



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

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.

Biological impact on upper ocean heating rate in the Southern Bay of Bengal

Minute changes in sea surface temperature (SST) over the high mean SST of the Bay of Bengal have an enormous impact on variation in the monsoonal circulation. The change in SST due to biological influence on radiative heating rate (RHR) with physical factors has a substantial impact on climate variability. We collected co-located data of optical parameters together with high resolution oceanographic and meteorological parameters during the Bay of Bengal Boundary layer experiment (BoBBLE) on board ORV Sindhu Sadhana. A study was conducted to understand the sensitivity of RHR to chlorophyll during the suppressed phase of a Boreal Summer Intraseasonal Oscillation from July 4 to July 14, 2016. Hyperspectral radiometer (HyperPro-II) was used for Time Series Experiment (TSE) (Figure-1) daily between 0600 and 0700 UTC to measure the upwelling and downwelling irradiance and ship-mounted CTD and automatic weather station (AWS) were used to collect the physical and meteorological data. To the best of our knowledge this is the first time attempt to estimate the RHR based on Insitu measurement of underwater light obtained from hyperspectral underwater radiometer in the Bay of Bengal region.

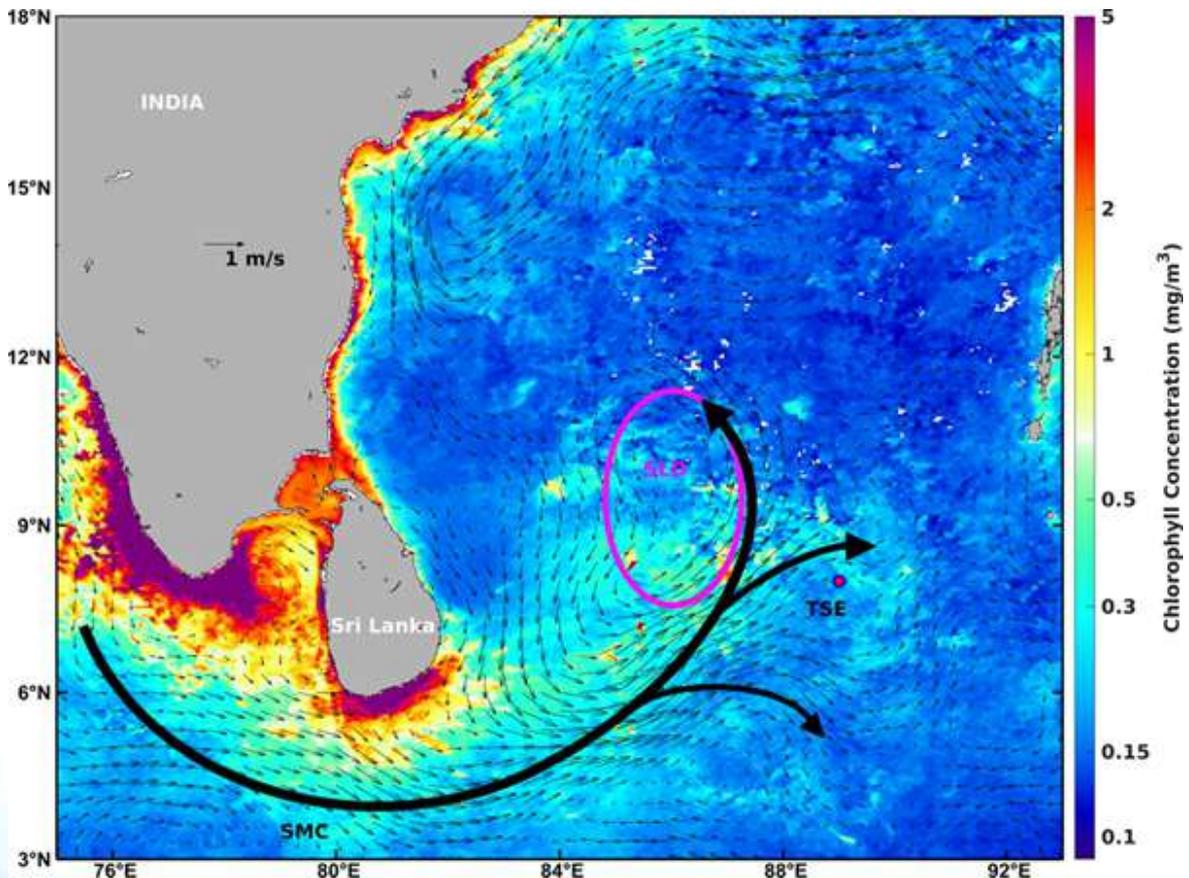


Figure-1: Map showing the location of Time Series Experiment (TSE) in the southern Bay of Bengal with background of ocean current placed over chlorophyll climatology for the month of July. (SMC: Summer Monsoon Current; SLD: Sri Lanka Dome).

