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Manuscript Submission (Penyerahan Naskah)



helmi zuryani <helmizuryani@gmail.com>

Sen, 15 Agu 2016,
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Title : Growth Performance of Mono Sex and Mixed Sex Climbing Perch (*Anabas testudineus*)
Author : Helmizuryani and Boby Muslimin
Institution : University of Muhammadiyah Palembang,
Organization : Departement of Aquaculture, Agriculture Faculty
Address/Phone : JL. Jenderal A. Yani 13 Ulu Palembang, South Sumatera, Indonesia / +6281315736505

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Growth Performance of Mono Sex and Mixed Sex Climbing Perch (*Anabas testudineus*)

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Abstract— Climbing perch (*Anabas testudineus*) is one of the native fish species in Indonesia. Spreading over several public waters on the island of Borneo, Sumatra and Java. This species is now beginning to be rare and endangered. Besides, the need for the Climbing perch in South Sumatra is increasing, but there are

challenges to produce climbing perch, need spend more time to get big climbing perch on aquaculture process, about 13 months. Many factors influence fish growth like rearing by sex. This study aims to determine the growth of the Climbing perch of the different sexes. This research was conducted at hatchery business

unit at Mulya Plaju, from May to July 2015. Fry spawning fish came from the wet Laboratory Faculty of Agriculture, University of Muhammadiyah Palembang. They were maintained separately between the male and the female and the gender-mix between male and female, reared in nets with a density of 30 individuals each net; each treatment was repeated three times. During the research, fry feed used artificial feed with 30% protein composition. The results showed that there was growth of female was faster than of male and of mixed sex. The growth of fish was 1,40-centimeters and weight of 4.56-gram, while survival rate of them was 100%.

Keywords— Growth, *Anabas testudineus*, Mixed Sex, Mono Sex

INTRODUCTION

Climbing perch (*Anabas testudineus*) is one of the native fish species Indonesia that spreads over several public waters on the island of Borneo, Sumatra, and Java. This fish is one type of resident fish (brackfishes) that generally lives wild in the waters of swamps, rivers and lakes. Demand for Climbing perch in South Sumatra is quite high, causing the price of Climbing perch to continue to rise. Climbing perch is favored by many people as the meat is good and tasty. However, it is not yet widely cultivated. In order to meet the demand for that fish, fishermen rely on catches from the wild season. Currently, this fish population declines because of overfishing. One effort which is needed to develop the fish farming is the provision of quality seed in adequate quantities and in the right time.

In 2012, we have started research on aquaculture of Climbing perch chaired by Helmizuryani and a team from the University of Muhammadiyah Palembang. The results of this study (first year) show that natural Climbing perch could be domesticated well, gonad maturation etching of parent fish and feed for the early domestication of the right is the tubifex worms feeding and spawning of etching method by injecting ovaprim. The second year was a continuation of the previous year to answer the question of why larvae growth of the Climbing perch was not optimal, with a focus on optimizing the maintenance of the Climbing perch (*Anabas testudineus*) from the time the larvae became the seed, so-called the phase of separating. The result indicated the fish seed etching can be maintained optimally with nursery in the tub; fish seed etching can adapt and evolve until physiologically well and the seeds could enlarge through the process of cultivation or acclimatization, proper maintenance to maintain fish seed etching through the stocking density, which was 30 fish per net, feed containing a mixture of maggot and pellet, and with a depth of 40 -centimeters. In the end, the result obtained was in the form of product quality fish seeds.

Nonetheless, once observed, there was a lack in optimizing the seeds to become preferred by the community; it was due to the absence of proper domestication in the maintenance of the Climbing perch as adult-size consumption is growing rapidly. It is necessary for the maintenance of a single sex as the community prefers consuming bigger fish.

MATERIAL AND METHODS

2.1. Study Area

Climbing perch were collected from Lebak Lebung, Komerling River, Ogan Komerling Ilir, South Sumatera.

