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Difference in Diet and Water Quality Influencing the Growth of the Newly Introduced *Penaeus merguiensis* Larva Culture

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Abstract

The water quality supporting the growth of aquatic animals on the surface is usually better than that those accumulated at the seabed and more bottomless sea. Since water usually brings many materials along the path all the way to reaching its end, their quality varies in places and seasons as area it passes also influences the possessed quality. By employing Penaeus merguiensis larvae produced by the Jepara's Marine Center for Brackishwater-Aquaculture Development owned by Jepara's government, this study analyzes varying effects in three nominal salinities (28, 32, and 36 ppt) and types of diets (Diet A: 100% live feed; Diet B: 100% FRIPPAK; Diet C: a combination of Diet A and Diet C, 50 % each) and finds the optimum water quality parameters such as dissolved oxygen, pH, and temperature on the growth of the newly introduced Penaeus merguiensis larvae. The results show that salinity of 28 and 32 ppt with Diet A works well in supporting the growth from Zoea to Postlarvae-1: Zoea-1 at 28 ppt with Diet A; Zoea-2 at 32 ppt with Diet A; Zoea-3 at 32 ppt with Diet A; Mysis-1 at 28 ppt with Diet A; Mysis-2 at 28 ppt with Diet C; Mysis-3 at 28 ppt with Diet A; Postlarva-1 at 28 ppt with Diet A. All shrimp prefers temperature ranging from 31-32.4°C with dissolved oxygen of 4.9-5.74 ppm and pH 7.0-8.1.

Keywords: *Dissolved oxygen, Penaeus merguiensis, pH, temperature, salinity*

Introduction

Besides being one of the important commodities in food supply-chain, shrimp is also a foreign exchange source for many countries in the Southeast Asia, including Indonesia. *Penaeus* is the species most widely cultivated in brackishwater ponds, consequently, ASEAN countries that take advantage of this business have agreed to prioritize shrimp farming (Ekmaharaj, 2018). Various methods have determined the arrangement and improvement of seedling management for hatcheries due to the demand of intensive cultivation practices with clear-understanding methods (Crisp *et al*., 2017).

Water quality is an important aspect in environment (Ristanto *et al*., 2021) and one of significant considerations for good growth in shrimp farming. Water in ponds includes temperature, salinity, dissolved oxygen, pH, nitrogen, phosphorus, and potassium, which improve algae's growth as a food source. Besides, hydrogen sulfide also influences the development of shrimp. Shrimp growth and survival are affected by temperature but a too high temperature can lead to death. A reasonable temperature should be considered for optimal development ranges from 26-30°C since a 34°C could damage the imunnity of shrimp, leading to susceptibility to various infections (Wang and Chen, 2006). As a solution, pond deepening, water exchange, and proper aeration will prevent the temperature from rising too high.

In most cases, young shrimp can tolerate a wider variety of salinity. Salinity resistance of adult and subadult shrimp in *Penaeus merguiensis* and *P. monodon* have been widely observed. Generally, *Penaeus merguiensis* require saltwater above 10 ppt to live. Soyel and Kumlu (2003) said that a rise in salinity resulted in an increase in the biomass for the nursery culture of penaeid larvae and noted that those larvae had higher survival and better growth at high salinities, reaching about 30-40 ppt. However, *P. merguiensis* could grow between 20 and 30 ppt and achieve optimal growth at 27 ppt (Zacharia and Kakati, 2004).

Water's dissolved oxygen in the pond can come from surface water diffusion, and it is a product of photosynthesis. The factors that influence

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the quantity of dissolved oxygen in the pond are air circulation and organic matter (Kembaren, 2013). Inadequate oxygen levels generally occur due to increased pond temperatures. Also, oxygen depletion in the shrimp environment contributes to the mass mortality of shrimp. During the day, photosynthesis produces more oxygen than is needed by aquatic animals to breathe, whereas at night, all plants and animals live; that is where the atmosphere adds oxygen to the water (Crisp *et al*., 2017). Maintaining appropriate dissolved oxygen levels in pond water is essential in favor of optimizing shrimp growth. Prolonged exposure to low oxygen increases shrimp's susceptibility to disease. Soyel and Kumlu (2003) noted that *Penaeus semisulcatus* postlarvae had higher total length and better development at moderate dissolved oxygen (0-15 ppt), displaying growth rates between 0.053 and 0.068 mm.day^{-1}. In some instances, inhalation of higher dissolved oxygen levels causes total oxygen depletion leading to anoxia in many shrimp larvae (Neilan and Rose, 2014).

