Poultry, Fisheries & Wildlife Sciences

Ihwan et al., Poult Fish Wildl Sci 2015, 3:2
http://dx.doi.org/10.4172/2375-446X.1000142

Case Report Open Access

Study on the Attachment of *Octolasmis* spp. on Gill of Wild Mud Crabs, Genus *Scylla* from Setiu Wetland, Terengganu, Malaysia

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Abstract

Most Asian country have been success for the culturing of the mud crab i.e. Thailand, Vietnam and Philippines but no action were taken to solve the barnacle infestation problem of mud crab. Previous study did not mention about significant of the attachment of pedunculate barnacle to the mud crab. But somehow, this pedunculate barnacle may be able to give effect to the mud crab respiratory system especially for adult mud crab. This preliminary study are to observe the effect of the pedunculate barnacle attachment to their host using histopathological and Scanning Electron Microscopy (Tabletop SEM 1000, Hitachi) observation. Histological sectioning of gill wild mud crab with the Hematoxylene and Eosin staining (H&E Stain) were done to study about their effect. The results show the attachment of the pedunculate barnacle is temporary and will be left the host-gill during molting period.

Keywords: *Octolasmis* spp.; Histopathology; *Scylla* spp.; Ecto-symbiont; Setiu wetland

Introduction

Barnacle infestations on wild mud crab, genus *Scylla* have been described earlier by Jeffries and Voris [1]. But nowadays, mud crab culture have been developed to support the fisheries industry by introduced the new commercial species. Most Asian country have been success for the culturing of the mud crab i.e. Thailand, Vietnam and Philippines [2], but no proper treatment were taken to solve the problem especially for the infestation of parasites and ecto-symbiont of mud crab. Some study did not mention about there is no significant of the attachment of pedunculate barnacle to the mud crab [3-7]. But in this case, this pedunculate barnacle may be able to give effect to the mud crab respiratory system especially for adult mud crab. Barnacles for this present study are from order Thorarica, Suborder Lepadormorpha and genus *Octolasmis* spp. [1,8-11] which having peduncle and capitulum which is usually protected by calcareaous plates. Commonly this genus of pedunculate barnacle are normally found in shallow littoral or pelagic waters and widely distributed in tropical and temperate area [12,13]. *Octolasmis* spp are one of the special genus in Cirriped. This genus normally formed special biological characteristics for adapting the sessile life during the long term evolutionary process, affecting the breath, development and ingestion of hosts [14]. The pedunculate cirriped, *Octolasmis* spp. were found to occur in large number on the gills of wild mud crab from all over the Asian country including Thailand, Singapore, Indonesia and India. From the previous study mentioned about the seasonal distribution of this pedunculate barnacle are very low in rainy season [6]. But there is no specific data that report the side effect of this pedunculate attachment to the host. Yap and Lim [15] have carried out the study of adhesive secretions from the cyprid larvae of *Octolasmis* spp. inhibiting the gills of mud crab using α-cells. According to Lavilla-Pitogo et al. and Lavilla-Pitogo and Pena [16,17], there are some effect of barnacles infestation on the gill of mud crab in cultured condition such as this pedunculate barnacles that inhibit the respiratory chambers occupy the space on the gills normally available for oxygen and carbon dioxide exchange. This can results to the negative effects of *Octolasmis* spp. infestation are competition for oxygen or blockage of the gills due to accumulation of debris on colonized respiratory surfaces. There are no proper methods of prevention and controls for *Octolasmis* spp. are developed. Some study also report that the crabs that heavily infected with pedunculate barnacles could also be disadvantaged due to the extra weight carried as well as being less marketable [18,19]. Objectives of this study are to describe the pedunculate barnacle infestation effects on the gill structure of the wild mud crab.

Methodology

Sixty wild mud crabs, genus *Scylla* were randomly sampled using crab trap or known as "binto" from Setiu Wetland (5°40'47.93"N, 102°42'45.04"E) of Terengganu coastal area, Malaysia. The crab were brought back to the Aquatic Organism Health laboratory of Institute of Tropical Aquaculture, Universiti Malaysia Terengganu and kept and maintained in aerated aquaria fill with brackish water which the salinity is same quality with natural environment (20-30ppt). The carapace width (CW) and body weight (BW) were measured by using caliper (vernier) and electronic balance (Sartorius) respectively. A total of 60 crab samples were measured and examined in this present study. The procedure of diagnosis takes about one hour for each crab sample for examined. Identification of mud crabs species were according to Keenan et al. and Keenan et al. [20,21]. Gill with attachment of barnacle were taken off from the mud crab body and fixed in 10% formalin. Tissue processing was done by using standard tissue processing for histology study and were stained using Hematoxyline and Eosin (H&E) stain. For Scanning Electron Microscope (SEM) procedures, all the samples were directly captured using fresh samples. These SEM process were follow Hitachi TM1000 Tabletop SEM.

