

PRANALI DEORE

Self abstract:

I am, Pranali Deore, a post-doctoral research fellow (2023-2025, Mary Lugton fellowship in Botany, tri-annual internal competitive scheme with 1% success rate). My research focuses on photobiology of marine dinoflagellate, Symbiodiniaceae, and its symbiotic association with bacteria.

A part of my research involves developing novel tools to overcome challenges in visualisation of marine dinoflagellate (Symbiodiniaceae, photo-endosymbiont of corals). Symbiodiniaceae forms close association (intracellular and cell surface attached) with diverse bacteria however, the precise localisation of endosymbiont bacteria in Symbiodiniaceae is unknown. The visual mapping of intracellular bacteria is challenging due to the broad spectrum (400–750 nm) autofluorescence arising from Symbiodiniaceae. During my first post-doctoral appointment (2020-2023, Gordon Betty Moore foundation), I integrated Fluorescence Lifetime Imaging Microscopy (FLIM) tool with Fluorescence *in situ* hybridisation (FISH) for unequivocal distinction of labelled intracellular bacteria (~1 µm) from Symbiodiniaceae (8 µm) autofluorescence. This tool enables estimation of relative load of intracellular bacteria (*BioRxiv*, 2024). However, visual delimitation between two intracellular bacterial cells within Symbiodiniaceae is limited because of the resolution of light microscope (200 nm). Therefore, I am currently translating expansion microscopy for mechanical expansion of Symbiodiniaceae cells (~4-fold, unpublished data) which will enable super resolution scale imaging (~70 nm) of intracellular bacteria on a light microscope. A robust expansion microscopy workflow will open many other research avenues to further marine dinoflagellate research (e.g., cell biology). The other arm of my research explores differences in photoprotective strategies underpinning the thermal tolerance in Symbiodiniaceae. I use photo-optical tools to probe photosynthesis in strains of Symbiodiniaceae exhibiting different levels of thermal tolerance. My recent report (under review in *J. Experimental Botany*) outlines how thermally more tolerant strains of Symbiodiniaceae exhibit dual photoprotective strategies (integration of photopigments to preserve thylakoid membrane integrity and activation of superquenching state) to cope with heat stress. My overall research is phycology focused and I have track record of using cross-disciplinary research tools to advance the field. Below is the summary of my research experiences.

Research experience – 6 years of experience in phycology excluding PhD duration (algae genetic engineering in industry for 2.5 years; photosynthesis and advance imaging in academia 3.5 years)

Independent research – 2 ongoing projects. Visualisation of microalgae-bacteria association using expansion microscopy; and characterisation of an unique non-plastid autofluorescent organelle in algae; 1 completed project photobiology project.

Funding – I am the principal investigator on 1 external competitive grant (the Australian Academy of Science, \$US 12,995), 2 internal competitive grants (Mary Lugton Fellowship \$US 16,326 and 2-year salary; ECR grant scheme \$US 24,483), 2 scientific initiative grants (The Botany foundation, \$US 5948; Environmental Microbiology Research initiative, \$US 4626); and a co-applicant on 2 ECR engagement grants (diversity and inclusion grant, \$US 3304; researcher development initiative grant, \$US 5485 at UoM)

Awards – I won one technology innovation award (Thermofisher scientific award for developing FLIM-FISH tool), four best talks awards, and won gold medal (valedictorian for securing the highest distinction across >50 courses within the university)

Scientific outputs – 15 papers (8 as first-author) and 5 patents; Google Scholar citation = 108, h-index = 7

Top 5 phycological papers:

1. Deore P, Tsang Min Ching SJ, Brumley DR, van Oppen MJ, Hinde E, Blackall LL (2024) Cutting through host autofluorescence: fluorescence lifetime imaging microscopy for visualising intracellular bacteria of coral photosymbionts. BioRxiv DOI:

<https://doi.org/10.1101/2024.01.16.575970> (Almetric mentions = 3; 70% contribution)

2. Deore P, Tsang Min Ching SJ, Nitschke MR, Rudd D, Brumley DR, Hinde E, Blackall LL, van Oppen MJH Unique photosynthetic strategies employed by closely related *Breviolum minutum* strains under short-term cumulative heat stress. Journal of Experimental Botany (IF: 7.2, under review – re-buttle submitted; 80% contribution)

3. Deore P, Beardall J, Palacios Y, Noronha S, Heraud P (2021) FTIR combined with chemometric tools - a potential approach for early screening of grazers in microalgal cultures. Journal of Applied Phycology 33:3723–3733 (IF: 3.3, Google Scholar citations = 9; 70% contribution)

4. Deore P, Beardall J, Noronha S (2020) Non-photochemical quenching: a non-invasive probe for monitoring microalgal grazing: influence of grazing-mediated total ammonia-nitrogen. Applied Phycology 1:32–43 (IF: 2.7, Google Scholar citations = 7; 70% contribution)

5. Karthikaichamy A, Deore P, Srivastava S, Coppel R, Bulach, D, Beardall J, Noronha S (2018) Temporal acclimation of *Microchloropsis gaditana* CCMP526 in response to hypersalinity. Bioresource Technology 254:24–30 (IF: 11.4, Google Scholar citations = 18; 40% contribution)

Academic background:

I obtained a joint PhD degree from Indian Institute of Technology Bombay, India and Monash University Australia (2015–2020). In my PhD research, I devised a suit of early warning tools for detection of protozoan contaminants in microalgae cultures. The predator protozoan species consumes microalgae as a prey and as a result culture crash is inevitable. The innovative diagnostic tool (based on release of total-ammonia nitrogen and its uptake by algae) is being patented (post examination phase in India). Prior to my PhD, I worked as a research scientist (2013–2015, Reliance Industries Limited, India) where I delivered five microalgal for high lipid, protein and biomass production. My formal education is in Biotechnology (Master of Biotechnology, five years of integrated course 2007–2012) from Pad. Dr. D. Y. Patil University, Mumbai, India. I secured a gold medal for scoring highest academic grade (overall 87%) across >50 courses at the university.