Research papers

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

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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 Indohais 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 not 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.