Water temperature plays an essential role in physical, chemical, and biological processes in water bodies (Abraham *et al*., 2002). With increasing water temperature, the solubility of gases in water, such as oxygen (O_2), could decrease. As a result, water quality degradation will increase. A drastic increase in water temperature can result in the loss of life, and generally, this is due to sewage and mold contaminating water bodies (Chong-Robles *et al.,* 2013). Surface water temperature can be influenced by various factors such as geographic location, seasonality, diurnal cycle, air circulation, water depth, and flow rate (Sung *et al*., 2011).

Corsin *et al.* (2001) observed a relationship between the presence of disease, optimal development, dietary types, and water quality toward *P. monodon* larvae. They believed good water quality like proper dissolved oxygen levels could lead to lethal problems as shrimp that grow intensively will discharge a lot. Furthermore, several studies (Bulbul *et al.,* 2014; Bulbul *et al*., 2015; Oujifard *et al.,* 2012) found that a 25-58% formulated crude protein gave the best weight gain with an 80% survival rate toward shrimp larvae. They also found that increasing protein content increased ammonia production due to sedimentation of crude protein from food waste and feces, and this phenomenon creates toxic sedimentation at the bottom of the pond if the given diet contained a lot of formulated proteins.

Therefore, a good aeration system is needed as it can prevent the accumulation of toxic materials at the bottom of shrimp ponds. If proper aeration is not carried out to reduce the accumulated toxic material, the entire shrimp's condition will be exposed to a hazardous situation. Soto and Lotz (2001) stated that dissolved oxygen levels below 3 ppm cause shrimp to die from the infection. Infected shrimp are susceptible to spreading disease to other shrimp in the same ecosystem when they ingest infected carcasses; thus, the proper steps to tackle the disease's spread need to be taken immediately for healthy shrimp. The sedimented illness is the most dangerous transmission source of white spot disease in shrimp farming.

Since those parameters are essential for shrimp larvae, this study comes with a breakthrough sheme by analyzing the effect of variations in salinitiies and diets and finding the optimum water quality parameters such as dissolved oxygen, pH, and temperature.

Materials and Methods

The material used in this study is shrimp (*P. merguiensis* larvae) obtained from Jepara's Marine Center for Brackishwater-Aquaculture Development. The experiment was carried out by supplying nine beaker glasses in one aquarium with a capacity of 20 liters. A total of 250 *nauplii* of *P. merguiensis* larvae glass^{-1} were prepared for diet experiment by giving live microalgae and FRIPPAK (consisting of fishmeal, vitamins, and minerals) in the form of a microencapsulated diet. Considering the digestive system of Zoea (Z) was not yet fully developed, Zoea-1 to Zoea-3 were treated with Diet A containing 2,000 cells.mL^{-1} of *Skeletonema costatum*. However, the number of *S. costatum* of 7,500 cells mL^{-1} was served for the Mysis (M) and Postlarvae-1 stages. Diet B containing FRIPPAK 4 mg.L^{-1} was performed for Z1 to Z3 and 6 mg.L^{-1} for M1 to M3 and Postlarvae-1. Lastly, Diet C containing 50% of Diet A and 50% of Diet B was administered for Z1 to Z3 and M1-M3 with the same feeding pattern (4 mg.L^{-1} for Z1 to Z3 and 6 mg.L^{-1} for M1 to M3 and Postlarvae-1). Temperature, dissolved oxygen, and pH were measured once per day in the morning with a DO meter (YSI550A-25). Temperature, oxygen, ammonia, acidity, and pH were measured once a day from 6.00-16.00. The calculation of larvae lengths was carried out at the beginning and end of the experiment everyday daily for seven days by measuring the difference in lengths:

$$L_Z=L_x-L_y$$

L_y is the length before the treatment; L_x is the length where the particular treatment was done. The product difference between the two lengths was the development (L_Z).

Results and Discussions

Lengths of Zoea-1 to Zoea-3 in different salinities and dietary patterns

The optimum length of Zoea-1 (1.21 mm) was found in 28 ppt with Diet A and the lowest one (0.93 mm) in 36 ppt with Diet C (Figure 1.). From Figure 2, it can be seen that the optimum length of Zoea-2 (2.11 mm) was found in 32 ppt with Diet A and the lowest one (1.62 mm) in 32 ppt with Diet C. From Figure 3, it can be concluded that the optimum length of Zoea-3 (2.29 mm) was found in 32 ppt with Diet A and the lowest one (1.96 mm) at the same salinity with Diet C.