2.2. Procedures

This research was conducted in the Hatchery Business Unit in Plaju for three months from May to July 2015. The materials used were: Seed of Climbing perch aged 90 days, 270 fish with weight of two-grams more or less, and a length of three centimeters, the spawning result of wet lab study program at Aquaculture Faculty of Agriculture, University of Muhammadiyah Palembang. The feed was given in the form of commercial pellets containing 30% protein. This was given as much as two to three percents of the weight of the population, given in the morning, afternoon and evening. The tool used were nine units of nets measuring 50x50x75-centimeters cubic and were placed in a pool measuring 20x8x3 meters cubic; pH meter, thermometer, DO meters, and ammonia measurement.

The study was conducted using completely randomized design method that was repeated three times. The treatments were: J1, the seed of Climbing perch with 30 male fish/ net; J2, the seed of Climbing perch with 30 female fish/ net; J3, the seed of Climbing perch with 30 mixed gender fish/ net. The parameters observed were:

Life sustainability (Survival Rate, or SR) is the number of fish that are still alive after a certain time. The fish were observed daily for identifying the death among them and the result was recorded. Survival value was calculated using the formula (Effendi, 2004): $\frac{\text{The number of fish that are still alive}}{\text{The number of first fish}} \times 100\%$

The weight of fish was measured by calculating weight gain and length, by using the formula (Effendi, 2004): $\text{The final weight of fish (gram)} - \text{Initial weight of fish (gram)}$, and $\text{Length gain: End length of fish (centimeters)} - \text{Initial length of the fish (centimeters)}$. Measurement of water quality included water temperature, pH, dissolved oxygen, dissolved carbon dioxide levels; this was done every 10 days. Observation results were tabulated in Complete Randomized Design Table, and analyzed using F analysis. If the analysis results obtain $F \text{ count} < F \text{ table}$ (5% and 1%), further tests are no need to be conducted, but if $F \text{ count} > F \text{ table}$, further tests must be conducted by involving coefficient of diversity. The average value of growth and survival of the fish will be displayed in the form of a histogram.

RESULTS AND DISCUSSION

3.1. Survival Climbing perch fish of the opposite sex

Figure 1 shows the survival rate of fish etching with different sexes and the highest percentage was in J2 treatment (female fish) at 100% followed with J1 (male fish) by 95.55% and the lowest one was in J3 (mixed gender fish) amounting to 75.55%. From the data obtained through subsequent calculation of variance analysis, it shows that the treatment toward the different sex fish had a significant effect on the survival rate (SR) of the Climbing perch. The same letter (b) means highly significant (5%).

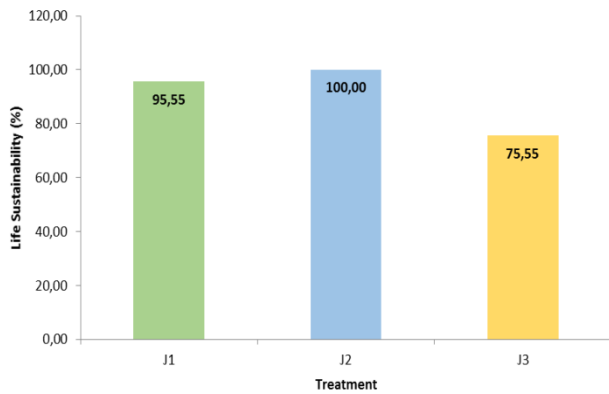


Fig. 1. Average rate of Life Sustainability of Climbing perch during the research

Tab. 1. Test on the smallest significant differences of Climbing Perch

Treatment	Average	LSD _{0,05} = 6,28
J1	95,55	b
J2	100,00	b
J3	75,55	a

Based on Table 1 above, 5% LSD test results showed that the J2 treatment had no significant effect to J1 but was significant to J3.

The survival value of Climbing perch seed with different sex ranged from 75.55 to 100%. The highest survival value was found in the J2 treatment of female fish by 100%. All the treatments were above 50%. The high survival value of the female was because female fish preferred to migrate from the bottom to the surface, and vice versa, while male fish preferred to be in the bottom. When the female fish were on the surface of the net, artificial feed which was supplied was directly consumed by fish seed etching, in addition to natural food as well. Furthermore, when the female fish moved to the bottom of net, remnants of feed that fell to the bottom of the net were also eaten by Climbing perch, in addition to the natural food form of benthos, which was also favored by the fish. Meanwhile, the lowest survival rate was in the mixed gender, between male and female, due to competition in fighting for food as each male and female fish was trying to get food. If available food was less than required, they would be cannibal. Then at the time of stocking fish of Climbing perch species between male and female, many could not survive or could not adapt with the new environment so that its survival rate was low.