Result and Discussions

From this study, the barnacle only covered the gill lamellae with

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Received October 05, 2015; **Accepted** October 30, 2015; **Published** November 07, 2015

Citation: Ihwan MZ, Ikhwanuddin A, Ambak MA, Shuhaimi AD, Wahidah W, et al. (2015) Study on the Attachment of *Octolasmis* spp. on Gill of Wild Mud Crabs, Genus *Scylla* from Setiu Wetland, Terengganu, Malaysia. Poult Fish Wildl Sci 3: 142. doi:10.4172/2375-446X.1000142

their cement structure and did not penetrate to the internal part of the gill. Mud crabs easily removed the barnacle every time it's molting. But, if the numbers of infection are high, the barnacle can give an effect to their host by decreasing the surface of gill chamber that can result of low oxygen and nutrient absorption or deficiency of gill to absorb the nutrient from water. Figure 1 show the histological sectioning of gill wild mud crab with the Hematoxylene and Eosin staining (H&E Stain). Figure 1 shows the normal gill of wild mud crab. Normally, gill of crab contain with gill chamber. Gill lamellae are the structure arrangement of chitin plates with no cells.

The observation of pdunculate barnacle attachment on the gill show there is no significant effect to the host. The barnacles allow only a part of their holdfast which is less than 1mm penetration which covers the surface of the gill. The chitin gill lamellae structure must be study to know their component of their chemical structure that attracts this barnacle able to attach. Figure 2 show the site of attachment of pedunculate barnacle's genus *Octolasmis* on wild mud crab genus *Scylla*. Figure 2a show the site of attachment and Figure 2b show the attachment part with the structure of holdfast/cement structure that allowed this barnacle species hardly attached. These pedunculate barnacles are found on the gill by the respiration process of the mud crab which filtered water from surrounding to absorb the oxygen.

Till now, there are no proper treatments for the pedunculate barnacles have been study [22]. Mostly barnacle cyprid attachment were done by the secretion of cement at the tips of antennules, it is initially in a normal crustacean orientation relatives to the substratum, ventral surface down. Small or large, generalized or specialized , the next moult of the planktonic stage VI nauplius yields a change of form to non-feeding cyprid are the stage of pre-settlement metamorphosis. At this stage, cyprid larvae are free-swimming and able to find the substrate for settlement for further growing [15,23,24]. For their attachment, the base of the peduncle is firmly attached, actually cemented, to the exoskeleton or gills depending upon the species [15]. Thus the barnacle is destined to remain attached at the site until the next molt of the host when the barnacles are sloughed off with the exuviae and probably are eaten along with the exuviae by scavengers. Previous finding reported traces of peduncle attachments, including stumps of various lengths, which strongly suggest that the gill "cleaners" are effective to a certain extent. Yap and Lim [15] mention that the hypodermal glands in the second segment of antennules of cyprid larvae of *Octolasmis* spp. are probably the site of production of bio adhesive responsible for temporary adhesion during the explorative of walking phase. There is some evidence that mention the α-cells are the main aspect for the barnacle attachment.

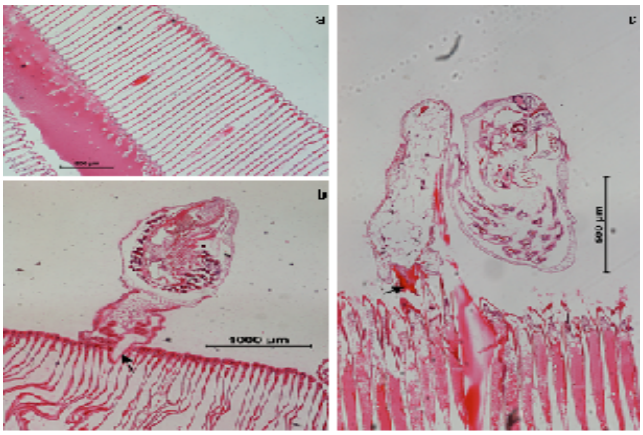

Figure 1: Histology sectioning for barnacle attachment. (a) Normal gill, (b) penetration part of barnacle (arrow) and (c) the attachment part also known as cement that keep the barnacle stay in the gill surface.

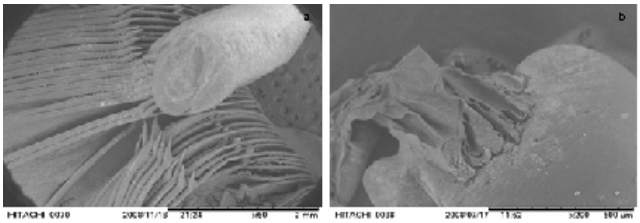

Figure 2: Scanning electron microscopy image for barnacle attachments part. (a) The picture of barnacle peduncle attached on the mud crab gill surface and (b) structure of cement that hold the gill lamellae. [Picture was captured using Tabletop Scanning Electron Microscope (Hitachi TM1000)].

Conslusion

From this study, the pedunculate barnacle showed their attachment on the gill with simple lining on the gill chitin surface. The SEM picture (Figure 2) showed the lining structure that covered the gill. Actually the barnacle holdfast did not penetrate the crab gill but they just hold the chitinous gill as their attachment part. The histology picture shows the attachment part of the barnacle. The sizes of the penetration are only 0.4 mm. Previous study mentions that there is no serious effects from the barnacle attachment to the gill of mud crab because this pedunculate barnacle can be removed each time the mud crab molts but there is no scientific data to prove it. However, for the matured mud crab, their molting lifecycle are not frequent compared with the juvenile mud crab. These problems arise because most of the broodstock now are caught from the wild.

Acknowledgement

We would like to extent our peaceful thanks to Institute of Tropical Aquaculture (AKUATROP) Laboratory management because give the opportunity to use the facilities to support this project. Also special thanks to AKUATROP management because give us an opportunity to do this research and last but not least to Niche Research Grant Scheme (NRGS Vot. No. 53131) for sponsoring this study.

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