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STUDY OF GROWTH AND SURVIVAL OF CLIMBING PERCH (ANABAS TESTUDINEUS BLOCH) WITH DIFFERENT SEX RATIO IN BIOFLOC SYSTEM

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ABSTRACT
The purpose of this research was to analyze how the performance of growth and survival of climbing perch - papuyu fish (*Anabas testudineus* Bloch) aquaculture with the biofloc system whether there were differences in the sex ratio of the stocked climbing perch had an effect and to find the right sex ratio. The experimental design used in this research was a completely randomized design (CRD) with 5 treatments and 5 replications, resulting in 25 experimental units. Treatment B100J0 = 100% female climbing perch and 0% male, treatment B75J25 = 75% female and 25% male climbing perch, treatment B50J50 = 50% female and 50% male climbing perch, treatment B25J75 = 25% female climbing perch and 75% male % and Treatment B0J100 = 0% female climbing perch and 100% male fish. The research was conducted for 90 days with daily growth parameters (SGR), weight and length growth, survival rate, food conversion, flock content, and main water quality parameters (water temperature, pH, dissolved oxygen and dissolved ammonia). From the results of the research it can be concluded that the difference in sex ratio has a significant effect on the weight growth of climbing perch with a 100% ratio of females for enlargement resulting in the best daily growth rate. The B100J0 treatment was better, that in subset 1 the treatments B0J100, B75J27 and B50J50 were the same. In subset 2, treatments B50J50 and B75J25 were the same, while in subset 3, treatments B75J25 and B0J100 had the same growth. However, based on the median value, treatment B100J0 was better than treatments B75J25 and B50J50 and other treatments. The difference in relative weight (%) between treatments indicates that treatment B100J0 23.72% from treatment B75J25, 54.57% from treatment B50J50, 86.39% from treatment B25J75 and 172.87% from the B0J100 treatment. thus treatment B100J0 = 100% female and 0% male is the best treatment. This phenomenon indicates the sex of the papuyu fish with a ratio of 100% female to rearing produces the best daily growth rate. The results of the research using the sex composition obtained an additional length (cm) for 90 days for each treatment B100J0 = 1.92 cm, B75J25 = 1.19 cm, B500J50 = 1.78 cm, B25J75 = 1.31, B0J100 = 1.61 cm, indicating length The standard depends on the other types of climbing perch, the variety of fish species tested and the length of time they are kept. Treatments B0J100, B75J25 and B50J50 had the same survival in subset 1, while in subset 2 treatments B100J0 and B75J25 had the same survival. Sex ratio was significantly different between treatments to food conversion. Then the Post Hoc test was carried out, the results of the analysis showed that the B100J0, B75J25, B50J50 and B25J75 treatments in subset 1 were just as good in their food conversion. Whereas in subset 2 the B0J100 treatment was not the same as the other four treatments. Floc content ml/L. Rangeflocs of all treatments within the range of 9.583-10.524 ml/L, were able to contribute in providing food in the rearing medium. The water temperature during the research period, air and water temperatures ranged from 26.89-27.62 °C (ºC). From the results of this research the range of acidity degrees in all treatments was in the range of 6.87-7.04. The DO concentration at the experimental site ranged 5.1-7.8 mg L-1, which is within the acceptable range for aquaculture.

KEY WORDS
Sex ratios, monosex, female, climbing perch, biofloc.

Aquaculture as a food-producing activity provides enormous opportunities for alleviating poverty, improving malnutrition and reducing hunger, aquaculture is also able to improve the level of economic growth and certainty in better management of natural resources (FAO, 2020a). Aquaculture production is projected in 2050 to 82 million from 40 million tonnes in 2008 (FAO, 2020a). According to (Costa-Pierce et al, 2012; Verdegem, 2013), an increase in aquaculture production is triggered by an increase in per capita demand as the world's population increases. Challenges in developing the aquaculture industry are due to limited natural resources and the impact of industrial pollution on the environment. Given these limitations/challenges, the development of a sustainable aquaculture industry should be focused on using systems with high productivity and profitability, utilizing fewer resources including space, energy, water and capital, and at the same time having less negative impact on the environment. (Asche et al, 2008; FAO, 2020a). If linked to the 14 SDG (Sustainable Development Goals) targets, the development of a sustainable aquaculture industry can contribute to various goals, including alleviating poverty (SDG 1), reducing hunger levels, being able to improve nutrition and achieving food security (SDG 2) and being able to support sustainable and inclusive economic growth (SDG 8) (FAO, 2020a).

In production enhancement and sustainable aquaculture strategies are focused on increasing the utilization of feed nutrients. Two different approaches can be developed, namely (i) improving feed quality and feeding strategies so that nutrients can be absorbed efficiently and optimally utilized, and (ii) recycling of nutrient waste by modifying aquaculture systems. In maintenance media, nutrients can be removed by several natural biogeochemical processes which mostly involve microorganisms with various functions in the nutrient cycle. Unconsumed feed and digestive and metabolic processes constitute nutritional waste in aquaculture systems. The reuse of nutrient waste in aquaculture systems can be directly utilized by other organisms at lower trophic levels, by utilizing feed particles as a food source, or indirectly through the conversion of nutrients into microbial biomass which can ultimately be consumed by the aquaculture fish themselves or other fish as a source of food (Bossier and Ekasari 2017).