3.2. The Growth of Length and Weight of Climbing perch with Different Sexes

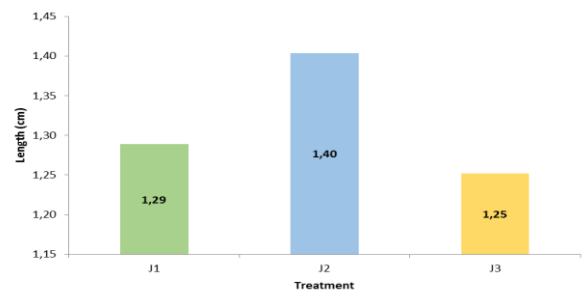


Fig. 2. Graph of the average length of Climbing perch growth during the research

Figure 2 shows that the highest length growth was in J2 treatment (female) with 1.40-centimeters, while the lowest one was in the J3 (male and female) of 1.25-centimeters. The diversity of the data analysis results shows that treatment with the opposite sex did not really affect the length growth of the Climbing perch, where F count was smaller than F table 5%.

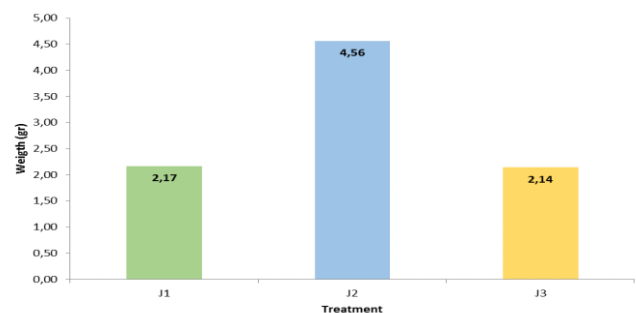


Fig. 3. Graph of the average weight of Climbing perch growth during the research

Also Fig. 3 shows the biggest weight gain was in J2 treatment (female) with 4.56-gram, while the lowest one was in J3 (male and female) with 2.14-gram. From the data analysis results, it showed that the diversity in treatment of the different sex significantly affected the weight gain of the Climbing perch, where F count was larger than F table 5%. The same letter means very significant (5%).

Table 2. Test on the smallest significant differences of Climbing perch

Treatment	Average	BNT _{0,05} = 1,60
J ₁	2,17	A
J ₂	4,56	b
J ₃	2,14	a

Based on Table 2, the results of 5% LSD indicate that J2 treatment had a significant effect on J1 and J3 treatments.

From the observations that have been made, the study of water quality was still feasible for the life of the seeds that were maintained. From the research of growth of mixed gender Climbing perch fish, on the seed, the highest length and weight growth was in J2 treatment, amounting to 1.40 -

centimeters length and 4.56-gram weight for female. Female Climbing perch grew faster than males because female Climbing perch were more active either in eating eat the feed or in swimming from the bottom to the surface in addition to the quality of the water supports. Natural food was spread on the surface to settle to the bottom of the water, so the natural food at the bottom of a pool / net could be eaten by the female fish on the surface and the artificial feed was also eaten by the female fish. The results of this study according to Kocour et al., (2003) who conducted research on goldfish that showed that carps which were kept in population of female fish grew faster than the mix (male-female), and carps which were maintained with one type of gender would have faster growth (Wohlfarth et al., 1975 in Kocour et al., 2003). The lowest value was found in J3 treatment with 1.25 -centimeters for the length and 2.14-gram for the weight of the male and female fish. The male and female Climbing perch competed in eating feed, thus the growth for each fish was slow. It was also caused by environmental conditions, which were less supportive for fish to grow and even caused the fish to become stressed. This is in line with the opinion from (Wedemeyer, 1996 in priyadi et al., 2010) that health issues and chronic stress are the results of social dominance of fish that are found in the interaction between the fish and are common in an intensive culture system, where the fish are subordinate (weak) and have very little access to take food and tend to grow more slowly; this is because of the caloric energy produced slightly as a result of a chronic stress condition. In the chronic condition, fish tend to be slow growing because they use more energy to survive rather than to grow.

