Study of the spread of white feces disease (WFD) on *Litopenaeus vannamei* in semi-intensive ponds in Aceh Besar District Aceh Province, Indonesia

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Abstract. This study aimed to determine the prevalence of white feces disease (WFD) infections in vannamei shrimp (*Litopenaeus vannamei*) in semi-intensive ponds in Aceh Besar District, Aceh Province. The study was conducted in August 2019 in the subdistrict of Masjid Raya and Lhoong. A total of 10 sampled shrimps were randomly selected from each location. Observation of clinical symptoms of WFD infected shrimps was subjected to the intestines, hepatopancreas and feces. The results showed that the prevalence of WFD infected vannamei shrimp within subdistrict of Masjid Raya and Lhoong was 20–40%.

1. Introduction
The cultivation of *Litopenaeus vannamei* shrimp provides a very significant contribution to the increase in cultivated shrimp production. This shrimp has the advantage of fast growth over other shrimp. The characteristics of good vannamei shrimp seeds are relatively uniform color and size, brownish green color (not red), open tail (uropod) > 95% uniformity of size and color, actively swimming against the current, not sticking to the bottom or tub wall, complete and free limbs from pathogens, the stomach of the fry full of food is indicated by a brown or black intestine and is not broken [1].

Shrimp in aquaculture activities are often infected by pathogens, causing the shrimp to become sick. One of the causes of infection by pathogens is due to the shrimp's weak immune system so that it is easy to get infected. The causes of a weakened shrimp immune system include drastic changes in water quality in the culture medium. Junda [2] said changes in the water quality of the culture media will stress the shrimp so that the shrimp are susceptible to opportunistic bacteria and contract disease. The disease that often attacks shrimp in ponds is white feces disease (WFD). This disease is not a new disease that has entered Indonesia, WFD has attacked in Thailand in 2010, was also detected in Malaysia, WFD disease had faded, and began to be detected again in 2014 which occurred in Indonesia, Thailand and Malaysia [3]. Shrimp infected with WFD with high intensity can harm vannamei shrimp cultivators, among others, can inhibit growth, high food conversion ratio (FCR) values reach 3 and can affect shrimp survival by up to 65% [4]. According Saraswati dan Wijaya [5]
White Feces Diseases (WFD) cause mortality up to 30% and decrease shrimp growth and production. WFD is caused by the accumulation of several Vibrio bacteria in shrimp water and intestines. Symptoms caused by shrimp when attacked by WFD are decreased appetite for shrimp, abnormal growth of shrimp, white feces. Other clinical signs are the release of the outer shell of the shrimp (*exoskeleton*) and epibiotic infestation from the protozoa which then cause dark gills followed by decreased appetite for shrimp, slow growth, and even death floating on the surface of the water. The shrimp intestines are white and look empty due to lack of food. Shrimp that are attacked are very difficult to save so that all the shrimp that are there have to be harvested or thrown away. Transmission can be direct through water or direct contact. They spread very quickly in organisms maintained at high densities. This disease in shrimp can interfere with the life process of shrimp so that their growth becomes abnormal [6]. Menurut Anjaini [7] WFD which is the presence of white feces floating on the surface of the water. Physical disruption of white feces disease attacked by exocytes becoming soft.

Aceh Besar is a district in Aceh Province that is surrounded by beaches [8]. Therefore, shrimp pond business is very promising from the perspective of water quantity because it is surrounded by the sea. However, recently vannamei shrimp farmers in the Aceh Besar region have complained (based on the author's interviews with farmers before the study) because of WFD disease that appears in the ponds. This WFD disease will certainly have implications for a decrease in the production of farmers. Research on the spread of WFD on vannamei shrimp in Aceh Besar district has never been studied, therefore, starting from the complaints of farmers and the absence of research related to the spread of WFD on vannamei shrimp in Aceh Besar district, the author tries to assess its spread in ponds. semi-intensive vannamei shrimp in Aceh Besar district. This study aimed to determine the prevalence of *White Feces Disease* (WFD) infection or white defecation in vannamei shrimp (*Litopenaeus vannamei*) cultivated in semi-intensive ponds in Aceh Besar District, Aceh Province, Indonesia

2. Material and Methods

2.1. Tool and Materials
The tools used in this research are DO meters, Refraktometer, thermometers, pH meters, pen, book, camera, plastic and shrimp.

2.2. Method
Each research was conducted in Masjid Raya and Lhoong Sub-District, Aceh Besar District, Aceh Province in August 2019. Vannamei shrimp samples were taken from semi-intensive ponds in Masjid Raya and Lhoong Districts. The sampling method was random (random sampling) of 10 individuals at each location directly using lift nets. The sampling method used in the implementation of this study used a purposive sampling method where the sampling location was determined deliberately, namely in 2 districts (Masjid Raya and Lhoong Sub-districts) located in Aceh Besar District. The two sub-districts that were used as sampling locations were the center of vannamei shrimp cultivation in the Regency. Shrimp samples taken from the sampling location were then observed in the laboratory if there were indications of WFD. The parameters observed were the organs including the intestines and hepatopancreas and shrimp feces in the ponds.

Apart from direct sampling of shrimp, additional information on the condition data of shrimp in aquaculture ponds was also obtained from interviews with cultivators using questionaires. Interview data were collected during visits to shrimp ponds. The information obtained was in the form of characteristics oh shrimp in the ponds, the length of the shrimp maintenance period, the age of the shrimp that had been attacked by WFD in general and a history of WFD in the pond.