Biofloc technology has the principle of recycling waste nutrients, especially nitrogen, as biomass for microbes that can be utilized and processed into feed ingredients and used in situ by aquaculture fish (Avnimelech, 2009; Kuhn et al, 2010). Heterotrophic microbiota are able to use organic carbon and inorganic nitrogen as a source of energy and growth by adjusting the C/N (Carbon/Nitrogen) ratio in the rearing medium through engineering by adding external carbon sources to the rearing medium and utilizing the carbohydrate content in the feed (Avnimelech, 1999), so that certain bacteria can assimilate waste ammonium for the production of new biomass. Ammonium / ammonia can be maintained at low concentrations and is non-toxic so no further water changes are required. The biofloc system is an environmentally friendly technology because it can improve water quality conditions and can provide instant food, good nutritional content and is able to maintain health for pet fish (Ahmad et al, 2017; Avnimelech, 2009; Emerenciano et al, 2017; Fischer et al, 2020). Crab et al, 2010; Emerenciano et al, 2013a, 2013b, 2013c; Pérez-Fuentes et al, 2013; Miao et al, 2017b). reported that biofloc contains amino acids, protein fatty acids, lipids, minerals, vitamins and enzymes, probiotics and immunostimulants. In general, crustaceans are well adapted to consuming biofloc, including giant prawns (*Macrobrachium rosenbergii*). According to (Dauda, 2019; Emerenciano et al, 2012; Li et al, 2019), the prerequisite of the biofloc system is the application of a carbon source with a suitable carbon to nitrogen ratio (C:N 10-20:1) of different carbon sources such as rice bran, molasses, corn starch, glycerol, and others. has been used to develop a biofloc system for fish, giant prawns, vanamei shrimp and crayfish. Ahmad et al, 2016; Bakhshi et al, 2018; Khanjani et al, 2017; Rajkumar et al, 2016; Dauda et al, 2017) reported that several studies have compared the effects of different carbon sources and determined their suitability for certain fish and crustaceans.

Besides being able to increase fish production and productivity, biofloc technology contributes to the provision of good quality fish seeds, which is one of the important keys in aquaculture production. In addition, it is also able to increase the reproductive performance of aquaculture fish as well as larval resistance and increase the immunity of fish reared (Ekasari et al, 2015; Ekasari et al, 2016; Emerenciano et al, 2013). The application of biofloc technology in rearing systems for several aquaculture fish species can increase relative net productivity in the range of 8–43%, when compared to non-biofloc rearing (conventional - traditional, water exchange in and out, clear water systems or recirculation systems) (Ekasari, 2014).

The climbing perch (*Anabas testudineus* Bloch) is one of the fish that has the potential to be aquacultured because it is very popular for consumption, especially on the islands of Sumatra, Kalimantan and Java because of its delicious taste (Sukadi et al, 2009). Because so far most of the consumption needs have been obtained from nature, such popularity has experienced a very significant reduction. some of its aquaculture efforts have been carried out by fish farmers using traditional pond techniques - conventional in Central and South Kalimantan. However, the production rate is still relatively low due to low stocking density (15 fish/m2). Even though high stocking densities in intensive culture can increase the growth and survival rate of aquaculture fish (Kusmini et al, 2017). Different stocking densities of papuyu fish have been reported for examples, 10 fish/m2 (Susila, 2016), 15 fish/m2 (Habib et al, 2015), and 14 fish/m2 (Khatune-Jannat et al, 2012). Khatune-Jannat et al. (2012) also reported that high stocking densities resulted in lower production performance compared to lower stocking densities. The climbing perch (Anabas testudineus Bloch) is one of the economically important fish originating from swamp waters; where swamp waters are part of the wetland as the Basic Scientific Pattern of Lambung Mangkurat University. The price of papuyu fish measuring 8-9 per kilogram can reach Rp. 100.000,- - Rp. 140.000,- subject to availability due to seasonal influences.

Growth dimorphism related to sex is also found in several other economical aquatic animal species. Tilapia fish (*Oreochromis mossambicus*) males were reported to have a weight growth of 1.68 times greater than female tilapia at the age of 120 hpt (Bhatta et al, 2013). The growth of female Penaeus monodon tiger prawns is around 20% faster than male shrimp, and affects harvest weight (Gopal et al, 2010). The weight of male crayfish Cherax quadricarinatus was 1.4 times larger than that of females at 145 days of age (Rodgers et al, 2006). A research of the growth of Climbing Perch in nature by estimating age based on otolith records showed that the growth rate of female papuyu fish was higher than that of male papuyu fish (Nagris, 2010). Different things have been reported in tilapia; Male tilapia grow faster than females (Chakraborty & Banarjee, 2010; Bhatta et al, 2013). Furthermore, the aquaculture production rate of male monosex tilapia was higher, namely around 10% (Nguyen & Little, 2000) than fish that were mixed with male-female aquaculture. Female monosex carp aquacultured in Central Europe had a significantly higher yield weight of 29.7% compared to heterosexual populations (Kocour et al, 2005).

One of the obstacles in the development of climbing perch aquaculture is the maintenance site. A rearing place is a place where the living habits of fish are kept both intensively and semi-intensively, to fulfill aquaculture strategies in biofloc systems with limited natural resources such as water and land. so that intensification is the most possible option using biofloc system technology for aquaculture activities on the scale of seed to enlargement. The link between climbing perch and the biofloc system needs to be developed, according to Ekasari. (2020), to apply to new species and find solutions to problems.The purpose of this research was to analyze how the performance of growth and survival of Climbing Perch aquacultured with the biofloc system whether there were differences in the sex ratio of the stocked papuyu fish had an effect and to find the right sex ratio.