Our study reveals that, the combined effect of marine biota, atmospheric factor and cloud index on the upper ocean radiant heating rate has a significant impact on the variation of SST. The study also shows that an increase in phytoplankton concentration increased the RHR. The increase in RHR from 0.01 to 0.14 $^{\circ}\text{C hr}^{-1}$ and subsequently the SST from 28.5 $^{\circ}\text{C}$ to 29.5 $^{\circ}\text{C}$ was observed at TSE. We also used a one dimensional model to determine the effect of Chl- a on the radiative heating rate in the upper ocean. Our model studies complement the biological heating and confirm that an increase in biological heat loss of 10 W m^{-2} would generate additional heating of 0.008 $^{\circ}\text{C hr}^{-1}$. Another important outcome of this study suggests that a 50 % reduction in radiant flux by cloud causes a 60 % reduction in upper ocean RHR. This study not only highlights the importance of biological influence on RHR and thereby the SST variability but also the biological contribution on upper ocean heating rate and can provide new opportunities to enhance the performance of biogeochemical models.

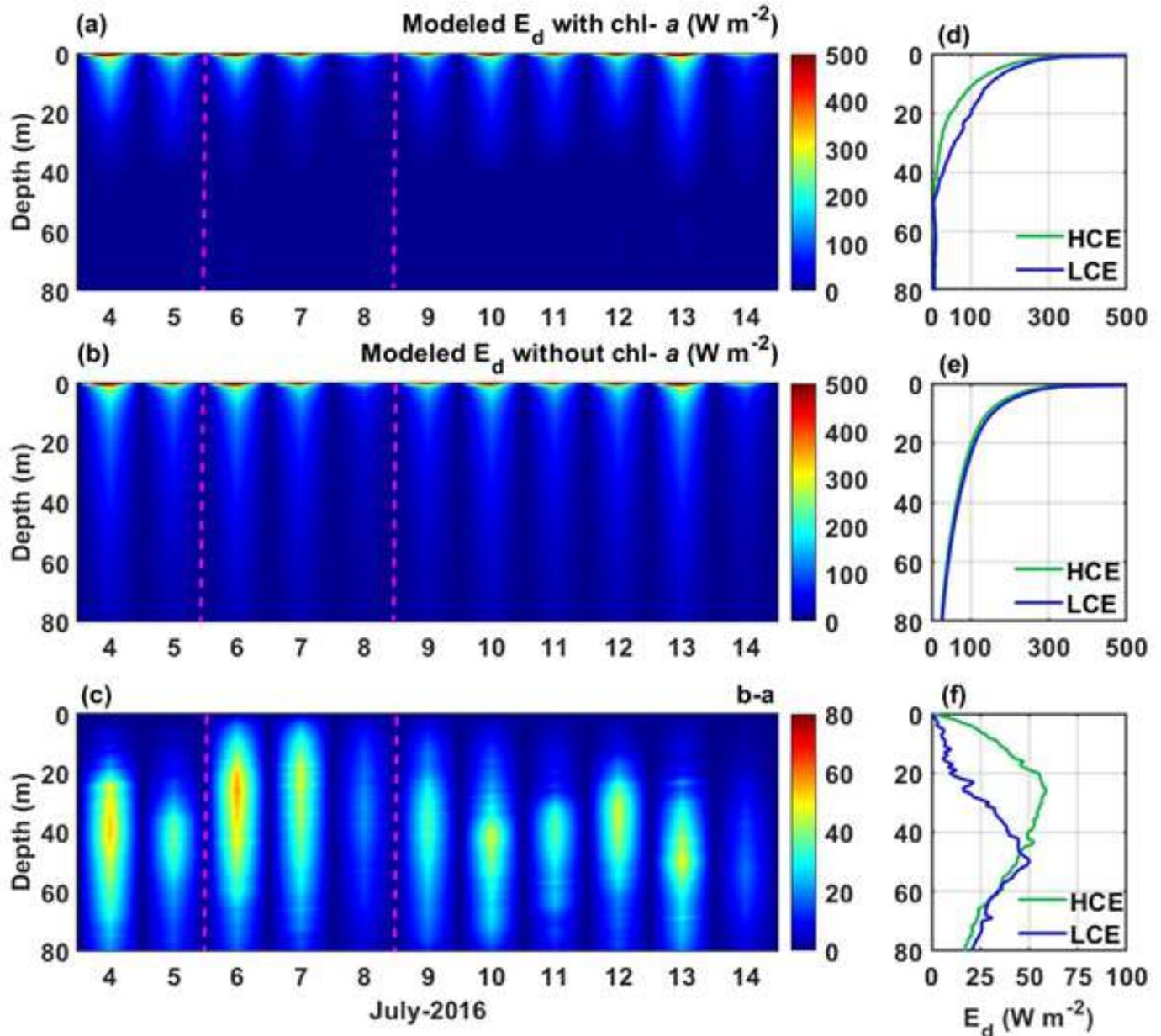
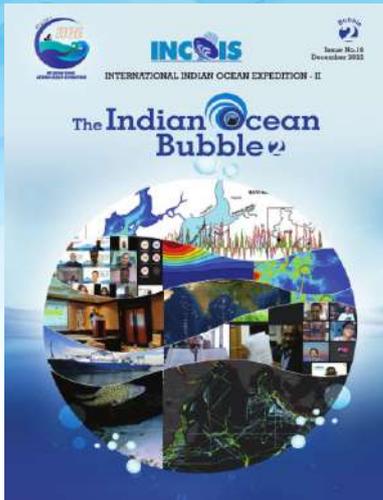