Lengths of Mysis-1 to Mysis-3 in different salinities and dietary patterns

The optimum length of Mysis-1 (3.30 mm) was found in 28 ppt with Diet A and the lowest one (2.23 mm) in 36 ppt with Diet B (Figure 4.). While the optimum length of Mysis-2 (3.64 mm) was found in 28 ppt with Diet C and the lowest one (2.22 mm) in 36 ppt with Diet B (Figure 5.). While the optimum length of Mysis-3 (4.18 mm) was found in 28 ppt with Diet A and the lowest one (2.60 mm) in 36 ppt with Diet B (Figure 6.).

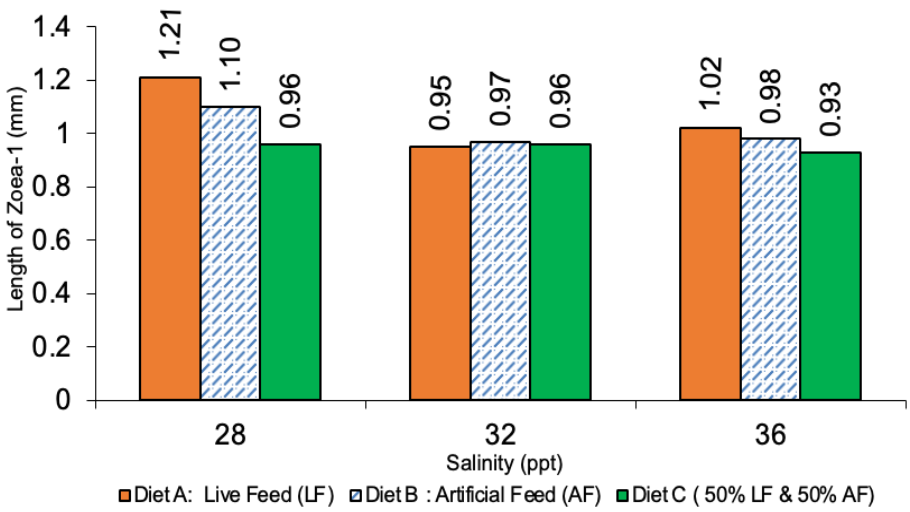

Figure 1. Lengths of Zoea-1 in different salinity and type of diet.

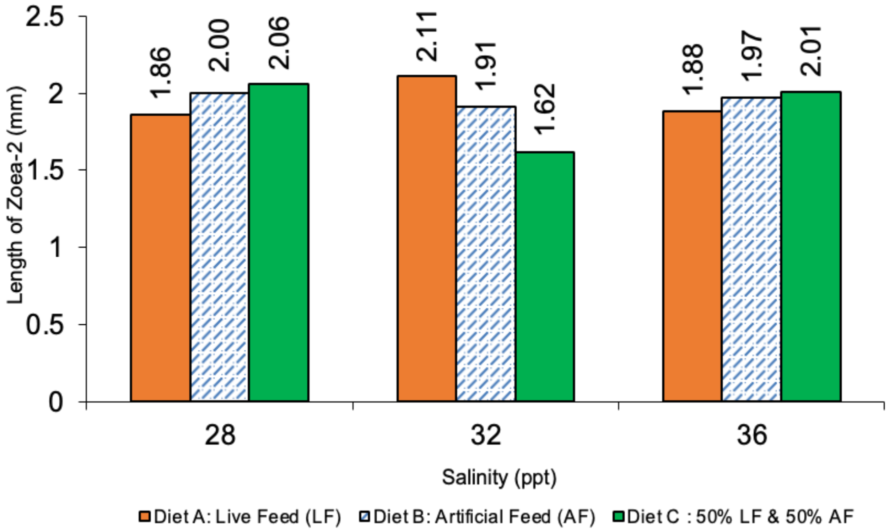

Figure 2. Length of Zoea-2 in different salinity and type of diet.

Length of Postlarvae-1 in different salinities and dietary patterns

The optimum length of Postlarvae-1 (4.52 mm) was found in 28 ppt with Diet A and the lowest one (2.87 mm) in 32 ppt with Diet C (Figure 7.). Based on data on larvae length (Figures 1-7.), this study empirically confirms that Diet A (natural food) has the most significant effect on the growth of newly introduced *P. merguiensis* with salinity ranging from 28 to 32 ppt. Shrimp larvae spend pre-juvenile, juvenile, and sub-adult stages in estuaries. As their bodies gradually increase in size and functionality, they begin to move into deeper waters forcing them to continue to grow before finally venturing farther to reach maturity. Slightly different from the Zoea phase, the Mysis phase at all stages shows an optimum length response within the same salinity (28 ppt). The overall salinity found by this study is supported by previous findings (Maicá *et al*., 2014; Sakas, 2016), stating that optimal salinity concentrations for shrimp larva range from 25 ppt to 30 ppt.