MATERIALS AND METHODS OF RESEARCH

The experimental design used in this research was a completely randomized design (CRD) with 5 treatments and 5 replications, resulting in 25 experimental units:

- Treatment B100J0 = climbing perch 100% female and 0% male;
- Treatment B75J25 = 75% female climbing perch and 25% male;
- Treatment B50J50 = 50% female climbing perch and 50% male;
- Treatment B25J75 = 25% female climbing perch and 75% male;

- Treatment B0J75 = 0% female climbing perch and 100% male.

Table 1 – Research Tools

No	Tool	Amount	Utility
1.	Round Tarpaulin Pool	25	Maintenance container
3.	Blowers	1	Oxygen supplier
4.	Aerator hose and stone	25	Oxygen distributor
5.	Name Sticker	1	Description marker
6.	Measuring cup	1	Material/volume meter
7.	Stationary	1	Recorder of activity results
8.	Ruler	1	Length measuring tool
9.	Scales	1	Weight measuring tool
10.	*Imhoff cone*	1	Floc filter
11.	Tissue	1	Cleaning tool
12.	Scrap	1	Fish catcher
13.	Water Quality Analysis Tool	1	Water quality meter

Table 2 – Research Materials

No	Material Name	Utility
1.	Papuyu fish (A. testudineus)	Object of research
2.	Water	Maintenance Media
3.	Wasaka Probiotic 7.0	Biofloc starter
4.	Molasses	Biofloc nutrition
5.	Chlorine	Disinfectant
6.	Salt	Biofloc Media
7.	Dolomite limestone	Biofloc Media
8.	Pineapple	Biofloc Media
10.	PK (Potassium Permanganate)	Drug
11.	Pellets pf 1000	Test feed

Table 3 – Morphological characteristics of climbing perch

NO	Male	Female
1.	Slimmer body	Fuller body
2.	Smaller body	Bigger body
3.	Brighter colors	Darker color
4.	Movement is more agile	Slow motion
5.	Smaller fish eggs	Larger egg

Source: Hanafie, 2019.

The work procedures carried out in this research are as follows.

Pool Preparation:

- Cleaning the research location and leveling the land so it doesn't tilt;
- The steel fitting forms a circle;
- Installation of round sheeting on steel as a maintenance container;
- Duct loading to channel the aerator;
- Installation of a canopy so that the temperature in the maintenance container is stable.

Fry Preparation:

- The fry are obtained from the results of cultivation at a density of 1 tail per liter of water;
- Sex selection is done by observing the body shape characteristics of male and female fish before the fry are sown in the pond;
- The fry used are 8-9 cm in size, weight 1-2 grams, stock density 300/pond. Sampling 20% of the total fish fry, then measuring the initial weight and length.

Research Implementation:

a. Fish Selection:

- Separation between male and female individuals;

- The method used for fish selection is by observing the morphology of papuyu fish or directly;
- The characteristics of the female genitalia are round in shape, while the male fish are more oval in shape.

b. Spread:

- Sowing the fry is done in the morning or evening, because the temperature is relatively low;
- The method used to differentiate male and female sexes is by observing morphology and dissection at the end of the research.

c. Maintenance:

- Measurement of water quality at the beginning and end of maintenance;
- Provision of commercial feed 5% of the total weight of fish stocked;
- Feeding 2x a day in the morning and afternoon;
- The feed used is feed size pf 1000;
- Fish sampling is carried out every 10 days by taking 20% of the total fish reared.

d. Harvesting:

- Harvesting is done after 90 days of maintenance;
- Harvesting is done by drying the maintenance containers;
- Harvesting is done by sampling at the final of maintenance and measuring water quality.

Observation Parameters:

Specific growth rate (SGR). The specific rate of growth (SGR) is calculated using the formula from Zonneveld et al. (1991):

$$SGR = \frac{LnWt - LnWo}{t} \times 100\%$$

Where: SGR = specific daily growth rate (%/day); Wt = average weight ± fish at the final of the research (g/head); Wo = average weight ± average fish at the beginning of the research (g/head); t = time (long maintenance).

Absolute Long Growth. Absolute length growth is calculated by the formula Zonneveld et al, (1991):

$$L = Lo - Lt$$

Where: L = Growth in absolute length (cm); Lt = fish body length at the end of the research (cm); Lo = fish body length at the beginning of the research (cm).

Feed Conversion Ratio. According to Effendi (1997), the feed conversion ratio (FCR) is calculated based on the following formula:

$$FCR = \frac{F}{Wt + D;\ F\ Wo}$$

Where: FCR = Feed conversion ratio; F = Weight of feed given (grams); Wt = Biomass of test animals at the final of rearing (grams); D = Weight of dead fish (grams); Wo = Biomass of test animals at the initial of rearing (grams).

Survival Rate (SR). Survival rate (%) calculations using the formula Effendi (1997), namely:

$$SR = \frac{Nt}{No} \times 100\%$$

Where: SR = Graduation (SR) %; Nt = Number of fish at the final of rearing; No = Number of fish at the start of stocking.

Table 4 – Water Quality Measurement Methods

Parameter No	Unit	Tool Type	How to use
Physical: 1.Temperature	°C	Thermometer	Dipped in the pool on one side of the container in a submerged position
Chemical: 2.DO	mg/L	DO-meter	Dipping *Dissolved oxygen*meters into the pool see the results of the scale that has been listed on the DO meter display
3..pH		PH meter	Insert the pH meter into a pool of water and wait until the number scale stops.
4.Ammonia	mg/L	Hach	Long wave

Hypotheses:

- H0 = The difference in sex ratio has no significant effect on the growth and survival rate of climbing perch (*Anabas testudineus* Bloch) biofloc system;
- H1 = Differences in sex ratios have a significant effect on growth and survival of climbing perch (*Anabas testudineus* Bloch) using the biofloc system.

