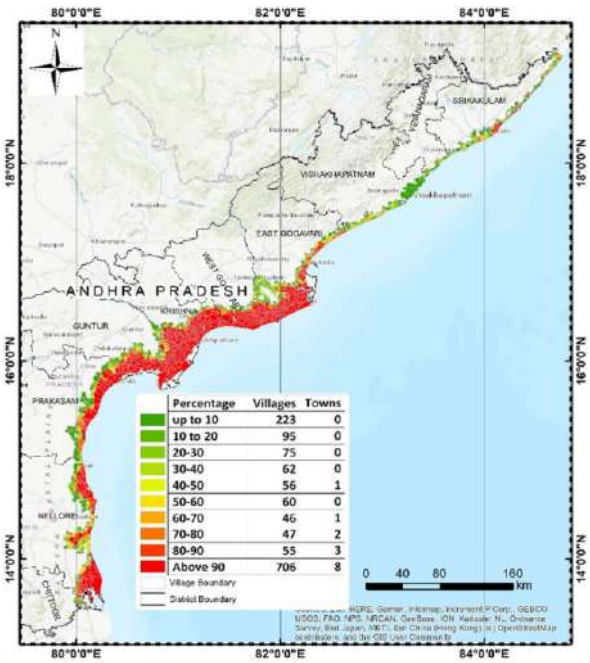


Figure-3: Incident villages in the coastal multi-hazard zones

[Report Courtesy: R. S. Mahendra and Prakash Chandra Mohanty, INCOIS, Hyderabad, India; E-mail: mahendra@incois.gov.in]

Eighth National Conference of Ocean Society of India (OSICON-23) during August 23- 25, 2023, Hyderabad, India

The 8th edition of the Biennial National Conference of the Ocean Society of India (OSICON-23), scheduled to be held at INCOIS, Hyderabad, India from August 23 - 25, 2023.

The conference website may be accessed here: https://osicon23.incois.gov.in/

The focal theme for OSICON-23 is 'Operational Oceanography - Science to Services,' which is a critical topic for the oceanographic community. It focuses on the translation of scientific knowledge into practical applications. The conference aims to bring together experts and researchers from around the world to discuss the latest advancements in operational oceanography, share knowledge, and promote collaboration among the ocean community.

Focal Theme
Operational Oceanography - Science to Services

OSICON-23 is expected to be attended by around 350 researchers from all over India to review and discuss the recent advances in Operational Oceanography and will help scientists and students involved in ocean-atmosphere studies to benefit from interactions with the experts in the following various sub themes:

Sub Themes

1. Ocean Information and Advisory Services
2. Ocean Observations (In-situ & Satellite)
3. Ocean Modelling and Data Assimilation
4. Coastal and Open Ocean Processes
5. Air-sea Interactions
6. Biogeochemistry of the Ocean
7. Biodiversity and Ecology
8. Ocean and Climate Change
9. Ocean Engineering and Technology
10. Marine Geology and Geophysics
11. Polar Science and Cryosphere Studies
12. Blue Economy
13. Marine Resource Management

Important Dates

Last date for Abstract Submission: **May 31, 2023**
Notification of Acceptance of Abstract: **June 30, 2023**
Online Registration Starts: **July 01, 2023**
Last date for Online Registration of accepted abstracts: **July 15, 2023**
Last date for Online Registration of other participants: **July 31, 2023**

OSI encourages the active participation of research students in large numbers and will try to support the travel expenses of some limited deserving students.

Contact Details

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ICES - PICES 7th International Zooplankton Production Symposium during Autumn17-22 March 2024, Hobart, Australia

SCOPE

We are living in the Anthropocene. Our oceans are warmer, more acidic, have widespread plastic and other pollution, and are subjected to increasing exploitation including overfishing. Zooplankton play a pivotal role in our oceans, as grazers of primary production, as drivers of carbon and nutrient cycles, and as prey for higher trophic level consumers including both harvested fish species and iconic marine mammals and seabirds. How zooplankton will respond to the dramatic changes in our marine ecosystems will impact the health and productivity of our oceans and our planet.