In the Mysis stage, natural feed (Diet A) and mixed diet (Diet C) contributed significantly to the optimum length of Mysis. Based on larval growth in the Mysis phase, it can be concluded that all Mysis stages grow optimally in 28 ppt: Mysis-1 and Mysis-3 grow optimally with Diet A, while Mysis-2 with Diet C. Continuing from the Mysis phase, Post-larvae-1 also grows better at a salinity of 28 ppt with Diet A. In the Postlarvae-1 stage, shrimp starts to develop and maximize their functionality as an adult animal fully. They generally have sufficient strength to survive offshore and are expected to adapt better before entering a state that forces them to survive by avoiding predators.

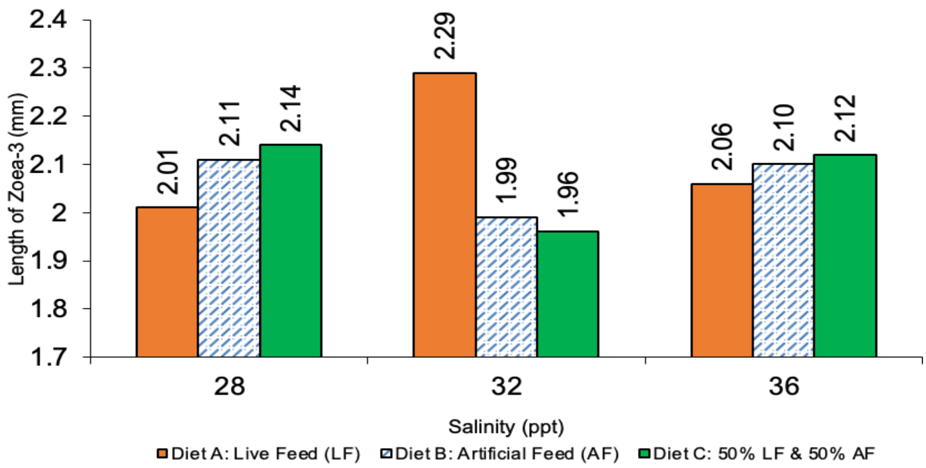

Figure 3. Lengths of Zoea-3 in different salinity and type of diet.

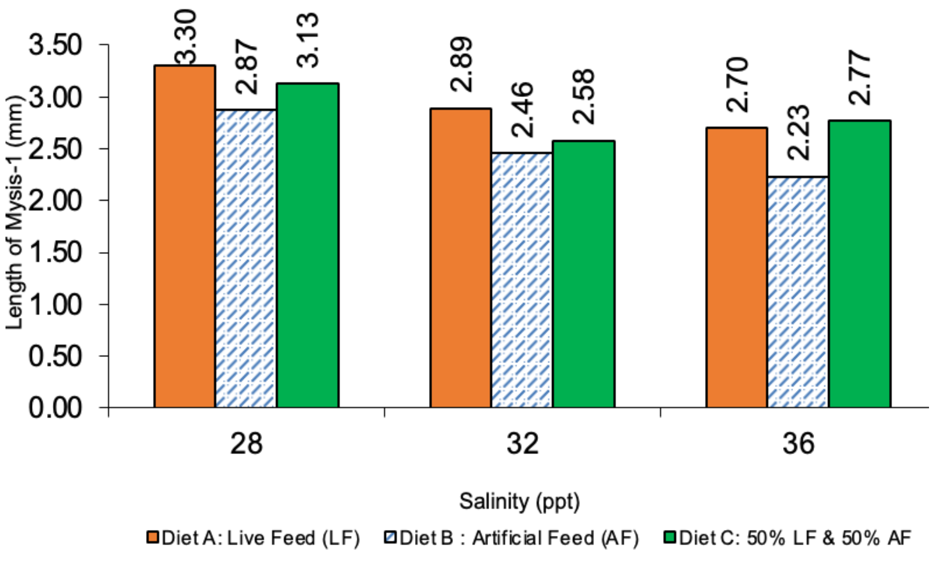

Figure 4. Length of Mysis-1 in different salinity and type of diet.

