Shailesh S. Nair Marine Microbiogist



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RESEARCH INTERESTS

- Marine microbial ecology & evolution with a focus on adaptations in changing oceans.
- Algae-bacteria-virus interactions and their roles in ocean biogeochemistry
- Anthropogenic contaminant and climate change impacts on coastal ecosystem
- Synthetic algae-bacteria consortia for effective pollutant degradation.
- seaweed holobiont and carbon sequestration under changing climate
- Seaweed microbiome manipulation and phage therapy to enhance seaweed farming

KEY SKILLS

- Advanced molecular techniques including metagenomics, metaviromics, and metatranscriptomics and bioinformatics analysis using R, Python, and Bash for processing complex environmental microbial datasets.
- Expertise in handling large multi-omics datasets, applying machine learning algorithms for pattern recognition, and constructing predictive ecological models.
- Extensive experience in isolation and characterization of diverse marine microorganisms (algae, bacteria, and viruses) and construction of synthetic microbiomes.
- Expertise in quantitative flow cytometry, microscopy, PCR, RT-qPCR, and stable isotope probing.
- Experience with field sample collection including scientific cruises (coastal and open ocean).
- Proficient in statistical analysis, data visualization, and scientific manuscript writing.

EDUCATION 2017 – 2021 Ph.D. in Microbiology, University of Chinese Academy of Sciences, China. Awarded in January 2022. Supervisor: Prof. Zhang Yongyu 2011 – 2013 M. Sc. in Marine Biology, Karnataka University, Dharwad, India. Awarded in 2014. 2008 – 2011 B.S. in Zoology, Goa University, Goa – India. Awarded in 2012.

ACADEMIC POSITIONS AND RESEARCH EXPERIENCE

	Assistant Professor (research), Marine Carbon Sequestration and Energy Microorganism
2024 - present	Group, Qingdao Institute of Bioenergy and Bioprocess Technology, Chinese Academy of
	Sciences.
	Postdoctoral researcher, Marine Carbon Sequestration and Energy Microorganism Group,
2022 - 2024	Qingdao Institute of Bioenergy and Bioprocess Technology, Chinese Academy of Sciences.
	Advisor: Prof. Zhang Yongyu
2013 - 2017	Research assistant, Department of Biological Oceanography, National Institute of
	Oceanography (NIO) India. Advisor: Dr. Smita Mitbavkar

FUNDED EXTERNAL PROJECTS (AS PRINCIPAL INVESTIGATOR)

2023-2025 Phage community dynamics and regulatory functions during long-term interactions between Synechococcus and heterotrophic bacterial communities. National Natural Science Foundation of China (基金委外国青年学者基金). Funding amount: 4,00,000 **RMB** 2022 - 2024Investigating the diversity and function of nitrogen-fixing bacteria in marine Synechococcus-bacteria symbiotic system. Ministry of Science and Technology, China (科技部外国青年专家人才项目). 2022 - 2024Elucidating the mechanisms of nitrogen fixation by heterotrophic bacteria during long-term Synechococcus-heterotrophic interactions. Chinese Academy of Sciences (中国科学院特 别研究助理项目). 2022 - 2024Developing phage cocktail treatments to combat bacterial pathogens in seaweed. Shandong Provincial Government (山东省博士后创新人才计划项目), China.

ACADEMIC HONORS AND AWARDS

2022	Young Foreign Talent (科技部外国青年专家人才计划), Ministry of Science and
	Technology, China.
2022	Outstanding International Ph.D. Graduate (国科大优秀国际毕业生), University of
	Chinese Academy of Sciences
2022	Excellent Incoming Postdoctoral Researcher (研究所优秀博士后支持计划), Qingdao
	Institute of Bioenergy and Bioprocess Technology, Chinese Academy of Sciences
2008	Outstanding Outgoing Student, Government higher secondary school, Goa, India.

RESEARCH FELLOWSHIPS

2022-2024	Special Postdoctoral Research Assistant Grant (中科院特别研究助), Chinese Academy
	of Sciences.
2017-2020	Ph.D. scholarship, University of Chinese Academy of Sciences.

INVITED TALKS

1. Association for the Sciences of Limnology and Oceanography (ASLO), amplifying voices webinar (2022, online). Topic: Decoding the mechanisms behind the recurrent mutualism between marine *Synechococcus* sp. PCC7002 and heterotrophic bacterial community despite environmental interference under long-term.