To better understand zooplankton in a changing world, ICES and PICES are holding the 7th International Zooplankton Production Symposium as a forum to discuss the latest zooplankton research. The ICES/PICES Zooplankton Production Symposium will bring together the top zooplankton researchers globally, showcasing recent advances. Understanding the current and evolving role of zooplankton will require new insights provided by:

- Assessing the impact on zooplankton of climate change, fishing, and pollution such as microplastics
- State-of-the-art sampling techniques such as DNA, imaging, and bioacoustics
- Biochemical methods applied to unravelling complex trophic ecology
- The application of cutting-edge approaches in zooplankton modelling, including size and trait-based biogeochemical and ecosystem models
- Revealing the role of microzooplankton in biogeochemical cycling and food webs
- Exploring the structure and functioning of macrozooplankton communities and their impact on carbon sequestration and trophic ecology
- Examining zooplankton in fisheries science, including dynamics of fish larvae, the impact of zooplankton on fish larval mortality and growth, and the commercial harvest of zooplankton
- Elucidating the vital role of zooplankton in polar environments
- Understanding the role of gelatinous filter feeders and jellyfish in carbon sequestration and trophic ecology
- The use of zooplankton as ecosystem indicators in a changing ocean

Our Symposium will be held over five days in the historic waterfront district of Hobart, Australia, during Autumn, from 17-22 March 2024. This event will be held in-person and provide the first opportunity since 2016 for zooplankton researchers to meet, build networks, and hear the latest science. We are monitoring the COVID-19 situation closely and will adapt our plans as needed.

The Organizing Committee invites proposals for sessions to be held during the Symposium. Proposals are welcome for sessions incorporating talks and posters, panel discussions and/or workshops. Sessions could cover, but are not limited to, the key areas listed above.

The symposium website may be accessed here: https://meetings.pices.int/meetings/international/2024/zps7/scope

Proposals may be submitted here: https://meetings.pices.int/meetings/international/2024/zps7/proposals

12th International Conference and Workshop on Lobster and crabs 22-27 October 2023 in Fremantle, Western Australia

The Organising Committee of the 12th International Conference and Workshop on Lobster and crab is pleased to announce the go ahead of this workshop that was originally planned for October 2020, for **22-27 October 2023. Please check the website** (https://icwl2023.com.au) **for updates on the conference.** This will be updated over the next month with more details on the program. We will be accepting abstracts and registrations from the 24 January 2023. This workshop is being planned as a face-to-face meeting.

The overall theme for the 2023 workshop is **'Ecosystem-based fisheries management (EBFM)'** as this generally represents best practice for fisheries management and reflects that fisheries research and management focus is now broader than just sustainability. Therefore we hope to attract presentations that cover a wide array of subjects under the EBFM banner including biology, stock assessment, management, ecosystem effects of fishing such as interaction with whales, habitat, economics, social, governance and management compliance.

We will be holding a **2-day EBFM workshop** which will be sponsored by the OECD Co-operative Research Programme: Biological Resource Management for Sustainable Agricultural Systems. This will occur on the first two days of the 5-day conference.

While this conference comes back to Western Australia where the 1st International Lobster Workshop was held in 1978, we have adopted the approach of the 2nd lobster conference in St Andrews in 1985 where **crab presentations** were welcome. We look forward to their participation in this conference.

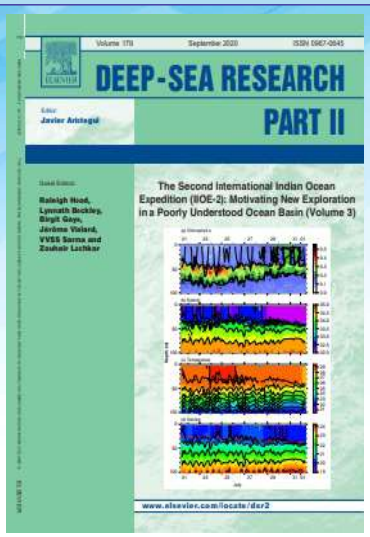
An **industry day** is also planned for Thursday 26 October and this is an important component of the program so we are looking forward to strong support from lobster and crab industry participants around the world. We are also keen to attract papers on **lobster and crab aquaculture** as this has been an important developing industry in Asia.