Fish will be able to grow optimally if maintained properly by differentiating the gender (Kocour et al., 2003). There are several species of fish that have the capability for optimal growth with such distinction, such as tilapia (*Oreochromis niloticus*), in which male tilapia will grow faster than the female tilapia due to the ability to grow physically (Schreiber, et al., 2007). Things that make male tilapia grow faster are such as anabolism of the effects of androgen hormone, genotype, the quantity and quality of feed, stock management, and environment. Moreover, male tilapia have hyperphagia (high appetite) because they do not spend energy on reproduction (Bareto et al., 2003; Dagne et al., 2013). In addition to tilapia, common carp (*Cyprinus carpio L.*) is also fish whose growth rate is affected by gender. Special care to the female fish has a positive effect on growth when compared to pisciculture as bisexual (mixed male and female) (Kocour et al., 2003). Unisexual female tilapia also have the ability to grow faster than the male tilapia when reared individually. This is because the female fish are able to perform with good energy retention; it relates to the habit of female fish in storing food, especially to perform mouth-breeding (hatch and giving the intake of fish larvae in the mouth) that shows a low rate of fish metabolism and oxygen consumption rate. There are several things that affect the growth of male and female tilapia, namely physiological factors, environmental, and genetic factors (Schreiber, et al., 2007). In this study, female Climbing perch fish had a larger size compared with that of the male. This was because female Climbing perch fish was better in preparing for reproductive activity, especially in May (Alam et al., 2010). It is one of the habits of the Climbing

perch in the face of time prior to mating, which contrasts with female tilapia that reduce feeding, especially during the mouth-brooding (Schreiber et al., 2007). During the growth period of the Climbing perch, the most influential factor is feed; feed with the right content and appropriate level of protein, such as pellets with 50.92% protein, will cause fish etching to be optimal compared to 30% and 20% protein of pellets (Alam et al., 2010). In this study, fish etching was given feed with 30% protein for Climbing perch fish maintained in a net for only a single sex. The results on female fish show that they had optimal growth compared to the male fish that were kept in one net or mixture. Thus, the Climbing perch fish growth capability would be optimum with mono-sex maintenance, but it still needs further research for pisciculture of mono-sex etching accompanied by other factors that affect growth.

3.3. Water Quality.

From the observations (table 3) which have been conducted during the study, it shows that the temperature ranged from 27.0 to 30.0 °C; pH ranged from 7.2 to 8.2, dissolved oxygen 7.20 to 8.96 mg^l⁻¹; and ammonia ranged from 0.0485 to 0.0562 MGL¹. The water quality during the study was still feasible for the life of the seeds which were kept.

CONCLUSION

From the research that has been done, several things can be concluded as follows: Fish survival etching with different sex was highest in J2 treatment (female fish) by 100% and the lowest one was in J3 treatment (male and female) by 75.55%. The highest length growth was found in J2 treatment (female) amounting to 1.40 -centimeters, while the lowest one was in J3 (male) with 1.25 -centimeters and weight growth was the highest in J2 treatment (female) with 4.56 g, while the lowest was in J3 treatment (male and female) with 2.14 -gram.

ACKNOWLEDGMENT

The writer would like to thank the Directorate General of Higher Education that has funded this study, to all reviewers of this paper; Prof. Dr. Siti Herlinda, M.Si. from Biological Control, University of Sriwijaya (UNSRI), Palembang, South Sumatera; Dr. Ir. A.D. Murtrado, MP. for the Manuscript peer reviewer, and Dean at Agriculture Faculty, University of Muhammadiyah Palembang (UM Palembang); all participants of Research Institute for Inland Fisheries (RIIF), Palembang, South Sumatera); Prof Dr. Diah Natalisa, M.B.A. as the Chairman of Kopertis Region 2, South Sumatera, and Dr. H.M. Idris as Rector of the University of Muhammadiyah Palembang that has permitted this research, the Head of the Institute for Research and Service at Community of Muhammadiyah Palembang University who facilitated this research, all lecturers, and undergraduate students of Aquaculture Program, UM Palembang for the great guidance, valuable input, and support until the completion of this study, and all parties who have helped in this research

