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### Lobster sea cage farming and its influence on phytoplankton diversity in evolving aquatic environments

**Mayur Shivdas Tade<sup>1,2\*</sup>**, Divu, D.,<sup>2</sup> Suresh Kumar Mojjada<sup>2</sup>, Abdul Azeez P<sup>2</sup>,  
Swathi Lekshmi, P.S<sup>2</sup>, Aarsha Subramanian<sup>2</sup>, Gopalakrishnan, A.<sup>2</sup>

<sup>1</sup>Kerala University of Fisheries and Ocean studies, Panangad, P.O., Kochi, Kerala, 682 506

<sup>2</sup>ICAR-Central Marine Fisheries Research Institute, Kochi, Kerala, 682 018

\*Corresponding author: mayur.tade@gmail.com

#### Abstract

Assessing the ecological impact of sea cage farming on phytoplankton diversity and water quality is crucial for sustainable cage culture production. Despite previous attempts, conclusive insights into these changes remain elusive. Our study focuses on the ecological impact of spiny lobster (*Panulirus polyphagus*) sea cage farming on water quality changes, particularly phytoplankton species and diversity. Study was conducted for 1 year period (September 2020 to August 2021) at Veraval in Northwest coast of India, where spiny lobster capture-based aquaculture is being practiced. Identification of 47 phytoplankton species from 41 genera showcased dominance by Bacillariophyceae (76.5%) and Dinophyceae (23.5%). Phytoplankton diversity (Shannon) analysis revealed a decline during the cage culture period ( $H' = 3.19$ ) at the experimental site, in contrast to the reference location ( $H' = 3.45$ ). Total Suspended Solids (TSS) were recorded to significantly impacted diversity and abundance ( $P \leq 0.05$ ). Key species positively correlated with TSS included *Chaetoceros* sp., *Cyclotella* sp., *Rhizosolenia robusta*, *Skeletonema costatum*, *Thalassiosira palmeriana*, *Navicula* sp., and *Thalassiosira frauenfeldii*. Conversely, *Biddulphia sinensis*, *Coscinodiscus excentricus*, *Ditylum brightwelli*, *Lithodesmium* sp., *Rhizosolenia alata*, and six others exhibited negative correlations. Understanding the impact of phytoplankton abundance on the sea cage culture site is crucial, as it significantly influences the ecosystem in which the mariculture activity been carried out. The study emphasizes the need for meticulous assessments plankton diversity before intensifying sea cage farming activities for sustainable mariculture development.

**Keywords:** Phytoplankton, mariculture, sea cage farming, spiny lobster, sustainability