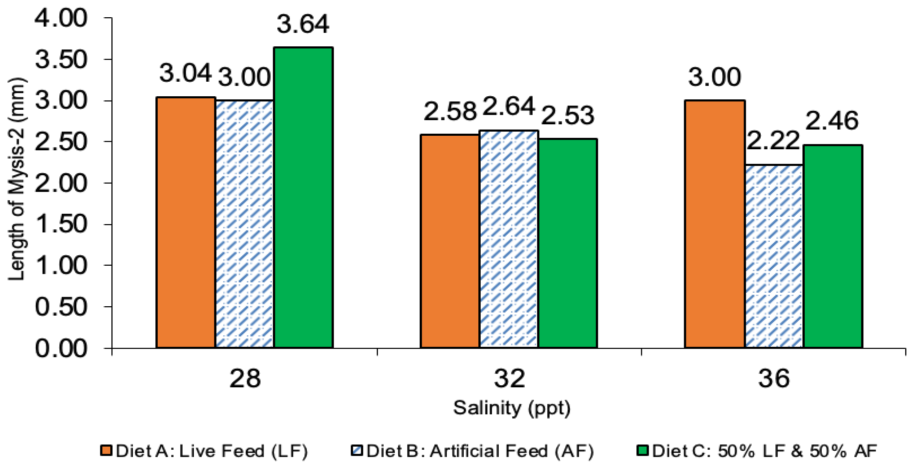

Figure 5. Length of Mysis-2 in different salinity and type of diet.

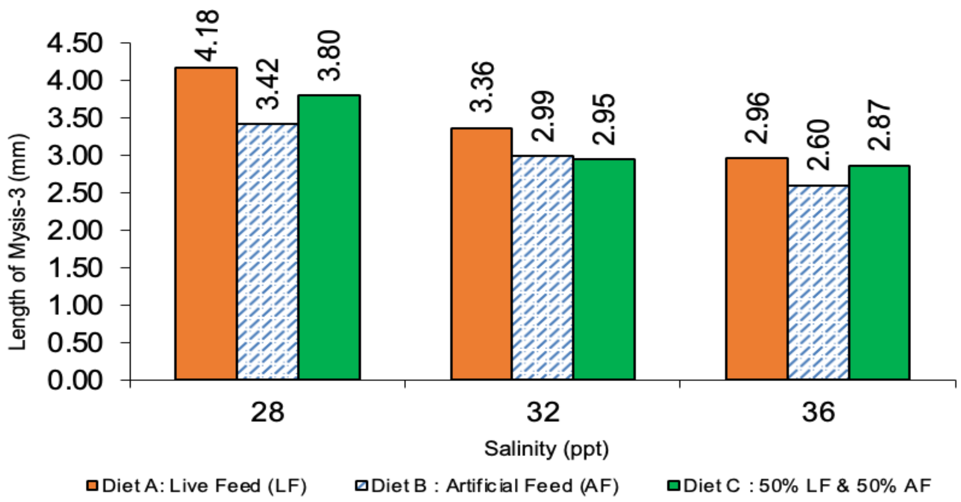

Figure 6. Length of Mysis-3 in different salinity and type of diet.

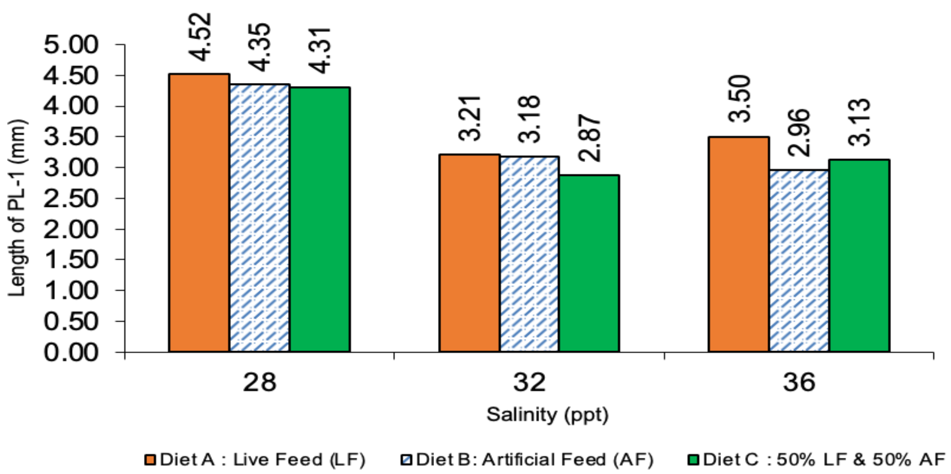

Figure 7. Lengths of Postlarvae-1 in different salinity and type of diet.