The data obtained from the results of this research were growth data, survival rate, feed conversion ratio, before the variance was analyzed, the data was tested for normality and homogeneity. The normality test and homogeneity test were carried out to ensure that the data were distributed normally, homogeneously as required to carry out a Completely Randomized Design (CRD). The data were analyzed by means of the F test (significance) with the SPSS 24 program to find out the difference between the treatment and the post hoc test. Water quality data obtained based on descriptive measurement results to determine the effect on growth and survival.

RESULTS OF STUDY

The results of research on growth performance and survival effect of the sex ratio of climbing perch (*Anabas testudenius* Bloch) on biofloc system maintenance have obtained observational data on absolute weight growth, absolute length growth, survival, and food conversion as well as flock abundance and water quality. From the results and discussion of the research of the response to the sex ratio of papuyu fish, it can be used as a basic reference in the development of aquaculture of papuyu fish, with a certain sex ratio, has good development prospects in increasing production with the fastest rearing period to reach consumption sizes.

Population weight growth is the addition of the overall body weight of fish from the beginning to the end of rearing. The average weight growth and SGR in rearing fish with different sexes can be seen in Table 5, Figure 1 and Figure 2.

It can be seen that the B100J0 treatment = 100% female and 0% male ratio in the maintenance of the biofloc system showed a higher weight growth value than the other treatments. Likewise with the difference in weight during the 90 days of maintenance. The SGR value (daily growth rate as well as the B100J0 treatment showed the same thing. The ANOVA test results showed a significance value (Sig.).004<0.05, then there is a significant

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difference between the treatments given. Tukey HSD and post hoc test results showed that in subset 1 the treatments B0J100, B75J27 and B50J50 were the same. In subset 2, treatments B50J50 and B75J25 were the same, while in subset 3, treatments B75J25 and B0J100 had the same growth. However, based on the median value, treatment B100J0 was better than treatments B75J25 and B50J50 and other treatments.

Table 5 – Difference in average population weight (grams) and SGR (%) of climbing perch (*Anabas testudineus* Bloch) with different sex ratios during the 90 day in biofloc system

Treatment	Days to		Average	Weight Gain (grams	SGR (%)
	0	90			
B100 J0	565.8± 7.52	1,651.80 ±212.16	985,58 ±358,31	352,980	6.80 ± 0.33
B75J25	514.00± 11.77	1,345.80± 25.74	852,90 ±283,40	285,300	6.66 ± 0.30
B50J50	484.40± 9.71	1,073.80 ±82.35	749,16 ±206,26	228,360	6.53 ± 0.25
B25J75	425.40± 11.17	868.40± 13.43	650,38 ±156,18	189,380	6.40 ± 0.22
B0J100	380.40± 8.26	719.20± 11.12	555,96± 112,18	129,360	6.24 ± 0.18

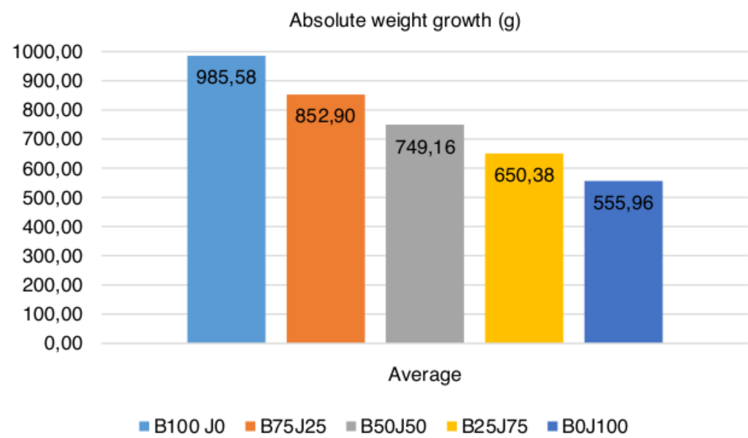

Figure 1 – Average population weight (grams) of climbing perch (*Anabas testudineus* Bloch) during 90 days of maintenance in the biofloc system

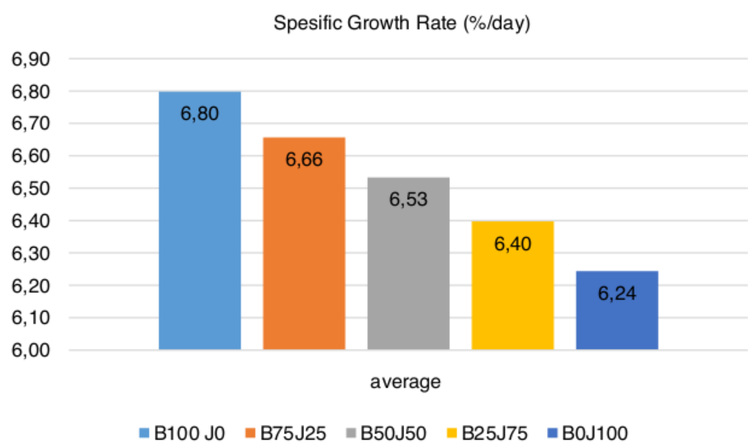

Figure 2 – Climbing perch (*Anabas testudineus* Bloch) daily growth rate (SGR) during 90 days in the biofloc system

