IOCCG Trevor Platt Memorial Scholarship-2026
Completion Report

October 2026

Home Institution: XIM University, India

Host Institute: Plymouth Marine Laboratory (PML), United Kingdom

Scholar: B Goutami

Visiting Period: 5th July-5th September 2026

Funding Body: International Ocean Color Coordinating Group (IOCCG)

Project Title: Satellite-Based Assessment of Phytoplankton Phenology as an Indicator of Ecosystem Resilience in Coastal and Estuarine Environments

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The primary goal of this fellowship was to establish satellite-based workflows to measure the timing of microalgae blooms, including bloom onset, peak, and duration, and to evaluate whether this timing serves as a reliable indicator of marine ecosystem resilience under climate variability and extreme weather events. The study conducts a comparative assessment between two distinct aquatic systems: a temperate estuarine system in the United Kingdom, centered around the Western Channel Observatory L4 station in Plymouth Sound, and a tropical, cyclone-impacted coastal lagoon in India, Chilika Lagoon.

During the initial training phase at Plymouth Marine Laboratory, research focused on developing standardized data processing and validation protocols using long-term observation records from the Western Channel Observatory L4 station. Procedures were established to extract satellite ocean color data and pair satellite pixel observations with ground-truth water samples collected at the L4 station using spatial matching windows and temporal tolerances. Satellite-derived chlorophyll estimates were evaluated against ground measurements to quantify baseline algorithm accuracy, systematic bias, and error margins in temperate UK coastal waters.

The validated remote sensing methodology established at PML was subsequently extended and applied to Chilika Lagoon, a shallow coastal lagoon in India, which is monitored across 33 field stations. Ground-truth measurements were paired with three satellite datasets offering varying levels of spatial detail, including Copernicus C3S at approximately 300-meter resolution, Sentinel-3 OLCI at 300-meter resolution, and Sentinel-2 MSI at 10-meter resolution. Furthermore, satellite bio-optical equations were calibrated locally to eliminate large overestimations due to suspended sediment and organic matter, ensuring that satellite measurements accurately reflect lagoon water conditions.

Further, various algorithms (Cumulative anomaly methods, climatological percentile-based threshold methods, and Relative amplitude threshold-based methods) have been tested to extract key phenological milestones, such as bloom onset, peak timing, and duration across the multi-sensor satellite record. The results demonstrated that the timing of the relative bloom peak remains highly consistent across satellite

sensors, providing a robust tool for tracking seasonal biological cycles despite baseline concentration offsets. High-resolution imagery from Sentinel-2 proved valuable for resolving fine-scale turbidity boundaries and estuarine channel dynamics across the distinct optical sectors of the lagoon. To evaluate ecosystem resilience, bloom timing anomalies and post-disturbance recovery trajectories were analyzed following Cyclone Fani, showing that tracking the rate at which chlorophyll levels return to baseline climatological states provides a quantitative metric of ecological resistance and recovery.

This scholarship successfully transferred satellite ocean color processing, bio-optical validation, and phenology extraction techniques from UK coastal waters to tropical Indian lagoon ecosystems. The findings are being compiled into a peer-reviewed manuscript focusing on local satellite calibration in turbid coastal lagoons and the application of phytoplankton bloom timing as an indicator of post-cyclone ecosystem resilience. Furthermore, I have been in continued contact with Dr. Gemma Kulk through online meetings after my visit to PML, and these discussions have helped with problem-solving and provided clear direction in this line of research.

Outcomes and Future Directions

This work directly supports one of my doctoral research objectives and aligns with ongoing university initiatives, including the Save Daya River Mission and research on Chilika Lagoon, while honoring Trevor Platt's pioneering contributions to marine phytoplankton ecology, bio-optical modeling, and ocean-colour research. The knowledge, data-processing workflows, and validation tools developed through this work are being transferred to strengthen my PhD research in India. The outcomes will contribute to joint peer-reviewed publications with collaborators at Plymouth Marine Laboratory (PML), a doctoral thesis chapter, and, where appropriate, remote sensing and geospatial teaching, student dissertations, and capstone projects.



Memories from my research visit to Plymouth Marine Laboratory (PML), UK, undertaken as part of the IOCCG Trevor Platt Scholarship