REFERENCES

- Alam, J., Mustafa, G., and Islam, M. 2010. "Effects of some artificial diets on the growth performance, survival rate and biomass of the fry of Climbing perch, *Anabas*". *Journal of Nature and Science*. Vol. 8 (2), pp 36-42.
- Barreto, R.E., Moreira, P.S.A., and Carvalho, R.F. 2003. "Sex-specific compensatory growth in food-deprived Nile tilapia". *Journal of Medical and Biological Research* Vol. 36, pp. 477-483.
- Dagne, A., Degefu, F., and Lakew, A. 2013. "Comparative growth Performance of Mono-Sex and Mixed-Sex Nile Tilapia (*Oreochromis niloticus* L.) in Pond Culture System at Sebeta, Ethiopian". *International Journal of Aquaculture* 3 (7). pp. 30-34.
- Effendi I. 2004. *Pengantar Akuakultur*. Penerbit Swadaya. Jakarta.
- Kocour, M., Linhart, O., and Gela, D., 2003. "Results of comparative growing test of all-female and bisexual population in two-year-old common carp (*Cyprinus carpio* L.)". *Journal of Aquaculture International*, vol. 11 (4), pp. 369-378.
- Priyadi, A., Ginanjar, R., Permana, A., and Slembrouck, J. 2010. "Tingkat Densitas Larva Botia (*Chromobotia macracanthus*) dalam Satuan Volume Air pada Aquarium Sistem Resirkulasi". *Prosiding Forum Inovasi Teknologi Akuakultur*. Ha. 439-446.
- Schreiber, S., Focken, U., and Becker, K. 2007. "Individually reared female Nile tilapia (*Oreochromis niloticus*) can grow faster than the males". *Journal of Applied Ichthyology*. 4 (1998) pp. 43-47.

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Terima kasih telah mengirimkan karya Anda ke jurnal kami.

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Pemimpin Redaksi

Omni-Akuatika





Growth Performance of Mono Sex and Mixed Sex Climbing Perch (*Anabas testudineus*)

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Received 20 June 2016; Accepted 15 October 2016; Available online 30 November 2016

ABSTRACT

Many factors influence fish growth like rearing by sex. This study aims to determine the growth of the Climbing perch of the different sexes. This research was conducted at hatchery business unit at Mulya Plaju, from May to July 2015. Fry spawning fish came from the wet Laboratory Faculty of Agriculture, University of Muhammadiyah Palembang. They were maintained separately between the male and the female and the gender-mix between male and female, reared in nets with a density of 30 individuals each net; each treatment was repeated three times. During the research, fry feed used artificial feed with 30% protein composition. The results showed that there was growth of female was faster than of male and of mixed sex. The growth of fish was 1,40 cm and weight of 4.56 gr, while survival rate of them was 100%.

Keywords : growth, *Anabas testudineus*, mixed sex, mono sex

1. Introduction

Climbing perch (*Anabas testudineus*) is one of the native fish species Indonesia that spreads over several public waters on the island of Borneo, Sumatra, and Java. This fish is one type of resident fish (brackfishes) that generally lives wild in the waters of swamps, rivers and lakes. Demand for Climbing perch in South Sumatra is quite high, causing the price of Climbing perch to continue to rise. Climbing perch is favored by many people as the meat is good and tasty. However, it is not yet widely cultivated. In order to meet the demand for that fish, fishermen rely on catches from the wild season. Currently, this fish population declines because of overfishing. One effort which is needed to develop the fish farming is the provision of quality seed in adequate quantities and in the right time.

Our preliminary research on Climbing perch that showed that natural Climbing perch can be domesticated by improving gonad maturation etching of parent fish, Tubifex worm feeding and spawning of etching method by injecting the ovaprim. Moreover, The result indicated the fish seed etching can be maintained optimally with nursery in the tub; fish seed etching can adapt and evolve until physiologically well and the seeds could enlarge through the process of cultivation or acclimatization, proper maintenance to maintain fish seed etching through the stocking density, which was 30 fish per net, feed containing a mixture of maggot and pellet, and with a depth of 40 cm. In the

end, the result obtained was in the form of product quality fish seeds.

Nonetheless, once observed, there was a lack in optimizing the seeds to become preferred by the community; it was due to the absence of proper domestication in the maintenance of the Climbing perch as adult-size consumption is growing rapidly. It is necessary for the maintenance of a single sex as the community prefers consuming bigger fish.

