

Seasonal Distribution and Host-Parasite Interaction of Pedunculate Barnacle, *Octolasmis* spp. on Orange Mud Crab, *Scylla olivacea*

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Abstract

Seasonal distributions of pedunculate barnacles, *Octolasmis* spp. on mud crab (*Scylla olivacea*) were investigated. Each ten specimens of male and female crabs were monthly collected from crab farms in Kan-Tung District, Trang Province, Southern Thailand (Andaman Coast). Live crab specimens were examined for gill parasites throughout 12 months (March, 2010 to February, 2011). The parasites found from each gill of crab samples were dislodged, examined and directly counted. The seasonal distribution pattern of gill parasitic populations was proposed and the interaction between host and parasite (size, sex) was also determined using an existing statistical program. Almost all crab samples (97 %) were infested with pedunculate barnacles of the genus *Octolasmis* (Cirripedia: Poecilasmatidae). Female crabs showed higher loading capacity for parasites than the male ones indicating by their intensities, 125: 47 specimens / crab host ($p < 0.05$). Contrarily crab sizes and gill sides were not significantly related to parasitic numbers ($p > 0.05$). The seasonal changes influenced parasitic abundance, with low numbers present in the rainy season (July and October, 2010 and January - February, 2011). It could be concluded that the pedunculate barnacles' population reflected their limited tolerance of water salinity caused by seasonal variation.

Keywords: Mangrove crab, *Scylla olivacea*, pedunculate barnacle, *Octolasmis*

Introduction

Mud crabs in the genus *Scylla* are reported on their distribution in the tropical and temperate zones of the Pacific and Indian Ocean [1-3]. They are found to inhabit mangrove swamps and intertidal habitats. The culture of mud crabs are widely conducted throughout Asia [4,5]. Keenan *et al.* [4] have previously revised *S. serrata* in Thailand to four species, *S. serrata*, *S. paramamosain*, *S. tanquebarica* and *S. olivacea*. The most important and common species distributed in the west coast of Thailand is *S. olivacea*.

It has been reported that marine crustaceans in order Decapoda are frequently infested with epizoic pedunculate barnacles of the genus *Octolasmis* [6]. Fifty five decapod species were regarded as the hosts of octolasmids. They could

possibly harbor up to seven species [7]. At least five species of *Octolasmis* have been recorded in the crabs of the family Portunidae of Thailand: *Octolasmis angulata*, *O. cor*, *O. lowei*, *O. neptuni*, *O. tridens* [8]. *Octolasmis* species were cemented to the gill lamellae in large numbers and occupied space on the gills [9]. This could cause death due to an interruption of the respiration system [10]. Different species are found on the gills, and varied sizes, shapes, calcareous plates including the hosts' gill position have been reported [8].

Voris *et al.* [11] also reported two common *Octolasmis* species being observed from mud crab (*Scylla serrata*); *Octolasmis cor* and *O. angulata*. The former were twice as common as the latter. Thus far, there have not been any documented

studies on the cause of crab disease or crab death, caused by a large population of this parasite group that might bring about the low production of cultured crabs and resulting in weakness which could be further infected by other pathogenic microorganisms.

The present study aims to focus on the seasonal distribution of *Octolasmis* spp. on orange mud crabs (*Scylla olivacea*) without specific identification, and compare the intensity of *Octolasmis* spp. between sex, size and gill sides of this crab from the west coast of southern Thailand.

Materials and methods

Ten male and ten female crab specimens were monthly obtained from crab farms in Kan-Tung District, Trang Province (07° 25' N, 99° 31' E), Southern Thailand (Andaman Coast) (**Figure**

1). The period of collection was 12 months from March, 2010 to February, 2011. According to Morphometric data of crab specimens were recorded such as carapace length (cl), carapace width (cw) and body weight. Each gill of fresh crab specimens were examined for pedunculate barnacle (*Octolasmis* spp.). The parasites found were dislodged, studied and directly counted. Prevalence and intensity of parasites were determined as detailed in Margolis *et al.* [12] (see below).

$$\text{Prevalence} = \frac{\text{number of infested hosts}}{\text{number of hosts examined}}$$

$$\text{Intensity} = \frac{\text{number of parasites}}{\text{number of hosts examined}}$$



Figures 1 *Scylla olivacea*: a, dorsal view; b, male (ventral view); c, female (ventral view); scale bar: 5 cm.

