Short Communication

Intensity and prevalence of ectoparasites infesting Indonesian mangrove crabs (*Scylla serrata*): A study in Banda Aceh, Indonesia

Nurian Nisa[1], Said A. Akbar[1*], Adli W. Perdana[1], Layan KM. Aleid[2] and Edza A. Wikurendra[3,4]

[1]Aquaculture Study Program, Faculty of Maritime Affairs and Fisheries, Universitas Syiah Kuala, Banda Aceh, Indonesia; [2]General Biology, College of Science, Taibah University, Medina, Saudi Arabia; [3]Department of Health Sciences, Faculty of Humanities and Health Sciences, Curtin University, Miri, Malaysia; [4]Doctoral School of Management and Organizational Sciences, Hungarian University of Agriculture and Life Science, Kaposvar, Hungary

*Corresponding author: saidaliakbar@usk.ac.id

Abstract

Mangrove crab (*Scylla serrata*) is a fishery commodity that has high economic value. The supply of mangrove crabs in Indonesia is still dominated by wild catches. One of the places to catch mangrove crabs is in the Mangrove Area of Deah Raya Village, Syiah Kuala District, Banda Aceh, Indonesia. Mud crabs are very susceptible to infestation by pathogens in their environment. Pathogens that are often found infesting mud crabs are parasites. Ectoparasite attacks are very dangerous for mud crabs because they can damage the body organs of mud crabs. Therefore, this research was conducted to determine the level of intensity and prevalence of ectoparasites in mud crabs (*S. serrata*) caught by fishermen in Deah Raya Village. This research uses a survey method with a purposive sampling method. Ectoparasite examination is carried out using the smear method. This research was conducted at the Hatchery Laboratory of the Faculty of Maritime Affairs and Fisheries in May 2024. Thirty crabs (*S. serrata*) were randomly sampled from the mangrove area in Deah Raya Village, Syiah Kuala District, and observed for the presence of ectoparasites. The observations revealed that the crabs were infested by ectoparasites from the protozoa phylum (such as *Zoothamnium* sp., *Epistylis* sp., and *Vorticella* sp.) and from the arthropod phylum (*Octolasmis* sp.). Infestation by *Zoothamnium* sp. was found as the most prevalent (n=15, 50%), followed by *Epistylis* sp. (n=6, 20%), *Vorticella* sp (n=3, 10%), and *Octolasmis* sp (n=3, 10%). The infestation intensity for *Zoothamnium* was 7.5 individuals per crab, *Epistylis* sp. 5.0 individuals per crab, *Vorticella* sp. 2 individuals per crab, and *Octolasmis* sp. 1 individual per crab. Considering the high prevalence and intensity of *Zoothamnium* sp. in the mangrove crabs, the mitigating efforts can be focused on this ectoparasite.

Keywords: Ectoparasites, intensity, mangrove, mud crab, prevalence

Introduction

Mangrove crabs (*Scylla serrata*) are a fishery product that has quite high economic value. Indonesia has great potential for mangrove crabs because of its vast mangrove forests. The ever-increasing demand from domestic and international markets makes mud crabs a very valuable commodity [1,2]. Based on BPS data (2018), most of the supply of mangrove crabs in Indonesia still comes from natural catches with a percentage of 65.3%, while cultivated products only contribute 34.7% [3].

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Aceh Province has the potential for mangrove crabs because Aceh still has quite good mangrove forests. One of them is in Deah Raya Village, Syiah Kuala District, Banda Aceh, Indonesia, where there is a mangrove ecosystem area. Mangrove crabs are generally obtained through fishing activities in nature, especially in mangrove ecosystems, which are the main habitat for mangrove crabs [4].

The problem found in mangrove crab fishing and cultivation is the high death rate caused by parasite attacks, namely ectoparasites. Ectoparasite attacks can cause damage to body organs in the host organism, including damage to the body surface and damage to the gills of the host [5]. In the mangrove ecosystem area in Deah Raya Village, there are many activities of local residents, such as fishing boats/boats around the mangrove ecosystem waters, housing, household waste and dumping from small shops, which can pollute the mangrove ecosystem environment [3,6]. The impact can disrupt growth and reduce the body's defense system of mud crabs. The aim of this study was to determine the types of ectoparasites that attack mangrove crabs (*S. serrata*) and to determine the prevalence and intensity of ectoparasites infesting mangrove crabs in the catch from the mangrove area of Deah Raya Village, Syiah Kuala District.

Methods

Sampling time and location

This research was carried out in May 2024. Sampling was carried out in Deah Raya Village, Syiah Kuala District, Banda Aceh, Indonesia (**Figure 1**) and sample analysis was carried out at the Hatchery and Breeding Laboratory, Faculty of Maritime Affairs and Fisheries, Universitas Syiah Kuala.