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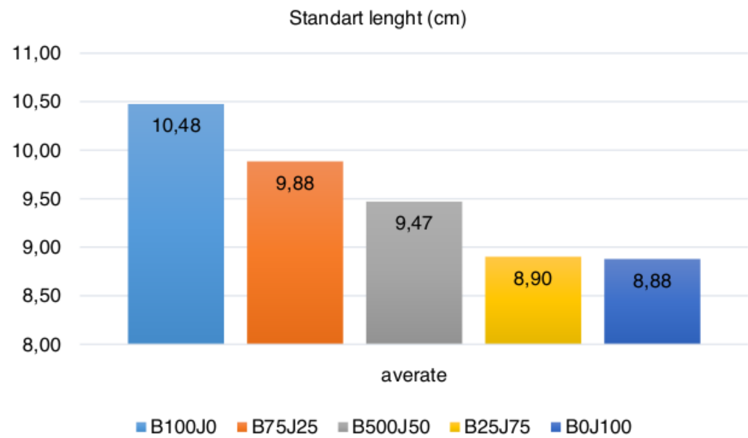

Figure 3 – Average standard length (cm) of climbing perch (*Anabas testudineus* Bloch) with different sex ratios during the 90 day maintenance of the biofloc system

The growth of the standard length of climbing perch has a significant value0.000<0.05 means that the sex ratio of papuyu fish has a significant effect on the growth in length of the Post Hoc test standard, the results of the analysis show that the treatmentB0J100, B25J75 and B50J50 showed the same standard length in subset 1 and subset 2 showed the same standard length increase between the B50J50 and B75J25 treatments. Whereas in subset 3, treatments B75J25 and B100J0 showed the same standard length. The results of the research using the sex composition obtained an additional length (cm) for 90 days for each treatment B100J0 = 1.92 cm, B75J25 = 1.19 cm, B500J50 = 1.78 cm, B25J75 = 1.31, B0J100 = 1.61 cm, indicating length The standard depends on the other types of climbing perch, the variety of fish species tested and the length of time they are kept.

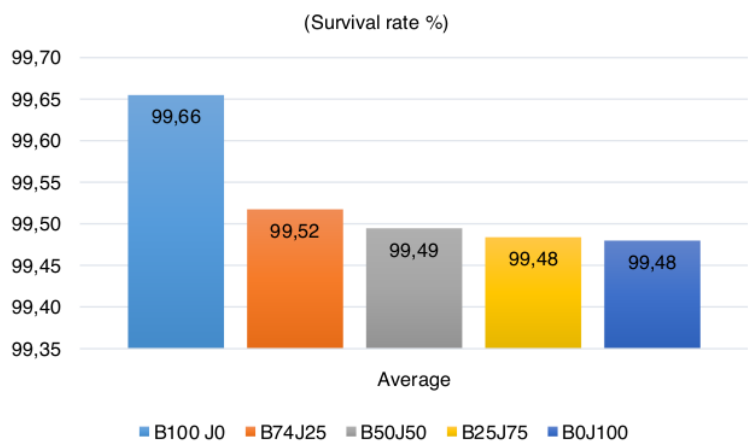

Figure 4 – The average survival rate of Climbing Perch (*Anabas testudineus* Bloch) with different sex ratios during the 90 day in the biofloc system

The treatment in this research was that the survival of climbing perch had a significance value of <0.05, meaning that the sex-to-sex ratio had a significant effect on survival in biofloc maintenance media. The results of the Post Hoc test obtained the results of the analysis that the survival of the B0J100, B75J25 and B50J50 treatments was the same in subset 1, while in subset 2 the B100J0 and B75J25 treatments had the same survival.

Figure 5 shows the results of the food conversion ratio of climbing perch (*Anabas testudineus* Bloch) with different sex ratios during the 90 day maintenance of the biofloc system.

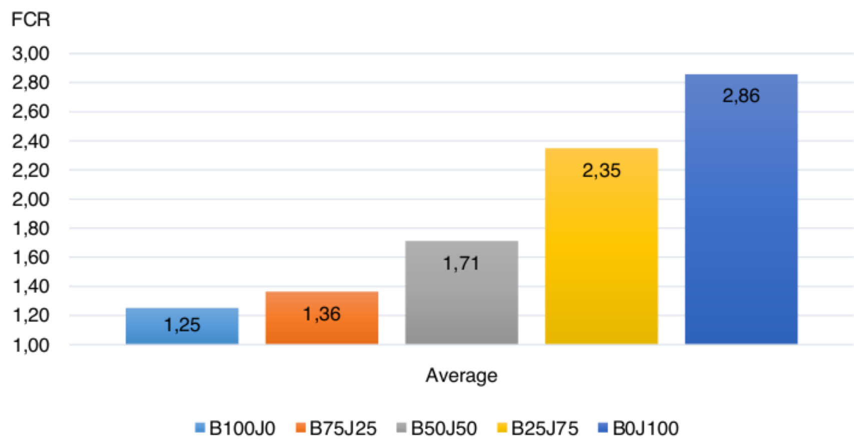

Figure 5 – Feed conversion of climbing perch (*Anabas testudineus* Bloch) with different sex ratios during 90 days in the biofloc system

The results of the ANOVA test, where the results showed a significance value of 0.00 <0.05, indicated that the sex ratio was significantly different between treatments on food conversion. Then the Post Hoc test was carried out, the results of the analysis showed that the B100J0, B75J25, B50J50 and B25J75 treatments in subset 1 were just as good in their food conversion. Whereas in subset 2 the B0J100 treatment was not the same as the other four treatments.

The results of measuring the floc content (ml/L) can be seen in Figure 6.

