SESSION 12: SIBER AND THE SECOND INTERNATIONALINDIAN OCEAN EXPEDITION

Rapporteur Shuwei Pu

Lynnath Elizabeth Beckley (online) [12-2]

Back to the future! Revisiting 110°E during the second International Indian Ocean Expedition (IIOE-2)

The study involved extensive oceanographic surveys, documenting various scientific datasets and experimental methodologies, along with contributions and research outcomes from participating personnel.

1.The recorded information encompasses oceanographic investigations, including data collection on temperature, nutrients, microbial communities, and fish populations, as well as observations conducted using multidisciplinary scientific equipment.

2.The research revealed the ecosystem complexity of the southern Indian Ocean regions, highlighting nutrient cycling dynamics, food web structures, and biodiversity patterns.

Through comparative analysis of data from multiple sampling stations, the research team examined the influences of environmental factors—such as temperature, salinity, and dissolved oxygen levels—on species distribution.

3.The findings advance our understanding of marine ecosystems, particularly the biogeochemical cycling processes in tropical and subtropical marine zones.

Michael R. Landry [12-5]

BLOOFINZ-INDITUN: Food webs supporting larvae of Southern Bluefin Tuna in their eastern Indian Ocean

1.The study investigated two distinctive features of the eastern Indian Ocean: the globally exclusive spawning ground of southern bluefin tuna and the downstream region of the Indonesian Frigate Island.

2.The research revealed that the ecological behaviors of southern bluefin tuna juveniles and marine food web organisms demonstrate a complete trophic chain study spanning from plankton to larval fish.

3.By comparing data spanning 1987 to 2022, the study found that despite rising temperatures, the foraging strategies of bluefin tuna shifted from plankton-based diets to more efficient crustacean prey consumption.

Yi Xu [12-4]

Salinity influenced stratification and phytoplankton bloom in the northern Indian Ocean

This report focuses on marine ecosystem research, discussing the biological productivity and climate feedback mechanisms in the Indian Ocean, along with the integration of diverse datasets, with a special emphasis on monsoon-driven oceanic impacts. The study centers on seasonal to interannual variability scales to analyze oceanic responses to climate change.

1. By employing the **Gash-Revolve-Standbyte-Carfield (GRSC) methodology** , the researchers aimed to enhance understanding of Indian Ocean biological productivity and explore its implications for potential climate feedback.
2. The investigation prioritized the ocean's response to monsoon variability and remote regulatory mechanisms, integrating multi-source datasets to examine intrinsic ocean

variability across temporal scales.

3. The study found that **sea surface temperatures in the Indian Ocean are rising at a faster rate than other oceanic regions**, intensifying surface-layer photosynthesis and boosting biomass accumulation—a trend consistent with climate model projections and satellite-observed increases in chlorophyll-a concentrations.
4. While biological productivity has declined across most Indian Ocean zones, the research identified anomalous chlorophyll-a concentration increases in specific areas, such as the eastern Bay of Bengal and parts of the eastern Indian Ocean, likely influenced by localized oceanographic processes.
5. Through analysis of heterogeneous data sources—including satellite remote sensing, in-situ observations, and numerical models—the study elucidated the complex impacts of physical ocean processes on biological productivity and their multi-scale spatiotemporal interactions.

Jenny Ann Huggett (online) [12-1]

Recent advances in zooplankton research in the southwest Indian Ocean

This report addresses multiple themes, including marine ecosystem research, biodiversity, and marine organism monitoring methodologies. The discussion referenced several research projects, scientific findings, and associated technical approaches and tools.

1. The research team conducted marine biodiversity studies in the **Southwest Interaction Zone**, revealing spatial variations in biomass and biological communities across distinct marine regions.
2. Significant differences in biodiversity and biomass were observed among seamounts and oceanic zones, such as the notably lower biomass in the **Waltersol Sea area**.
3. The study indicated that the distribution of marine organisms correlates with oceanographic features like seamounts and trenches, though the precise mechanisms remain uncertain.
4. Trophic relationships within marine ecosystems highlighted the influence of apex predators on biomass dynamics, exemplified by food web structures in shark-dominated systems.
5. The team utilized a multi-method approach—including image analysis and DNA barcoding techniques—to assess marine biological communities and evaluate ecosystem health.

Birgit Gaye (online) [12-7]

Environmental studies in the Indian Ocean subtropical gyre

This report encompasses environmental studies, oceanography, data analysis, and scientific research methodologies.

1. The presenter examined environmental investigations of the Indian Ocean subtropical gyre, with a specific focus on water mass analysis and nutrient cycling dynamics.
2. The study revealed that nitrogen cycling processes within the subtropical gyre modulate nutrient concentrations in water masses, with certain regions exhibiting pronounced denitrification and nitrogen replenishment signals.
3. Long-term monitoring of sediment fluxes identified intermittent flux intensification

events during summer periods, potentially linked to influences from the East Madagascar Plume.

4. The research emphasized that beyond the biological gravitational pump mechanism, additional factors such as oceanic plumes may critically shape sediment flux patterns, warranting further investigation to explain observed flux regimes.

Gregory Cowie (online) [12-6]

Coastal marine science capacity building and the 2nd International Indian Ocean Expedition

This report outlines an initiative named **PROLAP** (or **Pressolation Latin Box**), designed to enhance oceanographic observations through simplified tools, addressing observational gaps in under-resourced regions. The program encompasses the development of low-cost, modular instruments, training for multi-skilled oceanographers, and the establishment of long-term monitoring projects. Regional training camps are planned in Mozambique and other Indian Ocean regions to scale the initiative.

1. The **PROLAP/Pressolation Latin Box** observational initiative was proposed to tackle data scarcity in the Indian Ocean, while demonstrating that simplified tools can enable high-quality scientific research.
2. By creating cost-effective, modular instrumentation and offering multidisciplinary training, the program prioritizes empowering early-career scientists as trainers to strengthen coastal observation capacities.
3. The initiative integrates portable devices, open-source instruments, and tools for physical, biological, and chemical observations, aiming to complement existing monitoring systems and remote sensing data.
4. Implementation includes regional training workshops in Mozambique, the establishment of sustained monitoring programs, and plans to replicate the model across other Indian Ocean regions.

Shuwei Pu [12-3]

Study on the geographical distribution patterns of surface marine microorganisms in the Indo-Pacific convergence zone

This study explored surface microbial dynamics in the Indo-Pacific Convergence Zone (SCS, Malacca/Java Straits, Eastern Indian Ocean) using 16S rRNA sequencing. Dominant phyla included Proteobacteria, Cyanobacteria, Bacteroidetes, and Actinobacteria. Regional OTU analysis showed 18% shared taxa, with SCS hosting the highest unique OTUs (30.9%). Community stability decreased from SCS (lowest variability: 0.518) to the Indonesian Throughflow-affected EIO (highest: 0.738). Cyanobacteria correlated with salinity/CDOM. Co-occurrence networks revealed increasing Proteobacteria connectivity from EIO to SCS, SAR324 centrality shifts, and more negative taxa correlations in EIO/SCS. Findings elucidate multi-scale microbial patterns and environmental drivers in this ecoregion.