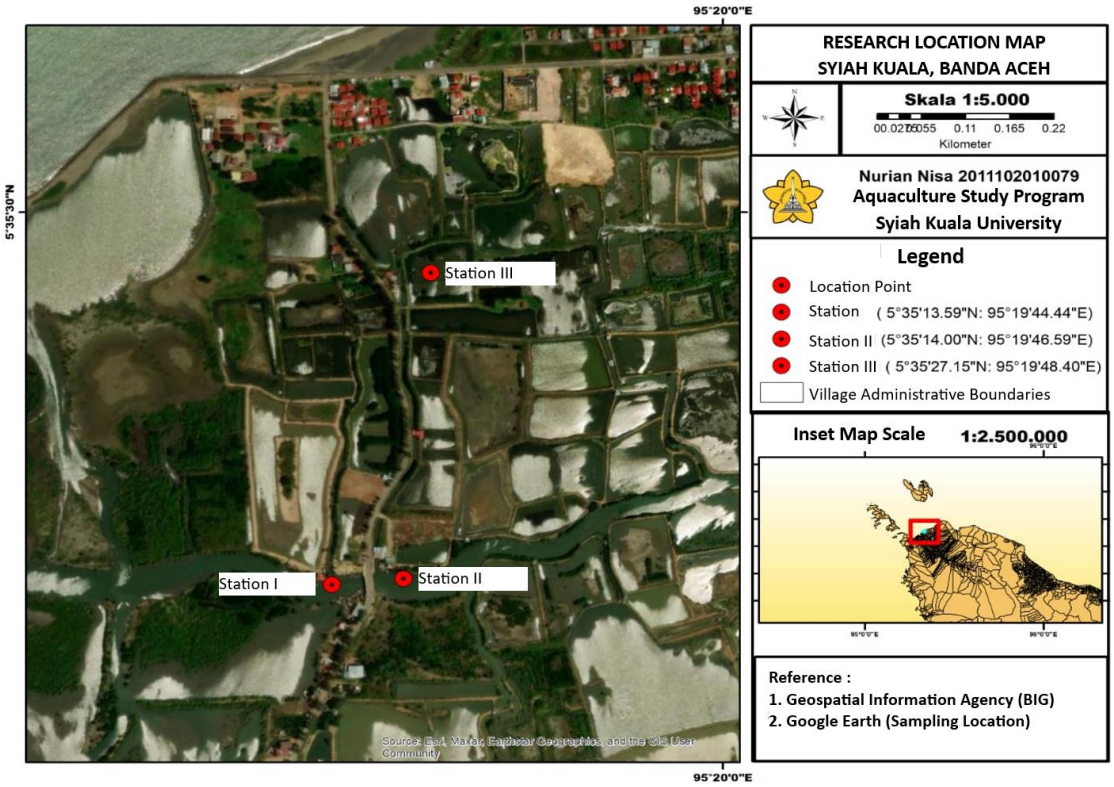

Figure 1. Map of sampling locations in Deah Raya Village, Syiah Kuala District, Banda Aceh, Indonesia.

Data collection

The number of samples taken was 10 individuals/location with a weight of around 100–200 grams, so the total number of samples taken was 30 mangrove crabs. Ectoparasite examinations are carried out at the Fish Quarantine Station Laboratory for Quality and Safety Control of Aceh Class 1 Fishery Products to determine the types of ectoparasites. The examination includes the

external parts, namely the carapace, walking legs, swimming legs and reference gills, because many annoying parasites are found in these organs. Then proceed with the ectoparasite examination procedure by scraping the carapace of the mud crab and placing it on an object glass, then dripping it with physiological NaCl so that it doesn't dry out, then observing using a microscope with 100×, 400× magnification and identifying it using the book by Kabata (1985).

Prevalence and intensity calculations

Parasite prevalence

Prevalence is an important thing to know because it can tell about the level of disease spread in the population at one point in time [7]. Data obtained from the samples examined, the prevalence was calculated using a formula: prevalence = (number of infested crabs : number of sampled crabs) × 100% [8].

Parasite intensity

The intensity was determined by dividing the number of parasites from a certain genus with the number of infected crabs. According to the Big Indonesian Dictionary, intensity is a state of level or measure of intensity. Intensity and prevalence levels refer to the formula: intensity = (number of parasites : number of infested crabs) [8].

Data synthesis and analysis

The parasite samples found were then recorded based on the type and number of parasites found. According to [9], the descriptive analysis method is statistics used to analyze data by describing or illustrating the data that has been collected and presented in tables and then analyzed descriptively by connecting findings and theory.