Since there were five *Octolasmis* species previously recorded from portunid crabs in the northern Gulf of Thailand (see above), this study hence, was limited only in terms of population and interaction between parasites and their host including the distribution pattern.

The seasonal distribution pattern of gill parasitic populations was given. T-Test Independent was used as a statistic tool for determination of their prevalence and intensity including the sex and gill side selection. Correlation between crab sizes and intensity of

parasite was also taken. The meteorological data (rainfall, temperature) from the meteorological Bureau were also used in the discussion.

Results and discussion

There was only one parasite group, pedunculate barnacle of the genus *Octolasmis* (**Figures 2** and **3**) present on the crabs' gills throughout 12 months of collection. Almost all crab samples (97.14 %) were infested with this parasite group (**Table 1**).



Figure 2 Gills infested with pedunculate barnacles (arrows).



Figure 3 Pedunculate barnacles dislodged from gills.

Table 1 Average prevalence and intensity of pedunculate barnacle on orange mud crab (year-round).

| Sex | Prevalence (%) | Intensity |
|--------|-----------------|------------------|
| Male | 98 ^a | 47 ^a |
| Female | 96 ^a | 125 ^b |
| Mean | 97 | 86 |

Different superscripts in the same row are significantly different at 5 % level.

Although almost all crab hosts were infested with *Octolasmis* spp. (same prevalence), there was significant differences in terms of intensity (parasite numbers by hosts examined). **Table 1** indicated that the intensity of parasites in female crabs was almost three times as many as in the male ones. Similar results have been reported in swimming crabs, *Portunus pelagicus* from Eastern Australia [13] and horseshoe crabs, *Tachypleus gigas* from the sea adjacent to Singapore [14]. This suggests that *Octolasmis* spp. preferred to live with female hosts. Some interesting comments for this phenomena were 1) female crabs might have

slower growth rate including longer molt interval, 2) more attractive to barnacle settlement, 3) spend more time in higher salinities and 4) typical migration after mating [13,15]. This could allow more time to acquire the parasitic organisms. Gross *et al.* [16] explained that hormonal profile of testosterone in male hosts could inhibit the parasitic infestation as modeled by Atlantic salmon (*Salmo salar*) in Europe. Statistically, there was no significant difference in population intensity present on both gill sides ($p > 0.05$). Average intensity on left gills was 42.4, while that of right gills was 43.5, respectively (**Table 2**).

Table 2 Average intensity of pedunculate barnacles within 12 months.

| Month / Year | Intensity | |
|--------------|-------------------|-------------------|
| | Left gills | Right gills |
| Mar. 2010 | 90.8 | 93.4 |
| Apr. 2010 | 57.6 | 53.3 |
| May. 2010 | 54.8 | 62.7 |
| Jun. 2010 | 34.6 | 35.9 |
| Jul. 2010 | 26.8 | 28.2 |
| Aug. 2010 | 62.4 | 62.8 |
| Sep. 2010 | 64.8 | 67.5 |
| Oct. 2010 | 20.8 | 25.5 |
| Nov. 2010 | 35.9 | 34.1 |
| Dec. 2010 | 34.5 | 30.3 |
| Jan. 2011 | 21.4 | 22.9 |
| Feb. 2011 | 4.9 | 5.6 |
| Average | 42.4 ^a | 43.5 ^a |

In terms of crab size, there was also no correlation between crab sizes and their *Octolasmis* population indicated by a low correlation coefficient, $R = 0.38$ (**Figure 4**). Generally crab farms in Southern Thailand obtain immature crabs or non-marketable sizes from local fishermen and continued rearing until the crabs were the required sizes. Therefore, the crab sizes

of each collection were slightly similar. Key *et al.* [15] have also reported that no significant correlation between crab size and their ectosymbiont barnacles. However, there were some papers that suggest that larger crab sizes accommodate more barnacle populations [11,17,18].

