



Growth Dynamics of selected *Vibrio* spp. in mono-, co-culture and multi-bacterial microcosms: Investigating the prevalence of *Vibrio parahaemolyticus* in seawater

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ABSTRACT

We examined the growth dynamics and interspecific competition of six environmental *Vibrio* isolates (*V. parahaemolyticus*, *V. vulnificus*, *V. cholerae*, *V. mimicus*, *V. cincinnatiensis*, and *V. zhanjiangensis*) recovered from Malaysian seawater. Monoculture assays were conducted across temperature (25–37°C), salinity (0.3–40 ppt), and nutrient (0.001X–0.05X Marine Broth or MB equivalent strength) gradients, followed by co-culture and multi-bacterial microcosm experiments (at 31°C, 26 ppt, 0.01X MB). Regression analyses showed no significant positive response to increasing temperature, whereas tested species responded positively to increasing salinity. Responses to nutrient enrichment suggested that *V. parahaemolyticus*, *V. mimicus* and *V. vulnificus* exhibited r-strategy framework, whereas *V. zhanjiangensis* represented K-strategy. In contrast, *V. cholerae* and *V. cincinnatiensis* could not be clearly classified. In co-culture and multi-bacterial microcosms, *V. parahaemolyticus* consistently outcompeted both *Vibrio* and non-*Vibrio* competitors, even when introduced at lower initial abundance. Therefore, the ecological success of *V. parahaemolyticus* in these systems was not solely determined by intrinsic growth capacity or environmental suitability, but also by interspecific dynamics. The frequent involvement of *V. parahaemolyticus* in aquaculture disease outbreaks may be driven by previously underappreciated interspecific competitive advantages that enable it to outcompete other microbes.

1. Introduction

The genus *Vibrio* comprises a diverse group of aquatic bacteria that are prevalent in marine and estuarine environments and play important ecological, economic, and public health roles. Members of this genus are well known for their metabolic versatility, halotolerance, and capacity to rapidly respond to environmental change, enabling them to persist across fluctuating temperature, salinity, and nutrient regimes (Materna et al., 2012; Farmer et al., 2015; Wong et al., 2024). Several *Vibrio*

species are also opportunistic pathogens, responsible for a wide range of human and animal infections associated with seafood consumption, wound exposure, and aquaculture activities (Grimes, 2020; De Souza Valente and Wan, 2021). However, research on the ecology of *Vibrio* spp. remains relatively limited in tropical waters.

Tropical regions specifically, provide environmental conditions that favour the persistence and dominance of the *Vibrio* genus in local water bodies. Coastal systems in Southeast Asia, including those along the west coast of Peninsular Malaysia, experience pronounced

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