Results

The identification results of ectoparasites in different body parts of mud crabs are presented in **Table 1**, while their respective prevalence and intensity are presented in **Table 2**. Various ectoparasites were identified (**Figure 2**), infesting different body parts of mud crabs across three stations. *Zoothamnium* sp. was the most prevalent species, particularly found on the carapace in Station 1, with a total count of 40 parasites, and on the walking legs at Station 2 (13 parasites). *Vorticella* sp. was recorded on the swimming legs at Station 1 (3 parasites) and on the carapace at Station 3 (2 parasites). *Octolasmis* sp. was identified only at Station 1 with 1 parasite in the gill. *Epistylis* sp. was noted on the walking legs and carapace in Station 2, totaling 10 parasites.

Table 1. Types of ectoparasites infesting the mud crabs and their distribution

Ectoparasite	Walking legs	Swimming legs	Carapace	Gill	Total
Station 1					
Zoothamnium sp.	7	None	29	None	40
Vorticella sp.	None	3	None	None	
Octolasmis sp.	None	None	None	1	
Station 2					
Zoothamnium sp.	3	None	None	None	13
Epistylis sp.	2	None	8	None	
Station 3					
Vorticella sp.	None	None	2	None	2

Table 2. The prevalence and intensity values of ectoparasites in mangrove crabs

Ectoparasite	Infested crabs, n	Parasite, n	Prevalence (%)	Intensity
Station 1 (n=10)				
Zoothamnium sp.	5	36	50	7.2
Vorticella sp.	2	3	20	1.5
Octolasmis sp.	1	1	10	1
Station 2 (n=10)				
Zoothamnium sp.	2	3	20	1.5
Epistylis sp.	2	10	20	5
Station 3 (n=10)				
Vorticella sp.	1	12	10	2

Prevalence and intensity values were also observed to be varied across the sampling stations. In Station 1, *Zoothamnium* sp. had the highest prevalence (50%) and an intensity of 7.2 individuals per crab, while *Vorticella* sp. and *Octolasmis* sp. showed lower prevalence rates of 20% and 10%, respectively. In Station 2, both *Zoothamnium* sp. and *Epistylis* sp. had a 20% prevalence, with *Epistylis* sp. showing the highest intensity (5 individuals per crab). In Station 3, *Vorticella* sp. had a 10% prevalence and an intensity of 2 individuals per crab.