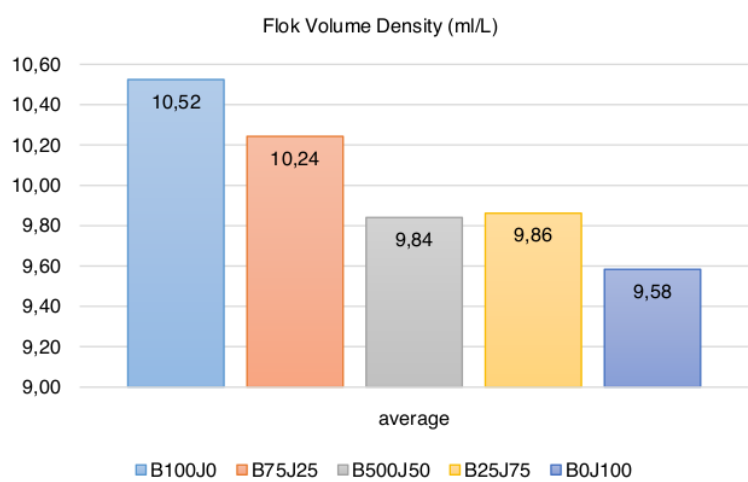

Figure 6 – Average floc content in the rearing medium for climbing perch (*Anabas testudineus* Bloch) with different sex ratios in the biofloc system

In Fig.6, shows the average floc content (ml/L) from the observations made. The mean values of floc content in each treatment were ordered as follows: B100J0 = 10.524 ml/L, B75J25 = 10.242 ml/L, B27J75 = 9.861 ml/L, B50J50 = 9.840 ml/L, and B0J100 = 9.583 ml/L.

Results of measurement and analysis of water quality, water temperature, degree of acidity, dissolved oxygen and dissolved ammonia. The water temperature during the research period, air and water temperatures ranged from 26.89 – 27.62 °C (°C),from the results of this research the range of acidity degrees in all treatments was in the range of 6.87 – 7.04.The results of this research showed that the dissolved oxygen content in all treatments was in the range of 4.02 – 4.90 mg/L while the dissolved ammonia content wasin the range of 0.49 – 0.57 mg/L.

DISCUSSION OF RESULTS

The difference in relative weight (%) between treatments indicates that treatment B100J0 23.72% from treatment B75J25, 54.57% from treatment B50J50, 86.39% from treatment B25J75 and 172.87% from the B0J100 treatment. thus treatment B100J0 = 100% female and 0% male is the best treatment. The difference in the growth of papuyu fish with a composition of more female fish reinforces the phenomenon of sex dimorphism. In addition, the high weight of female climbing perch, both with and without higher gonads compared to male fish, indicates that the growth of female fish is faster than male fish, which is thought to be not fully influenced by the weight of the gonads. Mizzau et al, 2013; Leclercq et al, 2010; Davidson et al., 2009) is the case with salmon (Salmonidae), female populations are preferred, because male salmon mature more quickly at a young age and have less meat than female fish

Growth dimorphism related to sex is also found in several other economical aquatic animal species. The male tilapia (*Oreochromis mossambicus*)was reported to have a weight growth of 1.68 times greater than the female tilapia at the age of 120 hpt (Bhatta et al, 2013). The growth of female *Penaeus monodon* tiger prawns is around 20% faster than male shrimp, and affects harvest weight (Gopal et al, 2010). The weight of male crayfish *Cherax quadricarinatus* was 1.4 times larger than that of females at 145 days of age (Rodgers et al, 2006).

The research evaluating the growth and performance of this research was conducted to evaluate the growth and production performance of Thai climbing perch and Vietnamese climbing perch (*Anabas testudineus* Bloch) for four months from April to July 2014. There were two treatments each with three replications. Three ponds in treatment-1 (T-1) were stocked with Vietnamese climbing perch, while the other three ponds designated as treatment-2 (T-2) were stocked with Thai papuyu. Fish were fed with commercial pellet feed (30% crude protein). Pond water quality parameters are monitored weekly and are within the acceptable range for fish farming. The average harvest weight for treatment-1 was significantly higher than treatment-2. After four months of rearing, the gross fish production was 15,352 and 9. 456 Kg/ha each obtained from Vietnam and Thailand lines. The results indicated that higher average growth and production were observed in the Vietnamese strain than the Thai climbing perch (Kohinoor, et al, 2016).

Debnath, et al, (2022), reported that the stocking density of papuyu fish is a species and is considered as one of the important aspects for optimizing feed and water quality management in biofloc systems. This research was conducted to determine the optimum stocking density of superior cultivated fish species, namely climbing perch (*Anabas testudineus* Bloch) in the biofloc system. Fish fingerlings with an average initial weight of 0.80 ± 0.02 g were reared in biofloc circular ponds for 13 weeks with three different stocking densities, 300 (T-300), 450 (T-450), and 600 (T-600).) fish m³ with repeated repetitions, and fish were fed a commercial diet of 3% of their body weight. These results indicate that in the early stages of cultivation, the optimum stocking density of papuyu fish in the biofloc system was 300–450 m³.

The range of mean weight gain (grams) 27.48 ± 0.62c with SGR (%) 2.24 ± 0.03c -

2.52 ± 0.03a (Kazi et al, 2016). Daily average weight gain (3.18±1.576g/d) (Waseeh, et al, 2020). Kazi et al, 2021, reported specific growth rates (SGR) ranging from 1.75 to 2.30%/day. Hasan et al (2010) stated that the SGR value of climbing perch reared in hapa ranged between 3.69 and 3.82% day-1 which was higher than the current research. Uddin et al (2016) found that the SGR value of climbing perch kept in cages in Kaptai Lake ranged between 2.24 and 2.52%/day.The results of the research (Arnuparp, et al, 2020) showed that the SGR range was between 4.08 ± 0.52- 4.09 ± 1.11ns (%/day).

