The prevalence and intensity of ectoparasites infecting vanname shrimp (*Litopenaeus vannamei*) reared in different ponds

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Abstract. Vanname shrimp can be cultivated in the base of different ponds, i.e. soil pond, concrete and plastic. These three different ponds have different impacts on the cultivation process. The purpose of this study was to identify the genus of ectoparasites and to calculate the prevalence and intensity of the ectoparasites that infect vaname shrimp in a soil pond, concrete and plastic pond respectively. The method used in this study was a survey method from three locations. The number of samples was 5% each. The prevalence of the ectoparasites that infect vaname shrimp was 95% in soil ponds (almost always), 73.33% in plastic ponds (usually) and 94.17% (almost always) in concrete ponds. The intensity of ectoparasites in soil ponds was 69.08 zooid / tail (weight), plastic ponds was 3.02 zooid / tail (light) and 60.96 was for zooid / tail in concrete ponds (heavy). Further research is needed to identify the infecting endoparasites in vanname shrimp cultivated at the base of different ponds.

1. Introduction

The vaname shrimp (*Litopenaeus vannamei*) is one of the potential commodities that can be cultivated in ponds. This shrimp also has several other advantages compared to others. Vaname shrimp have a high survival rate, fast growth rate, and there is a huge demand in the market every year. Hendrajat et al. [1] stated that between 2010 - 2014, vaname shrimp increased production to 380 tons per year.

Vaname shrimp can be cultivated in various ponds, i.e. soil, concrete and plastic ponds. These three different ponds have an impact on the process of cultivation. In soil ponds, they have high porosity properties which has an impact on pH reduction [2]. Besides that, they still rely on high tide water filling [3], so then the cultivation process depends on natural conditions. Plastic and concrete ponds have a solid construction. This type of pond can minimize microulgae, moss and other aquatic plants that have an impact on increasing organic matter and this causes high ammonia levels due to decay [4]. The base and walls of concrete and plastic ponds are a potential place for attached ectoparasites, especially in the protozoa groups. In the case of *Zoothamnium*, heavy infestations can cause the death and the inhibition of the growth of the shrimp [5].

According to [6], they reported that vaname shrimp were infected by ectoparasites such as *Vorticella, Zoothamnium* and *Epistylis* with a prevalence of 90% (severe) and with an intensity of 34 zooid/tail. Another study reported that vaname shrimp off the West Coast of Aceh were infected by *Zoothamnium* with the highest prevalence and intensity (36% and 20 zooid/tail) [7]. Based on the
description above, it is necessary to study the prevalence and intensity of the ectoparasites that infect vaname shrimp that are cultivated in different pond bases.

2. Material and methods
The study was conducted between January and March 2018. The sampling of vaname shrimp (11.74 ± 4.13 gram and 11.95 ± 2.94 cm) was carried out in 3 locations; soil, concrete and plastic ponds. The number of ponds taken refers to [8], which is 5% of all shrimp ponds produced. The number of samples taken was 30, with stocking densities of more than 1000 head / pond. The examination of the sample began by weighing the sample and then measuring its length. The researcher then scraped the tail, body surface, gills, walking and swimming legs. The scraping results were observed under a microscope with 100X and 400X magnification. The ectoparasites were then identified based on [9], [10], and [11], before being calculated for prevalence and intensity based on [12] and categorized according to [13].

3. Results and discussion
The ectoparasite identification results showed that three genera of ectoparasites (Zoothamnium, Epistylis and Vorticella) were infesting the vaname shrimp in the soil, plastic and concrete ponds (Figure 1).

![Figure 1. Ectoparasite observation result (A). Colony of Zoothamnium (B). Zoid of Vorticella (C). Zooid of Epistylis](image)

_Zoothamnium_ colonies have one stalk consisting of 2 - 31 zooids which can contract lengthwise and shorten. The _Zoothamnium_ colony is shaped like an inverted bell and transparent. The cilia are located anteriorly to the spasmonema, micronucleus and macronucleus in the zooid. [10] and [11] stated that the _Zoothamnium_ genus lives solitary or colonies, shaped like an elongated bell, has a micronucleus and macronucleus, contractile vacuoles, habitats in freshwater and marine. [14] reported that the vaname shrimp, as shown in Gresik, were also infected by _Zoothamnium_ ectoparasites.

_Vorticella_ looks clear and solitary with one stalk, and there is one zooid. The stalk can contract lengthwise and shorten. The zooid was shaped like an inverted bell. The cilia are located anteriorly, and in the spasmonema, micronucleus and macronucleus of the zooid. The zooid length was 67.24 μm, had a width of 58.60 μm and a stalk length of 16.02 - 94.08 μm and were living in ocean waters. According to [11], [10] and [9], _Vorticella_ has a contractile stalk that can contract lengthwise and shorten. _Vorticella_ is yellowish or greenish, has a micronucleus, macronucleus in the zooid and lives in brackish water and marine. The same result was as in [15], which found that _Vorticella_ ectoparasites infected the pleopod and gills of white shrimp (_Penaeus indicus_).

_Epistylis_ looks clear and is zooid-shaped like an upside down bell. It is a solitary zooid with one stalk or one zooid. The stalk is not contractile (can’t lengthwise and shorten). [9] and [10] stated that _Epistylis_ has a non-contractile stalk, and has zooids up to 600 μm, a relatively short macronucleus, egg-shaped, cone or inverted bell zooids, solitary or colonies, a macronucleus, contractile vacuoles and
lives in both freshwater and marine. According to [16], it has been found that *Epistylis* infected shrimp in Wuhan, China.

### Table 1. Prevalence and intensity of ectoparasites in soil, plastic and concrete ponds.

| Type of Pond | Number of sample (tail) | Infested shrimp (tail) | Number of ectoparasites (zooid) | Prevalence (%) | Intensity (zooid/tail) |
|--------------|-------------------------|------------------------|----------------------------------|----------------|-----------------------|
| Soil         | 60                      | 57                     | 3938                             | 95             | 69.08 (heavy)         |
| Plastic      | 60                      | 44                     | 133                              | 73.33 (usually)| 3.02 (light)          |
| Concrete     | 120                     | 112                    | 6828                             | 94.17 (almost always) | 60.96 (heavy) |

The highest prevalence and intensity of the three types of ponds is in concrete, soils and ponds. This may be due to the soil porosity, which has an impact on the inability of the soil to retain water in culture ponds and the sedimentation of organic matter that can be used by aquatic plants to grow and become home to ectoparasites. [17] stated that *Epistylis, Zoothamnium and Vorticella* are ectoparasites that can attach to the substrate such as alga, soil, wall and base of the ponds [18], [10]. *Zoothamnium* can attach to the walls and base of the pond at the sessile stage (trophont) [18]. According to [19], *Zoothamnium* trophonts can develop to the telotroth stage, which is free swimming when it comes to looking for hosts or substrates. The telotroth stage will grow and develop into zooids and colonies.

The lowest prevalence and intensity was found in plastic ponds. The use of plastic was thought to cause failure to attach the ectoparasites in the pond. [20] stated that the use of plastic in shrimp ponds can prevent water contamination by parasites or viruses.

### 4. Conclusion

The highest prevalence and intensity of ectoparasites that infested vaname shrimp was in soil ponds, with the lowest prevalence and intensity being in plastic pond.

### 5. References

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