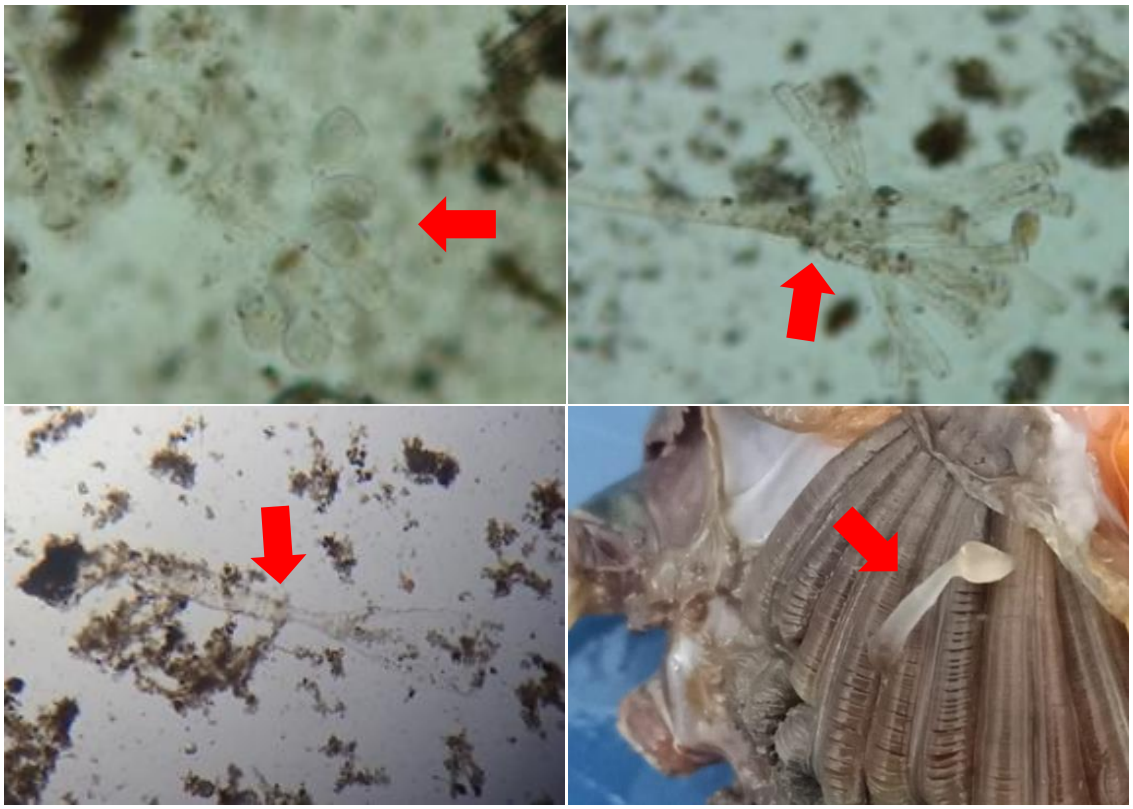

Figure 2. Photographed images of ectoparasite infecting the mangrove crabs, namely *Zoothamnium* sp. (A), *Epistylis* sp. (B), *Vorticella* sp. (C), and *Octolasmis* sp. (D) as highlighted by the red arrow. Ectoparasites from phylum Protozoa, such as *Zoothamnium* sp., *Epistylis* sp., and *Vorticella* sp., were observed under the microscope at 400× magnification. An ectoparasite from phylum Arthropoda (*Octolasmis* sp.) was observed without the microscope.

Discussion

In the present study, the highest intensity of parasite infestation on the mud crabs is the *Zoothamnium* sp., in which the intensity can be categorized as "moderate". The prevalence of *Zoothamnium* sp. was found to be 20–50%, with the highest prevalence observed in Station 1. The *Vorticella sp*. infestation was “low” in intensity, where the prevalence reached 10% and 20% in Stations 3 and 1, respectively. *Epistylis* sp. and *Octolasmis* sp. infestations were found to occur in “low” intensity with a prevalence of 20% (Station 2) and 10% (Station 1), respectively.

In comparison to a previous study, the intensity of *Zoothamnium* sp. infestations was found to be lower (18 parasites per mud crab) [10]. The prevalence of *Zoothamnium* sp. infestations in banana shrimp (*Fenneropenaeus merguiensis*) was reported to be 36% [11]. Infestation by *Zoothamnium* sp. is commonly found to be high in prevalence and intensity due to the fact that these ectoparasites live in colonies [12] . This is in accordance with the statement put forward by [13]. Moreover, the growth of *Zoothamnium* sp. is not affected by the water quality, allowing the parasite to be present abundantly. The level of concern for the infestation by this organism should be determined by the resulted mortality, in addition to the prevalence and intensity.

As for *Epistylis* sp. and *Octolasmis* sp., the prevalence of its infestation in mud crabs in this present study was lower as compared to that observed in a previous study [14]. It is worth noting that the excessive presence of *Octolasmis* sp. may impact the level of dissolved oxygen. This is in

line with the fact that *Octolasmis* sp. often infests and causes damage to the gills of the mud crabs [15]. Previously, a study reported that gill damage caused by *Octolasmis* sp. infestation consequently inhibits the respiration process [16]. Moreover, the parasite likely competes with its host for nutrients, which can eventually lead to mortality [16]. Similarly, *Epistylis* sp. infestation can be harmful to mud crabs because the ciliate colonies can cause physical damage to the exoskeleton, increase susceptibility to secondary infections, and induce stress [17]. In the case of *Vorticella* sp. infestation, the symptoms include the appearance of thin, moss-like fibers that are grayish-brown on the carapace [18]. These similar symptoms are also found in crabs infested by *Epistylis* sp. [19,20]. Mud crabs infected with ectoparasites of the genus Vorticella suffer from impaired movement and difficulty molting [1,21].

The study has several limitations that should be considered. The sample size was relatively small, with only 30 crabs examined, which may not fully represent the broader population of mangrove crabs in the region. Additionally, the study was conducted in a single location within Deah Raya Village, Syiah Kuala District, potentially limiting the generalizability of the findings to other areas with different environmental conditions. Furthermore, the research was carried out during a single month without considering possible seasonal variations in ectoparasite prevalence and intensity. The study also focused exclusively on ectoparasites, which might have overlooked other pathogens or environmental factors affecting mud crab health. Future studies should be able to address these limitations to improve the robustness and applicability of the findings.

Conclusion

The study identified that *Zoothamnium* sp., *Epistylis* sp., *Vorticella* sp., and *Octolasmis* sp. are prevalent ectoparasites infesting mangrove crabs (*S. serrata*) in the Deah Raya Village, Syiah Kuala District. Among these, *Zoothamnium* sp. exhibited the highest prevalence and intensity. The findings highlight the need for targeted mitigation efforts, particularly against *Zoothamnium* sp., to reduce the impact of ectoparasite infestations on mangrove crab populations. However, further research with larger sample sizes, multiple locations, and consideration of seasonal variations is necessary to generalize the results and fully understand the impact of ectoparasites on mud crab health.

Ethics approval

Ethical clearance is waived for this study because it involved non-invasive sampling of wild mangrove crabs (*Scylla serrata*), and the procedures adhered to standard observational methods that do not cause harm or distress to the animals.

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Competing interests

The authors have no known conflict of interest in relation to the publication of this work.

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Underlying data

All data supporting the findings of this study are fully presented within the article.

How to cite

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