2.3. Prevalence of pathogens attacked by shrimp
Prevalence (%) was calculated according to Kabata [9]:
The prevalence of White Feces Disease (WFD) in shrimp in the ponds of Masjid Raya and Lhoong Sub-districts is classified as a general category (20-40%) (Tabel 2). Furthermore, based on water quality parameters, it is known that it is still classified as tolerant for shrimp, namely temperature 27–32°C, pH 7.3–8.5 and DO 3.7–6.5 mgL⁻¹. Sutanto [10] revealed that the optimum temperature range for vannamei shrimp is 26–33°C. The pH range for vannamei shrimp to live well is 6–8.5 [11]. Wibowo [12] states that dissolved oxygen concentration of 3–8 mgL⁻¹ is sufficient to normally support aquatic aquatic communities.

Table 2. WFD-infected shrimp data in Masjid Raya and Lhoong Sub-district

| No | Pond | Total Samples | Masjid Raya Sub-district | Lhoong Sub-district |
|----|------|---------------|--------------------------|---------------------|
|    |      |               | Total shrimp infected with WFD | Prevalence (%) | Total shrimp infected with WFD | Prevalence (%) |
| 1  | Pond 1| 10            | 3                        | 30                  | 2                      | 20            |
| 2  | Pond 2| 10            | 3                        | 30                  | 3                      | 30            |
| 3  | Pond 3| 10            | 3                        | 30                  | 4                      | 40            |
| 4  | Pond 4| 10            | 4                        | 40                  | 3                      | 30            |
| 5  | Pond 5| 10            | 3                        | 30                  | 3                      | 30            |
| 6  | Pond 6| 10            | 4                        | 40                  | 3                      | 30            |
| 7  | Pond 7| 10            | 3                        | 30                  |                        |               |
Information obtained from interviews with shrimp cultivators showed that in the Sub-District of Masjid Raya the average pond area was 3000 m² and Sub-District of Lhoong the average pond area was 3000-4000 m². The stocking density of vannamei shrimp in the pond was 70 indm⁻². The amount of stocking density of shrimp in ponds greatly affects the success of cultivation activities. Based on the sampling results during the study (Tables 2), it is known that the prevalence range in the ponds in the Masjid Raya sub-district was around 30-40%, while the prevalence in the ponds in Lhoong sub-district was around 20-40%. The prevalence in this range is still classified as a common infection [9]. The investigation of the causes of shrimp infection with WFD in the ponds from interviews with farmers obtained information that the application of biosecurity in shrimp culture is still not optimal, so that cultured shrimp still have the potential to be infected with WFD. Effendi [13] states that biosecurity is an effort to prevent pathogens from entering the environment and prevent pathogens from leaving the ponds into the surrounding environment. The application of biosecurity is the basis for disease control in cultivation activities. Tasilhan [14] states that the steps related to the application of biosecurity are through the installation of barriers to prevent pathogens from entering the pond environment through intermediate animals. In shrimp ponds, the way this is done is by installing a fence around to prevent the entry of crabs that carry pathogens into the shrimp ponds. The next step is to sterilize the water for the maintenance media using a disinfectant such as chlorine.

The forms of disease prevention that have been carried out by cultivators in the Masjid Raya and Lhoong sub-districts include the use of specific pathogen free (SPF) and specific pathogen resistant (SPR) fries obtained from credible companies and have been certified by the Ministry of Marine Affairs and Fisheries and also the Cultivators have used disinfectants such as chlorine to sterilize both tools and workers before entering from one pond to another. Because prevention efforts have been made, the prevalence value of disease-infected shrimp in the sampling pond is low.

![Figure 1. Characteristics of WFD-infected vannamei shrimp hepatopancreas (a) and normal vannamei shrimp hepatopancreas (b).](image1)

![Figure 2. The intestines of WFD-infected vannamei shrimp (a) and the normal vannamei shrimp intestines (b).](image2)
Based on observations of shrimp samples taken at the study location, the shrimp that were attacked by WFD showed that their hepatopancreas were paler than healthy/normal shrimp (Figure 1). Furthermore, in the intestine of the shrimp that was attacked by WFD, the intestines were broken and white in color, while the intestines of healthy/normal shrimp were completely filled with the intestines and were brown in color (Figure 2). Information obtained from shrimp farmers in Masjid Raya and Lhoong Sub-districts from the results of interviews revealed that vannamei shrimp were contacted WFD at the age of 40-60 days.

The incidence of WFD according to Chanratchakool et al. [15] mostly occurred in pond conditions where the level of basic lubrication was very high due to the decay of organic material at the bottom of the pond. Organic material comes from dead organisms, from algae, shrimp droppings and left over shrimp feed that is not eaten. Hanggono and Junaidi [16] stated that some ponds that were previously affected by WFD could recover by replacing water as much as possible, with the aim of diluting the content of Vibrio sp. and basic mud removal. Routine probiotics are also highly recommended. Probiotic bacteria will become habitat competitors for Vibrio sp. so that it can reduce the population of these pathogenic bacteria. White Feces Disease (WFD) is a disease that attacks vannamei shrimp caused by Vibrio sp. bacteria [17].

Kharisma and Manan [18] also stated that maintaining the growth of phytoplankton in the culture medium so that it does not bloom is also the right step. An easy way is to maintain water transparency in the range of 35–40 cm using a measuring instrument (Secchi disc). Lower brightness indicates high density plankton growth. The high density of phytoplankton will be dangerous for the pond environment, because if the nutrients are depleted, there will be mass death which has the potential to cause water damage, reduce oxygen levels and increase the production of toxic compounds such as ammonia and hydrogen sulfide.

4. Conclusion
The prevalence value of shrimp infected with White Feces Disease (WFD) in Masjid Raya Sub-district ranges from 30-40%, while in Lhoong Sub-district it is around 20-40%. In general, the two sampling locations concluded that the prevalence catagory of WFD-infected shrimp was classified as a catagory common infection.

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