If the results of this research are related to the results of previous studies, especially with a higher Specific Growth Rate, both for the B100J0, B75J25 treatments reared in the biofloc system and conventionally. The dominant composition of the female sex and using floating pellet feed with 34% protein is thought to be a trigger for daily growth. Day growth rate (SGR) treatment B100J0 = 7.41 %, B75J25 = 7.20%, B50J50 = 6.97%, B25J75 = 6.76 %, B0J100 = 6.57 %, higher than the results of the research (Arnuparp, et al, (2020), Kazi et al, 2016), Waseeh, et al, 2020) Kazi et al, (2021,)Uddin et al (2016). This phenomenon indicates the sex of the climbing perch with a ratio of 100% female to rearing produces the best daily growth rate.

When compared with the results of previous studies, it shows that survival is not affected by gender and is better than the research of Kazi et al. (2016), and is consistent with research Hoque et al (2017), Waseeh et al, 2020, Jannat et al (2012) %. Mandal et al. (2010), Zafar, et al, 2017, (Kohinoor, et al, 2012) and (Arnuparp, et al, 2020).

Haque et al, (2017)reported the final average length gain (cm) of Vietnamese climbing perch in the range of 13.58 ± 0.01 - 13.70 ± 0.03, cm. with initial length not informed only an average weight of 1.01 gram during maintenanceSeptember 01, 2013 to April 02, 2014 (7 months).Widiyati et al, (2018), used fry of initial length in the range of 2-3 cm, but did not inform the length at the end of the research, only provided information on the initial weight in grams and the final weight in grams. With weight gain in the range of 1.83-2.73 grams during 40 days of maintenance. (Kazi et al, 2016) used an average initial length of 5.80 cm, during 90 days of rearing it produced a final length in the range (cm) 11.15 ± 1.04a -12.50 ± 0.66a, with a difference range of 5.35 – 6.70 cm. Anantharaja et al, (2017), used the initial size with a length range of 5.60 ± 0.57 cm while the final length in the aquaponic system was 9.02 ± 0.54 cm and 8.19 ± 0.59 cm in the conventional system with an additional length of 3.6 cm and 2.59 respectively cm during maintenance of 42 days.

Haque et al (2017), reported a range between 92.50 ± 2.200 - 95.12 ± 1.120 (%), Waseeh et al, 2020 reported a range of 92.75% - 98.5%, Jannat et al (2012) reported the survival rate of climbing perch ranged from - 96.57 ±0.03a %. Mandal et al. (2010), which also shows the same thing (96%). Whereas Zafar, et al, 2017, reported for the Vietnamese climbing perch variety the survival range was 93.25 - 95.14% and the mature variety was 64.00 – 72.00% (Kazi et al, 2016), the survival rate of the research was around 57.67 ± 1.53c - 71 ± 1.0a 67±1.0b %. The highest (93.60%) and lowest (83.06%) survival rates were in Thai climbing perch (T4) and local climbing perch (T3) (Kohinoor, et al, 2012). Survival rate (%) 95.15 – 96.06(Arnuparp, et al, 2020).

If seen from the average value of the research results, the different sex ratios are consistent with several previous studies with an average treatment during 90 days of maintenance where the survival of climbing perch in the treatment is sorted as follows:B25J75 (99.76%), B100J0 (99.66%), B0J100 (99.48%), B75J25 (99.44%) and B50J50 (81.75%), with a range of 81.75- 99.76.

Food conversion (FCR) research results (Arnuparp, et al, 2020)ranged from 1.55 ± 1.32 - 1.57 ± 1.02The food conversion value (FCR) of research results (Waseeh et al, 2020) ranges from 1.48 to 1.85, and 1.56. Kazi et al, 2021 reported that FCR food conversion values ranged from 2.81 to 3.19, the lowest value. Uddin et al, (2016) reported FCR ranging from 2.65 to 2.93 when cultured in Kaptai Lake cages. The results of this research have similarities with Christensen's experiments. Hasan et al (2010) reported that the FCR values of climbing perch kept in hapa ranged from 3.31 to 3.99, higher than this research. This is presumably due to the use of low quality pellet feed by Hasan et al (2010). Moniruzzaman et al (2015a) observed FCR (2.81-3.19). The results of research on different sex ratios show that the food conversion value gives the best average value sequentiallyB100J0 = 0.68, B75J25 = 0.84, B50J50 = 0.96, B25J75 = 1.12 and B0J100 = 1.6. When compared with the results of research 1 it is better and with previous studies it is still in line. The conversion value of handling the production of biofloc media, the availability of flocks and a protein feed content of 34% is thought to be a better food conversion and efficient use of flocks.

