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Environmental factors that regulate *Vibrio* spp. abundance and community structure in tropical waters

Yi You Wong^{1,2,3}, Choon Weng Lee^{1*} , Chui Wei Bong^{1,2}, Joon Hai Lim^{1,2,3}, Ching Ching Ng¹, Kumaran Narayanan⁴, Edmund Ui Hang Sim⁵ and Ai-jun Wang^{6,7}

Abstract

Vibrio spp. is a group of heterotrophic bacteria that are ubiquitous in marine habitats, with various ecological and clinical importance. This study investigated the environmental factors that regulate *Vibrio* spp. dynamics in various tropical marine habitats, including nearshore (an estuary and a coastal beach) and offshore transects located northwest and southeast of Peninsular Malaysia, while focusing on the distribution of attached and free-living *Vibrio* spp., population growth, and community composition. The results showed that > 85% of the *Vibrio* spp. in nearshore waters occurred in attached form and correlated positively to total suspended solids (TSS) and Chlorophyll *a* (Chl *a*) concentrations. On the other hand, *Vibrio* spp. growth rates were positively correlated to dissolved organic carbon (DOC) concentrations, but negatively correlated to total bacterial counts, likely due to resource competition. In addition, high-throughput sequencing of 16S rRNA V3-V4 region showed that *Vibrio* spp. in these tropical waters contributed < 1 – 18% of the whole bacterioplankton community, and the six major *Vibrio* spp. taxa were *V. alginolyticus* group, *V. brasiliensis*, *V. caribbeanicus*, *V. hepatarius* group, *V. splendidus* group and *V. thalassae*. db-RDA (cumulative variance explicated = 93.53%) further revealed the influence of TSS, DOC, and dissolved organic nitrogen (DON) to the *Vibrio* spp. community profiles. The study highlighted the importance of suspended solids (TSS and Chl *a*) and dissolved organic nutrients (DOC and DON) towards *Vibrio* spp. dynamics in tropical marine waters.

Keywords *Vibrio* spp., Growth rate, Attached, Free-living, Diversity, Driving factors

1 Introduction

Vibrio spp. are a group of Gram negative, rod shaped bacteria that are commonly found in various aquatic habitats (Thompson et al. 2004). This group of bacteria not only includes several important causative agents of infections in human and aquatic organisms, but are also involved in the degradation of complex polymers and supply of essential substrates that are vital in the marine biogeochemical cycle (Thompson et al. 2004; Thompson and Polz 2006; Graziano et al. 2016; Moi et al. 2018; Kim et al. 2020).

In the environment, *Vibrio* spp. exist in attached or free-living form in adaptation to changing surrounding conditions (Worden et al. 2006; Turner et al. 2009). Attachment allows *Vibrio* spp. to access particulate

*Correspondence:

Choon Weng Lee
lee@um.edu.my

¹ Laboratory of Microbial Ecology, Institute of Biological Sciences, Faculty of Science, Universiti Malaya, Kuala Lumpur 50603, Malaysia

² Institute of Ocean and Earth Sciences, Universiti Malaya, Kuala Lumpur 50603, Malaysia

³ Institute for Advanced Studies, Universiti Malaya, Kuala Lumpur 50603, Malaysia

⁴ School of Science, Monash University Malaysia, Bandar Sunway, 47500 Subang Jaya, Selangor, Malaysia

⁵ Faculty of Resource Science and Technology, University Malaysia Sarawak, Kota Samarahan, Sarawak 94300, Malaysia

⁶ Laboratory of Coastal and Marine Geology, Ministry of Natural Resources, Third Institute of Oceanography, Xiamen, Fujian 361005, China

⁷ Fujian Provincial Key Laboratory of Marine Physical and Geological Processes, Xiamen, Fujian 361005, China