Soyel and Kumlu (2003) stated that a rise in salinity resulted in an increase in the biomass for the nursery culture of penaeid larvae and noted that those larvae had higher survival and better growth at high salinities, reaching about 30-40 ppt. However, *P. merguiensis* could grow between 20 and 30 ppt and achieve optimal growth at 27 ppt (Zacharia and Kakati, 2004). Hence, the results of the present study demonstrates that *P. merguiensis* is not a good candidate for shrimp culture with high salinity.

In terms of dietary types, several studies (Bulbul *et al.,* 2014; Bulbul *et al.,* 2015; Oujifard *et al.,* 2012) found that a 25-58% formulated crude protein gave the best development with an 80% survival rate yet discovered that formulated protein increased ammonia production ratio due to sedimentation of crude protein in food waste and feces. A study by Corsin *et al.* (2001) found a relationship between disease, optimal growth, dietary types, and water quality influencing the larvae of *P. monodon*. Their findings revealed that the nurturing water quality could possibly lead to lethal problems since aquatic animals that grow intensively due to supportive surroundings will discharge a lot in a certain period.

Soto and Lotz (2001) stated that bad water quality would cause shrimp to die due to infection. Infected shrimp can spread disease to other shrimp; therefore, healthy shrimp requires proper steps, especially when configuring dietary patterns and water quality since the accumulated toxic is the most dangerous source of disease against shrimp. This phenomenon happens a lot in shrimp farming activity as ammonia generates toxic sedimentation at the bottom of the pond if the given diet contained a lot of formulated proteins.

Although previous studies (Bulbul *et al.,* 2014; Bulbul *et al.,* 2015; Oujifard *et al.,* 2012) found that diets containing formulated protein were the best, the present study found that *P. merguiensis* larvae favor natural diets containing *Skeletonema costatum* (Diet A) and is supported by Muangyao *et al.* (2019) that agreed that shrimp larvae will always prefer natural diets.

Water quality (pH, temperature, and dissolved oxygen) during experiments

Table 1 shows the water temperature for the seven days of the experiment at a salinity of 28 ppt (15-21 December 2020). Temperature observation projected with larvae length data shows that the best temperature: in 28 ppt was 31.4-31.5°C; in 32 ppt was 31.1-32.4°C; in 36 ppt was 31.6-32.6°C. The temperature has a significant effect on the growth of living organisms and is an indicator that plays a substantial role in larval development. The optimum temperature that supports Zoea varies: Zoea-1 at 31.40°C±0.1; Zoea-2 at 32.40°C±0.1; Zoea-3 at 31.70°C±0.1. Viewing from all Zoea phases, the mean temperature obtained was 31.46 °C±0.1, and these values are relatively the same when Zoea-1 reaches its optimum length. Thus, it can be concluded that the optimum temperature for larvae in the Zoea phase in this study is 31.4-32.4 °C. Still, referring to temperature data, the optimum temperature that supports Mysis also varies. Viewed from all Mysis phases, the mean temperature obtained was 31.41°C±0.1, and these values were relatively the same when each Mysis reached its optimum length (at 28 ppt salinity with Diet A and C). Thus, it can be concluded that the optimum temperature for Mysis in this study ranges from 31.0-31.6°C. The lowest lengths of Zoea and Mysis were found at 32.7°C and 32.6°C, respectively. These findings are supported by Kumlu *et al*. (2000), who stated that temperatures above 30°C could increase the mortality of shrimp larvae.

Continuing from the Mysis phase, Post-larvae-1 also grew well at 31.70°C, and this value was still in the optimum temperature range for Zoea and Mysis. According to some researchers (Preston *et al.,* 2003; Zacharia and Kakati, 2004), of the three phases of shrimp larvae, Zoea is the most sensitive

Table 1. Average temperature (°C) during experiment at different salinity

Date	Salinity 28 ppt			Salinity 32 ppt			Salinity 36 ppt		
	Diet			Diet			Diet		
	A	B	C	A	B	C	A	B	C
15 Dec 2020	31.4	31.7	31.5	32.1	32.3	32.2	32.6	32.8	32.7
16 Dec 2020	31.4	31.6	31.4	32.4	32.6	32.6	32.6	32.3	32.6
17 Dec 2020	31.3	31.5	31.4	31.7	31.9	31.8	32	32.2	32.1
18 Dec 2020	31	31.3	31.2	31.1	31.5	31.2	31.7	32.2	32.1
19 Dec 2020	31.3	31.6	31.5	31.5	31.7	31.6	31.6	31.8	31.7
20 Dec 2020	31.5	31.7	31.6	31.6	31.8	31.7	32.3	32.6	32.5
21 Dec 2020	31.4	31.6	31.6	31.7	31.8	31.7	32.5	32.7	32.7

