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BACTERIA, ELEMENTAL SULFUR AND STABLE CARBON ISOTOPE RATIOS IN THE MANGROVE MUD CLAM ANODONTIA EDENTULA (LINNE, 1758)

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ABSTRACT

LEBATA, MA. JUNEMIE HAZEL L. University of the Philippines in the Visayas, November 1998. Bacteria, elemental sulfur and stable carbon isotope ratios in the mangrove mud clam *Anodontia edentula* (Linné, 1758).

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Different sizes of the mangrove mud clam *Anodontia edentula* were collected from the mangroves in Brgy. San Roque in Estancia, Iloilo and examined for the presence of gut through dissection and microscopic observation. The presence of bacteria in the mantle, gill and foot tissues was also examined through bacterial culture and scanning electron microscopy (SEM). Elemental sulfur content of the mantle, gill and foot tissues and total sulfur content of the sediment were analyzed; and stable carbon isotope ratios of the clams, sediment, detritus and plankton in the study area were determined. These experiments were conducted to establish the possibility of clam-bacteria symbiosis in this species.

Dissection and histological sections of juvenile and adult mangrove clams showed the presence of a very simple gut, unlike the well-defined organs of the digestive system of other bivalve species that have no symbionts.

A decreasing bacterial count (CFU/g tissue) with increasing size of clam was observed only in plates containing gill isolates. In contrast, no bacterial colonies were observed in the mantle and foot isolates. The results paralleled the observations in other lucinids that bacteria are confined only in the gills. Moreover, as the clam grows it becomes less dependent of the bacteria.

The morphology of colonies was the same in all plates suggesting only one type of colony. Bacteria observed were gram-negative, colorless and

spherical to rod shaped. SEM also revealed only one type of spherical bacteria both in cultured plates and in gill bacteriocytes.

Sulfur analysis showed highly significant ($p<0.0001$) amounts of elemental sulfur in the gills (1.38-1907.20 μmoles/g FW) compared with the quantities observed in the mantle (0.51-6.41 μmoles/g FW). Elemental sulfur was absent from the foot tissues. This finding supports the aforementioned presence of bacterial symbionts only in the gills. Furthermore, results showed a significantly ($p<0.0001$) decreasing elemental sulfur from the newly collected clams compared to those maintained in mangrove mud and stocked in seawater only which were analyzed 3 weeks later indicating that stored elemental sulfur is being utilized by the bacteria in the absence of sulfide. Moreover, smaller clams (40.1-50.0 mm SL) had significantly higher elemental sulfur content than bigger ones (50.1-60.0 mm SL) supporting the inverse relationship between number of gill bacteria and clam size. Total sulfur content of mangrove mud *in situ* was higher than those used as substrate in the experiment; and was not significantly different from initial to final readings in the latter. This shows that mangrove mud *in situ* is linked to a steady sulfur source.

Stable C isotope ratios showed that the clams do not obtain their carbon from plankton, sediment nor detritus and may thus be solely dependent on bacterial carbon. This was shown by the more negative $\delta^{13}C$ ratios of carbon fixed during bacterial chemoautotrophy compared to carbon fixed photosynthetically.

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INTRODUCTION

The mangrove ecosystem supports nearshore fisheries, provides coastal protection against typhoons and storm surges, stabilizes sediments and reduces erosion, controls flooding and pollution and provides a habitat for wildlife (Tomlinson, 1986; Field, 1995). This habitat also enhances the development of intertidal mudflats (Newell *et al.*, 1995). Aside from these non-material goods, mangrove products include timber, fuel wood, fishing and agricultural materials, paper, drugs and beverages, textile and leather items, and food (Saenger *et al.*, 1983; Tomlinson, 1986; Field, 1995). Fishes, crustaceans and mollusks are some of the food sources found in mangroves.

Food security is one of the important benefits mangroves provide. In a mangrove-reforestation area in Banacon, Bohol, annual per capita consumption and sales of shells were 212 and 276 liters, respectively (Mantilla-Tura and Melana, 1993). According to Young and Serna (1982), at least 22 commercially important species of bivalves are domestically marketed in the country. At least 10 species of edible shellfish appeared in brackishwater mudflats in Silay City, Negros Occidental (Primavera and Agbayani, 1997). In Hinobaan, Negros Occidental characterized by marine waters, the most noteworthy species and a highly prized delicacy is the mangrove mud clam, locally known as *imbao*.

Among the many edible mangrove-associated mollusks, *imbao* is one of the popular bivalves in the coastal municipalities of Visayas and Mindanao. It is an important source of food and livelihood in coastal areas where it is