Emerenciano et al, (2017)suggested the ideal floc content in a biofloc system for shrimp in the range of 5 – 15 ml/L, fish fry in the range of 5-20 ml/L, juvenile to adult size (consumption size) in the range of 20-50 ml/L. The floc content of papuyu fish reared by biofloc and conventional systems is in the range of 15.50 – 43 m06 ml/L (Kumar et al, 2015). Because the range of flocs for all treatments was in the range of 9.583 - 10.524 ml/L, in line with the opinion (Emerenciano et al, 2017), but lower than the results of the research (Kumar et al, 2015). Thus there is an opportunity to increase the content of floc so that the availability of biofloc is more consumed by climbing perch. The temperature ranges in studies on conventional and biofloc systems are within acceptable ranges for fish farming, and these results are consistent with the findings of Uddin et al (2015), Uddin et al (2016), Bashar et al (2015a), Bashar et al (2015b), Moniruzzaman et al (2015a), and Moniruzzaman et al (2015b). Boyd (1982) has also reported that the water temperature range from 26.06 to 31.97°C is suitable for fish farming whereas according to(Emerenciano et al, 2017),in the biofloc system in the range of 28–30°. (Arnuparp, et al, 2020) reported water quality for papuyu fish in the biofloc system with a water temperature range of 26.80 - 30.67 °C. A good degree of acidity for the biofloc system is in the range of 6.8–8.0(Emerenciano et al, 2017), while the results of the research were lower than the results of the research (Kumar et al, 2015) on the climbing perch biofloc system in the range of 7.6 – 7.0. (Arnuparp, et al, 2020) reported water quality for climbing perch using the biofloc system with an acidity range of 7.85 – 8.14. From the results of this research the range of acidity degrees in all treatments was in the range of 6.87 – 7.04. Thus the degree of acidity of the media maintenance of the biofloc and conventional systems is ideal for the life and growth of the research climbing perch. DO concentrations at the experimental sites ranged from 5.1 to 7.8 mg L-1, which is within the acceptable range for aquaculture and is in line with the findings of Uddin et al (2015), Bashar et al (2015a), Bashar et al (2015b), and Alamgir (2004). However, fish can survive at 0.50 mg L-1 DO concentration, but the most suitable DO range for fish farming is suggested from 5.0 to 8.0 mg L-1 (DoF 1996). (Emerenciano et al, 2017), suggested that the dissolved oxygen content of the biofloc system was above 4 mg/L. (Arnuparp, et al, 2020) reported water quality for papuyu fish using the biofloc system with a dissolved oxygen range of 4.80 - 5.01 mg/L. From the results of this research, the dissolved oxygen content in all treatments was in the range of 4.02 - 4.90 mg/L. Thus the dissolved oxygen content is good for the formation of biofloc, the growth and life of the Papuan fish.The mean results of measurements of ammonia levels (mg/L) of climbing perch (*Anabas testudenius* Bloch) reared for 90 days using the biofloc and conventional systems with differences in the initial size of the fry of all treatments within the range of 0.49 – 0.57 mg/L. (Emerenciano et al, 2017) the dissolved ammonia content should be less than 1 mg/L whereas according to (Kumar et al, 2015) the results of research on the papuyu fish biofloc system obtained values of the range0.24 ± 0.05c - 0.78 ± 0.10aAmmonia-nitrogen (mg/L) 0.05-0.85 0.06-0.92 (Kohinoor, et al, 2016). (Arnuparp, et al, 2020) reported water quality for papuyu fish using the biofloc system with a dissolved ammonia range of 0.019 - 0.021 mg/L.

CONCLUSION

From the results of the research it can be concluded that the difference in sex ratio has a significant effect on the weight growth of climbing perch with a 100% ratio of females for enlargement resulting in the best daily growth rate. The B100J0 treatment was better. that in subset 1 the treatments B0J100, B75J27 and B50J50 were the same. In subset 2, treatments B50J50 and B75J25 were the same, while in subset 3, treatments B75J25 and B0J100 had the same growth. However, based on the median value, treatment B100J0 was better than treatments B75J25 and B50J50 and other treatments. The difference in relative weight (%) between treatments indicates that treatment B100J0 23.72% from treatment B75J25, 54.57% from treatment B50J50, 86.39% from treatment B25J75 and 172.87% from the B0J100 treatment. thus treatment B100J0 = 100% female and 0% male is the best treatment. This phenomenon indicates the sex of the papuyu papuyu fish with a ratio of 100% female to rearing produces the best daily growth rate. TreatmentB0J100, B25J75 and B50J50 showed the same standard length in subset 1 and subset 2 showed the same standard length increase between the B50J50 and B75J25 treatments. Whereas in subset 3, treatments B75J25 and B100J0 showed the same standard length.The results of the research using the sex composition obtained an additional length (cm) for 90 days for each treatment B100J0 = 1.92 cm, B75J25 = 1.19 cm, B500J50 = 1.78 cm, B25J75 = 1.31, B0J100 = 1.61 cm, indicating length The standard depends on the other types of climbing perch, the variety of fish species tested and the length of time they are kept.Treatments B0J100, B75J25 and B50J50 had the same survival in subset 1, while in subset 2 treatments B100J0 and B75J25 had the same survival. Sex ratio was significantly different between treatments to food conversion. Then the Post Hoc test was carried out, the results of the analysis showed that the B100J0, B75J25, B50J50 and B25J75 treatments in subset 1 were just as good in their food conversion. Whereas in subset 2 the B0J100 treatment was not the same as the other four treatments.Floc content ml/L. rangeflocs of all treatments within the range of 9.583 - 10.524 ml/L, were able to contribute in providing food in the rearing medium. The water temperature during the research period, air and water temperatures ranged from 26.89 – 27.62 °C (°C). From the results of this research the range of acidity degrees in all treatments was in the range of 6.87 – 7.04. The DO concentration at the experimental site ranged from 5.1 to 7.8 mg L-1, which is within the acceptable range for aquaculture. mg/L, Mean results of measurement of ammonia levels (0.49 – 0.57 mg/L) of climbing perch (*Anabas testudineus* Bloch) reared for 90 days in the biofloc system.

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