one to temperature changes. Therefore, research on the importance of optimum temperature for larvae (especially in the zoea phase is fundamental). Furthermore, inappropriate temperature could cause mass mortality of larvae. Soyel and Kumlu (2003) discovered that daily growth rates at salinities above 30 ppt (0.114-0.137 mm.day^{-1}) for *P. semisulcatus* were about 2.5 times greater than those obtained below 20 ppt and found the best temperature deemed to be optimum was 28°C, and some researchers (Gunalan *et al.,* 2010; Hernández *et al.,* 2011) found that the optimum range for white shrimp to grow ranging from 28 to 32°C.

Table 2 shows the dissolved oxygen levels for the seven days of the experiment at a salinity of 28 ppt (15-21 December 2020). Dissolved oxygen observation projected with larval length data shows that the best quality of dissolved oxygen: in 28 ppt was 4.9-5.62 ppm; in 32 ppt was 4.9-5.2 ppm; in 36 ppt was 4.5-5.3 ppm.

The Zoea phase's optimum dissolved oxygen in this study ranged from 4.9-5.74 ppm, and the lowest Zoea's length was found in 4.42 ppm±0.4. Meanwhile, the optimum dissolved oxygen in Mysis-1, Mysis-2, and Mysis-3 are 5.30 ppm±0.4, 5.15 ppm±0.4, and 5.77 ppm±0.4, respectively. However, the lowest length Mysis was found in 4.40 ppm±0.4. Thus, the Mysis's optimum dissolved oxygen in this study ranged from 5.15-5.77 ppm, and the lowest Mysis length was found in 4.42 ppm±0.4. The optimum dissolved oxygen for Postlarvae-1 was 5.62 ppm, and this value is still in the optimum range for Zoea and Mysis. However, the lowest Postlarvae-1 length was found in 5.1 ppm.

Dissolved oxygen (DO) is widely acknowledged as one of the most critical aquaculture variables (Lin and Chen, 2003; Schuler *et al.,* 2010; de Lourdes Cobo *et al.,* 2014). The optimum DO suggested by some researchers vary. Suprapto (2005) argued that the optimum DO for white leg shrimp culture should be greater than 3 ppm with a minimum tolerance of 2 ppm. More significant than that amount, Adiwijaya *et al.* (2003) suggested that the optimal range of DO during shrimp farming was 3.5-7.5 ppm. Eddiwan *et al.* (2020) found that the minimum DO level for healthful shrimp was 6.98 ppm, with a maximum of 7.51 ppm. They also said that DO less than 2.0 ppm could likely ruin aquatic organisms' productivity due to the low availability of phytoplankton as one of the important elements in saline waters. Similarly, Duan *et al.* (2014) found that DO of 4 ppm was the lower critical value recommended for shrimp farming practice, allowing the shrimp to satisfy their normal requirement without compensating other mechanisms in their regulatory systems. Wei *et al.* (2008) stated that DO below 3-4 ppm in the short term could cause stress, leading to greater susceptibility to disease, low appetite, and slow growth.

According to Vinatea *et al.* (2011), the minimum DO needed by juvenile shrimp was 4.1 ppm, and it works together with salinity, temperature, and density as they influence the size of shrimp. Moreover, Walker *et al.* (2009) found a correlation between dissolved oxygen and whiteleg shrimp size; the more significant the shrimp's size, the lower the oxygen demand the shrimp require. Similarly, hyperosmotic and hypoosmotic environmental conditions could increase the oxygen need. The water quality parameters cumulative effect would reflect the shrimp production (Chakravarty *et al.,* 2016).

Besides, hyperosmotic and hypoosmotic could increase the need for DO. Boyd and Hanson (2010) argued that the solubility of oxygen in pond water is influenced by changes in temperature and other parameters such as salinity and pH. Other factors that affect DO, according to Juranek & Quay (2013) are the process of photosynthesis. They found that O2 generated during photosynthesis is proportional with the vertical distance, intersecting air and causing the mixture to the water levels. Since the present study found the optimum dissolved oxygen in the Zoea, Mysis, Postlarvae-1 phases ranged from 4.9-5.62 ppm, it can be inferred that the results agree with Adiwijaya *et al.* (2003), who suggested that the optimal range of DO during shrimp farming was 3.5-7.5 ppm. Therefore, the DO found in the present study (5.15-5.77 ppm) was still in the range of previous findings and was deemed to be appropriate for *P. merguiensis* larvae.

