



Research papers

Macrobenthic community associated with semi-cultured blood cockles (*Tegillarca granosa*) in tropical mudflats

Zhen Wei Lai^{a,b}, Hong Wooi Teoh^c, Choon Weng Lee^{a,b}, Soon Loong Lee^b, Hajime Saito^d,
Ving Ching Chong^{b,*}

^a Institute of Ocean & Earth Sciences, University of Malaya, 50603, Kuala Lumpur, Malaysia

^b Institute of Biological Sciences, University of Malaya, 50603, Kuala Lumpur, Malaysia

^c China-ASEAN College of Marine Sciences, Xiamen University Malaysia Campus, 43900, Sepang, Malaysia

^d Japan International Research Centre for Agricultural Sciences (JIRCAS), 1-1 Oiwashi, Tsukuba, Ibaraki, 305-8686, Japan

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ABSTRACT

This study aims to address the potential effects of environmental factors, competition and predation among cohabiting macrobenthos, and in particular on the cultured blood cockles (*Tegillarca granosa*). Macrobenthos and environmental variables were sampled from culture beds close to the harvesting period at two sites (BNO, BSB) in Selangor and one (KSB) in Perak (Malaysia). A total of 79 taxa were recorded mostly belonging to three taxonomic groups, Mollusca (27 taxa), Crustacea (26) and Actinopterygii (18). Redundancy analysis revealed close associations among the common scavenging/grazing gastropods (*Nassarius bellulus* and *N. jacksonianus*), predatory gastropods (*Notocochlis tigrina* and *Indothais malayensis*) and various macrobenthic species suggesting competition and predation risk to the cultured bivalves. The biomass of sediment chlorophyll-a (highest at BNO) was correlated with higher *T. granosa* and macrobenthic density. The higher ammonia level at BSB and KSB may explain the lower macrobenthic density and reduced competition allowing the venerid bivalve, *Pelecypora* cf. *gouldii* to proliferate at the expense of *T. granosa*. This study identified two abiotic factors (nutrient enrichment, ammonia) and two biotic factors (food limitation and predation) that potentially affect the production of densely-stocked *T. granosa* on the mudflat.

1. Introduction

The blood cockle, *Tegillarca granosa* (Linnaeus, 1758) is a member of the ark shell family, Arcidae. Among all the arcids, *T. granosa* is one of the most important species of cultured mollusks in Southeast Asia. In Thailand and Malaysia, this species is cultured on a commercial scale as well as providing an alternative income for the local fishermen. Sheltered muddy shores are natural habitats and suitable culture areas for *T. granosa*. The optimum salinity range for the natural settlement of *T. granosa* larvae on coastal mudflats (between mid-neap and low spring level) is 26–31 ppt (Pathansali, 1966). *T. granosa* also prefers sheltered mudflats that bordered coastal mangrove forests where the substrate is fine, soft, brackish muds (Pathansali, 1966).

T. granosa is considered a surface deposit feeder with a diet that includes a mixture of detritus, benthic microalgae, phytoplankton and terrestrial plant particles (Broom, 1982a; Lam and Hai, 1998; Yurimoto et al., 2014a). Due to the bivalve's wide distribution along the shallow

and muddy coast of west Peninsular Malaysia, it is not surprising that the mollusk is cultured extensively and often intensively. The young *T. granosa* spats of shell length 4–10 mm (6–8 month-old) are collected from natural spatfall areas before they are sown on their culture beds in the mudflat. The young spats are allowed to grow undisturbed, supported by only the natural food production in the mudflat. Sown young spats grow to harvestable sizes from 6 to 12 months (Pathansali, 1966; Broom, 1982a).

The three main *T. granosa* producing states in Peninsular Malaysia are Penang, Perak and Selangor. Although *T. granosa* culture is believed to have started out in Perak in 1948, the Malaysian fisheries agency only reported *T. granosa* production from 1985. Selangor then produced 8,075 mt in an area of 821 ha of coastal mudflats (Annual Fisheries Statistics, 1985). In 2008, the Selangor state government initiated the Cockle Farm High Impact Project in the three main districts of Kuala Selangor, Klang and Sabak Bernam primarily to increase *T. granosa* production and assist traditional fishermen who had abandoned fishing

* Corresponding author.

E-mail address: chong@um.edu.my (V.C. Chong).

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