Figure-2: The impact of phytoplankton on the downwelling irradiance during the time series experiment (HCE: High surface chlorophyll (6-8) and LCE: Low surface Chlorophyll)

Citation: Parida, C., Lotliker, A. A., Roy, R., Vinayachandran P.N., (2022). Radiant Heating Rate in the Southern Bay of Bengal during the summer monsoon. Deep-Sea Research Part II: Topical Studies in Oceanography.

[Report Courtesy: Chandanalal Parida, Curtin University, Perth, Australia & Aneesh A.Lotliker, INCOIS, Hyderabad, India; E-mail:chandanlal.parida@gmail.com]

The Indian Ocean Bubble, Issue No.16 is now available online



Web Link: https://iioe-2.incois.gov.in/IIOE-2/pdfviewer_pub.jsp?docname=IIOE-2-DOC_OM_259.pdf

Informal articles are invited for the next issue. Contributions referring Indian Ocean studies, cruises, conferences, workshops, tributes to other oceanographers etc. are welcome.

Articles may be up to 1500 words in length (Word files) accompanied by suitable figures, photos (separate .jpg files)

Deadline: 15 April, 2023

Send your contributions as usual to iioe-2@incois.gov.in

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/>

ICES - PICES 7th International Zooplankton Production Symposium during Autumn 17-22 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 deadline for submitting proposals is March 15, 2023.

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.

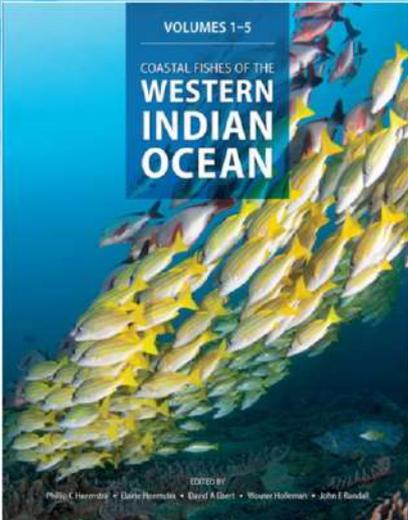
An **industry day** is also planned for Thursday 26 October and this is an important component of the program so we are looking forward to strong support from lobster and crab industry participants around the world. We are also keen to attract papers on **lobster and crab aquaculture** as this has been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

Coastal Fishes of the Western Indian Ocean



This remarkable 5-volume publication on the fishes of the Western Indian Ocean was launched at the annual Smith Memorial Lecture on 29 September 2022 in South Africa. **Coastal Fishes of the Western Indian Ocean** took 25 years to complete and involved almost 100 contributors from many parts of the world. It includes descriptions of 3500 species of fishes and has generated much interest in the diversity of coastal fishes in the Western Indian Ocean. It covers the region from Cape Point, South Africa to the Red Sea and east to Kanyakumari, India.

Searchable pdf versions of each volume have been created and for more information go to:

<https://www.saiab.ac.za/coastal-fishes-of-the-western-indian-ocean.htm>

[Report Courtesy: Lynnath Beckley, Environmental & Conservation Sciences Murdoch University, Western Australia; E-mail: L.Beckley@murdoch.edu.au]

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).

Indo-Pacific Fish Conference and the Australian Society for Fish Biology 20-24 November 2023, Auckland, New Zealand

The Indo-Pacific Fish Conference will be held in Auckland, New Zealand from Nov 20-24 2023 in partnership with the Australian Society for Fish Biology. Submission of abstracts is open from 10 Feb - 11 June 2023.

Registration opens **20 April 2023**.

Closing date for nominations for the associated IPFC Bleeker Awards in fish Systematics and Taxonomy is **30 April 2023**.



For more details visit Conference Website: <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 March 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 March, 2023 is available at:

<https://mailchi.mp/clivar.org/clivar-march-2023-bulletin>

Call for Contributions

Informal articles/short notes of general interest to the IIOE-2 community are invited for the next (April-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 April, 2023**



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