The average pH in different salinity and diet from 15-21 December 2020 is presented in Table 3. Table 3 shows the pH level for the seven days of the experiment at a salinity of 28 ppt (15-21 December 2020). The pH observation projected with larval length data shows that the best pH quality: in 28 ppt was 7.9-8.1; in 32 ppt was 7.9-8.1; in 36 ppt was 7.9-8.0.

Based on pH data, the optimum pH value that supports Zoea does not vary too much, where Zoea-1, Zoea-2, and Zoea-3 are all optimum at pH 7.9±0.04. The lowest zoea length was found at pH 8.00. In the Mysis phase, the optimum pH values for Mysis-1, Mysis-2, and Mysis-3 were 7.09±0.08, 8.02±0.08, and 8.10±0.08, respectively. Thus, it can be concluded that the optimum pH in the Mysis phase in this study ranged from 7.0 to 8.1. Although pH 8.10 was also the optimal pH, the lowest length Mysis was also found at pH 8.10. Continuing from the Mysis phase, Post-larvae-1 also grew well with a

Table 2. The average of dissolved oxygen (ppm) during experiment at different salinity

Date	Salinity 28 ppt			Salinity 32 ppt			Salinity 36 ppt		
	Diet			Diet			Diet		
	A	B	C	A	B	C	A	B	C
15 Dec 2020	5.74	4.25	4.89	5	4.56	4.98	4.8	4.7	4.42
16 Dec 2020	5.26	4.7	4.9	4.9	4.7	5	4.9	4.7	4.5
17 Dec 2020	5.25	5	5.12	4.98	4.68	4.84	5.09	5	4.6
18 Dec 2020	5.3	4.19	5.16	5.2	4.75	4.98	5.3	5.07	4.39
19 Dec 2020	5.23	5.02	5.15	5.2	4.66	5.1	5.13	5.08	5.01
20 Dec 2020	5.77	5	5.1	5.11	5	5.05	5.4	4.40	4.82
21 Dec 2020	5.62	5	5	5.2	4.9	5.1	5.3	5	4.9

Table 3. The average pH

Date	Salinity 28 ppt			Salinity 32 ppt			Salinity 36 ppt		
	Diet			Diet			Diet		
	A	B	C	A	B	C	A	B	C
15 Dec 2020	7.9	8	8	7.9	7.9	8	7.9	7.8	8
16 Dec 2020	8	8	8.01	7.9	8	8	8	7.9	7.9
17 Dec 2020	8	8.01	7.9	7.9	7.9	7.9	7.9	7.9	7.9
18 Dec 2020	7.9	7.91	7.92	7.9	7.9	7.9	7.9	7.9	7.9
19 Dec 2020	8	8.01	8.02	8	8	8	8	8	8
20 Dec 2020	8.1	8.11	8.12	8	8	8	8	8	8
21 Dec 2020	8.1	8.1	8.11	8.1	8	8	7.9	8	8

pH of 8.1, and this value was still in the optimum pH range for both Zoea and Mysis.

The present findings are supported by some researchers (Elovaara, 2001; Hernández-Ayon *et al.,* 2003; Hernández *et al.,* 2011; Chen *et al.,* 2015) stating that the proper pH for Vannamei shrimp larvae ranged from 7.5-8.8. The value of pH is the degree of water acidity affecting the growth of all living entities. Han *et al*. (2018) found that a suitable pH for shrimp farming should be in the gradual-low pH environment (6.65–8.20). They also found that a high-pH environment, known as gradual-high pH (8.20–9.81), decreased weight gain percentage and length gain percentage continuously; high water pH will result in death, while too high water pH can cause growth rate to slow and even get stunted. Therefore, it can be concluded that shrimp media for *P. merguiensis* has an ideal pH of 7.5–8.5

Therefore, Diet A in the present study is good for the growth and survival of *P. merguiensis* larvae. Besides, a good aeration system is needed as it can prevent the accumulation of toxic materials at the bottom of shrimp ponds. If proper aeration is not carried out to reduce accumulated material, the entire shrimp's condition will be exposed to a hazardous situation. Due to several limitations, this study suggests further research examining the same topics to some other phases such as juvenile, subadult, and adult stages to support better ecology configurations for future shrimp biodiversity.

Conclusion

Salinity of 28 ppt and 32 ppt with Diet A works well from Zoea and Postlarvae-1, except for Mysis-2 that prefers Diet C. All larval phases prefer temperature ranging from 31-32.4°C with dissolved oxygen of 4.9-5.74 ppm and pH of 7.0-8.1.

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