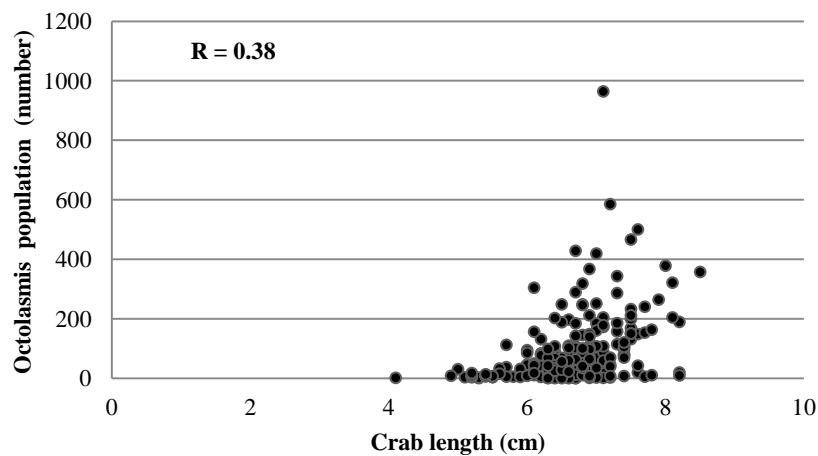


Figure 4 Correlation between crab sizes (length) and *Octolasmis* population.

According to the Thai Meteorological Department (2010 - 2011), the rainy season of Southern Thailand started around June to November 2011 indicated by rainfall data (466.5 - 294.5 mm) with the dry season starting from December 2010 to February 2011 (185.5 - 20 mm) (TMD: <http://www.tmd.go.th/climate/climate.php?FileID=4>). This seemed to influence the

Octolasmis parasite population. Low rainfall or dryness could contribute to parasites in increasing their number shown by their intensity, while they decrease in the rainy period (**Figure 5**). Within the rainy period, however, the parasite might increase due to decreasing rainfall. Nevertheless the overall scenario of distribution pattern of parasites show fluctuation caused by climatic variation.

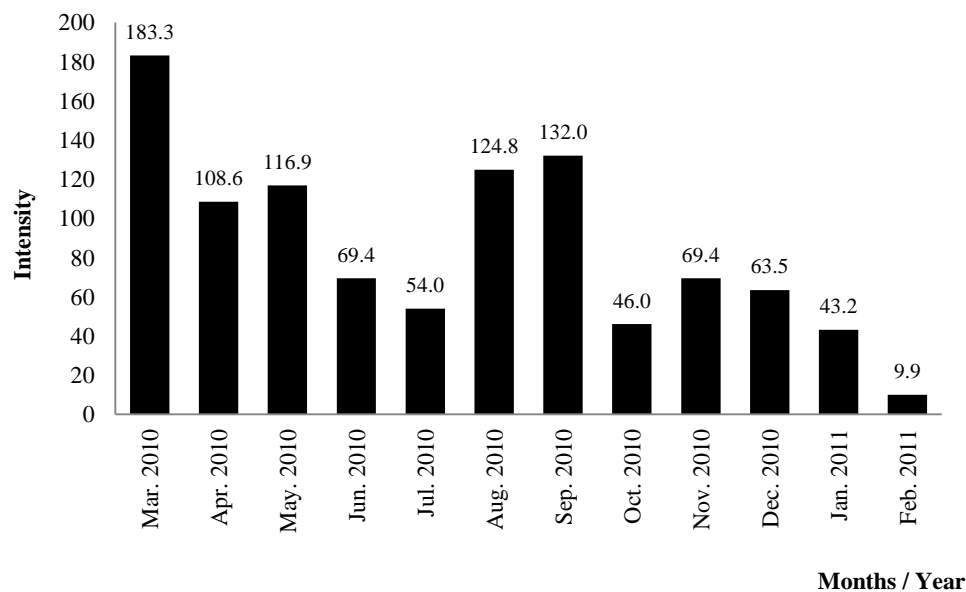


Figure 5 Seasonal distribution pattern of *Octolasmis* spp. on orange mud crabs.

According to the above, parasite populations decrease in the rainy season, particularly during heavy rains and start to increase as the dry season arrives. This could be supported by comments given by Key [15] that the crabs in higher salinities could be more attractive for barnacle settlement. Rainfall might indirectly result in lower salinity which could affect the feeding behavior, reproduction, metabolism and other activities including the molting process of *Octolasmis* spp. This could be true in life cycle development of all crustaceans [19].

Conclusions

The study indicated that pedunculate barnacle, *Octolasmis* spp. were common parasites of orange mud crab. Female crabs showed higher loading capacity for parasites than male ones. Contrarily crab sizes and gill sides did not significantly interact with the parasites ($p > 0.05$). The seasonal changes directly influenced the parasitic population, low numbers were present during rainy periods. It could be concluded that pedunculate barnacles did not prefer to live in low salinity environment caused by the heavy rain.

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