2. Hainan Blue Carbon Forum (2024, China). Topic: Understanding seaweed-microbiome interactions in changing oceans and implications for carbon sequestration.

3. International Marine Biotechnology Association (IMBA) Symposium on Blue Carbon Biotechnology (2024 online). Topic: Understanding seaweed-microbiome interactions in changing oceans and implications for carbon sequestration.

TEACHING EXPERIENCE

- 1. 2022 present: **Instructor**, Hands-on instruction in bioinformatics and data visualization (undergraduate and graduate visiting students, and other lab members).
- 2023 present: Assistant supervisor, Experimental design, data analysis, and scientific writing (undergraduate and graduate visiting students).

PEER-REVIEW CONTRIBUTION

• mBio

• ISME J.

- Applied and Environmental Microbiology
- Frontiers in Microbiology

Corresponding author, † Co-first author

PUBLICATION LIST

<u>Unpublished (3 in total as first author):</u>

- 1. Nair S, et al. Escalating herbicide loads to oceans, their fate, biogeochemical impacts and risks for carbon sequestration (*in review*).
- 2. Li C[†], **Nair S**[†], et al. Bacterial planktonic-to-attached lifestyle shift and herd immunity as adaptive anti-phage strategies through distinct evolutionary paths (*in peer review*).
- Nair S, et al. running title Eco-evolutionary dynamics of bacteriophage communities in longterm *Synechococcus*-bacteria mutualistic system (*in preparation*).

Published (12 in total, 6 as first author and 1 as corresponding author):

- Nair S, et al. (2022) Inherent tendency of *Synechococcus* and heterotrophic bacteria for mutualism on long-term coexistence despite environmental interference. *Science Advances*, DOI:10.1126/sciadv.abf4792.
- Nair S, et al. (2022). A novel phage indirectly regulates diatom growth by infecting diatomassociated biofilm-forming bacterium. *Applied and Environmental. Microbiology*. DOI:10.1128/AEM.02138-21.
- Zhang Y#, Nair S#, et al. (2024). Adverse environmental perturbations may threaten kelp farming sustainability by exacerbating Enterobacterales diseases. *Environment Science & Technology*. DOI: 10.1021/acs.est.3c09921.
- Nair S, et al. (2024). Engineering microbiomes to enhance macroalgal health, biomass yield, and carbon sequestration. *Green Carbon*. DOI:10.1016/j.greenca.2024.11.001.
- Zhao J[†], Nair S[†], et al. (2024). Macroalgal virosphere assists with host-microbiome equilibrium regulation and affects prokaryotes in surrounding marine environments. *ISME J*. DOI: 10.1093/ismejo/wrae083.
- Zhang Z[†], Nair S[†], et al., (2021). Long-term survival of *Synechococcus* and heterotrophic bacteria without external nutrient supply after changes in their relationship from antagonism to mutualism. *mBio*. DOI:10.1128/mbio.01614-2.
- Zhao H[†], Zhang Z[†], Nair S[†], et al. (2024). Overlooked vital role of persistent algae-bacteria interaction in ocean recalcitrant carbon sequestration and its response to ocean warming. *Global Change Biology*. DOI:10.1111/gcb.17570.
- Gao X, Xiao Y, Wang Z, Zhao H, Yue Y, Nair S et al. (2024). Adaptive traits of Planctomycetota bacteria to thrive in macroalgal habitats and establish mutually beneficial relationship with macroalgae. *Limnology &Oceanography Letters*. DOI: 10.1002/lol2.10424.
- Zhang Z, Li D., Xie R., Guo R., Nair S., et al. (2023). Plastoquinone synthesis inhibition by tetrabromo biphenyldiol as a widespread algicidal mechanism of marine bacteria. *ISME J.* DOI:10.1038/s41396-023-01510-0.

- Mou S, Zhang Z, Zhao H, Nair S, et al. (2022). A dark-tolerant diatom (*Chaetoceros*) cultured from the deep sea. *Journal of Phycology*. DOI:10.1111/jpy.13240.
- Zhao H, Zhang Z, Nair S, et al. (2022). Vertically exported phytoplankton (< 20 μm) and their correlation network with bacterioplankton along a deep-sea seamount. *Frontiers in Marine Science*. DOI: 10.3389/fmars.2022.862494.
- Zhang Z, Zhao H, Mou S, Nair S, et al. (2022). Phage infection benefits the photosynthetic efficiency of a marine diatom by regulating the associated bacterial community. *Microbial Ecology*. DOI:10.1007/s00248-022-02045-1.