Students can apply for the **Paul Kanciruk Student award** for financial support to attend the conference.

The Department of Primary Industry and Regional Development (DPIRD) and the Western Rock Lobster (WRL) council are looking forward to hosting scientists, managers and industry participants in Western Australia in 2023. Don't hesitate to contact us or the conference organisers, Arinex, if you have any questions.

Co-hosts of the workshop Nick Caputi, DPIRD (nick.caputi@dpird.wa.gov.au) & Nic Sofoulis, WRL (sofs1@bigpond.com).

DEEP-SEA RESEARCH PART II



THE SUBMISSION PORTAL FOR VOL. 6 OF THE DEEP-SEA RESEARCH II SPECIAL ISSUE SERIES ON THE IIOE-2 IS NOW OPEN

Submission of manuscripts that describe the results of studies related to the physical, chemical, biological, and/or ecological variability and dynamics of the Indian Ocean (including higher trophic levels) is encouraged.

Submission of manuscripts from students and early career scientists is also encouraged.

If you are interested in submitting a manuscript, please contact Raleigh Hood (rhood@umces.edu).

XI Indo-Pacific Fish Conference to be held in Auckland, New Zealand during 22-24 November 2023

A session entitled Larval fishes - solving phylogenetic, life-cycle and ecological questions will be part of the XI Indo-Pacific Fish Conference to be held in Auckland, New Zealand from 22-24 November 2023.

Most marine bony fishes have a two-phase life history with pelagic larvae that differ in morphology, ecology and habitat from the adults. These phases operate in separate evolutionary theatres, and ecologically, effectively function as separate species. Larval morphological features provide characters for phylogenetic analysis and aspects of life history are determined during the larval phase, including recruitment and scale of genetic and demographic connectivity. Although larval survival is necessary for persistence of species, larvae are often neglected by researchers and managers focused on adults. This session will address many of the unanswered questions about the pelagic larval phase of Indo-Pacific fishes.

The session will be co-chaired by
- Jeff Leis (University of Tasmania; jeffrey.leis@utas.edu.au)
- Lynnath Beckley (Murdoch University; L.Beckley@murdoch.edu.au) and
- Ainhoa Bernal (Institut de Ciències del Mar; bernal@icm.csic.es)

Those interested in contributing to the larval fish session should contact one of the session co-chairs.

Submission closes on 11 June 2023

The conference website is https://www.ipfc11-asfb.ac.nz/

Endorse your projects in IIOE-2

Don't miss the opportunity to network, collaborate, flesh out your research project and participate in IIOE-2 cruises!!

The endorsement of your scientific proposal or a scientific activity focusing on the Indian Ocean region is a recognition of the proposal's or activity's alignment with the mission and objectives of IIOE-2, of its potential for contributing to an increased multi-disciplinary understanding of the dynamics of the Indian Ocean, and of its contribution to the achievement of societal objectives within the Indian Ocean region. Over 51 international, multi-disciplinary scientific projects have already been endorsed to date by the IIOE-2. Yours could be the next one!

Visit https://iioe-2.incois.gov.in/IIOE-2/EndorsementForm.jsp for further details and for projects already endorsed by IIOE-2 https://iioe-2.incois.gov.in/IIOE-2/Endorsed_Projects.jsp.

CLIVAR April 2023 Bulletin is available online

The International CLIVAR Project Office distributes a monthly bulletin with announcements, funding opportunities, meeting notifications relevant to the ocean/climate science community.

The latest CLIVAR Bulletin April, 2023 is available at:

https://mailchi.mp/clivar.org/clivar-april-2023-bulletin

Call for Contributions

Informal articles/short notes of general interest to the IIOE-2 community are invited for the next (May-end) issue of the IIOE-2 Newsletter. Contributions referring IIOE-2 endorsed projects, cruises, conferences, workshops, "plain language summary" of published papers focused on the Indian Ocean etc. are welcome. Articles may be up to 500 words in length (Word files) accompanied by suitable figures, photos.(separate.jpg files).

Deadline: **25 May, 2023**

The Indian Ocean Bubble 2

Access the latest issue of Indian Ocean Bubble-2

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