2. Material and Methode

Study Area

Climbing perch were collected from Lebak Lebung, Komerling River, Ogan Komerling Ilir, South Sumatera.

Procedures

This research was conducted in the Hatchery Business Unit in Plaju for three months from May to July 2015. The materials used were: Seed of Climbing perch aged 90 days, 270 fish with weight of 2 g more or less, and a length of 3 cm, the spawning result of wet lab study program at Aquaculture Faculty of Agriculture, University of Muhammadiyah Palembang. The feed was given in the form of commercial pellets containing 30% protein. This was given as much as two to three percents of the weight of the population, given in the morning, afternoon and evening. The tool used were nine units of nets measuring 50 x 50 x 75 cm and were placed in a pool measuring 20 x 8

x 3 m; pH, thermometer, dissolved oxygen, and ammonia were also measured.

The study was conducted using completely randomized design method that was repeated three times. The treatments were: J1, the seed of Climbing perch with 30 male fish/ net; J2, the seed of Climbing perch with 30 female fish/ net; J3, the seed of Climbing perch with 30 mixed gender fish/ net.

The parameters observed were:

Life sustainability (Survival Rate, or SR) is the number of fish that are still alive after a certain time. The fish were observed daily for identifying the death among them and the result was recorded. Survival value was calculated using the formula (Effendi, 2004): $\frac{\text{The number of fish that are still alive}}{\text{The number of first fish}} \times 100\%$

The weight of fish was measured by calculating weight gain and length, by using the formula (Effendi, 2004): $\frac{\text{The final weight of fish (g)} - \text{Initial weight of fish (g)}}{\text{Length gain: End length of fish (cm)} - \text{Initial length of the fish (cm)}}$. Measurement of water quality included water temperature, pH, dissolved oxygen, dissolved carbon dioxide levels; this was done every 10 days. Observation results were tabulated in Complete Randomized Design

Table, and analyzed using F analysis. If the analysis results obtain $F_{count} < F_{table}$ (5% and 1%), further tests are no need to be conducted, but if $F_{count} > F_{table}$, further tests must be conducted by involving coefficient of diversity. The average value of growth and survival of the fish will be displayed in the form of a histogram.

3. Results and Discussion

Survival Climbing perch fish of the opposite sex

Figure 1 shows the survival rate of fish etching with different sexes and the highest percentage was in J2 treatment (female fish) at 100% followed with J1 (male fish) by 95.55% and the lowest one was in J3 (mixed gender fish) amounting to 75.55%. From the data obtained through subsequent calculation of variance analysis, it shows that the treatment toward the different sex fish had a significant effect on the survival rate (SR) of the Climbing perch. The same letter (b) means highly significant (5%).

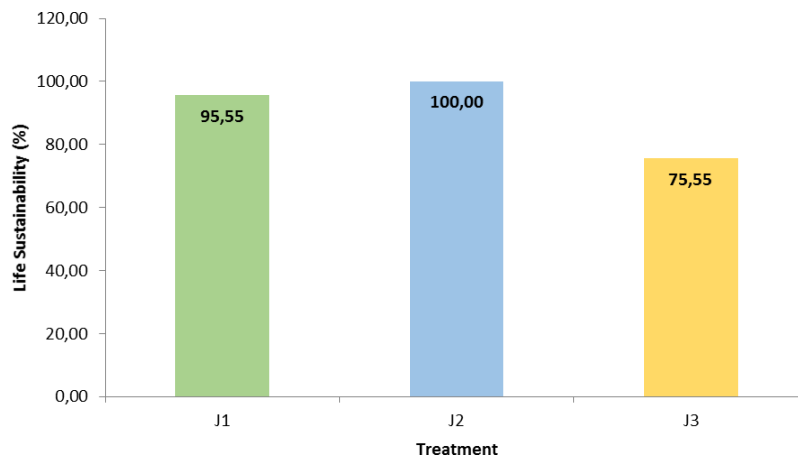


Fig. 1. Average rate of Life Sustainability of Climbing perch during the research

Tab. 1. Test on the smallest significant differences of Climbing Perch

Treatment	Average	LSD _{0,05} = 6,28
J1	95,55	b
J2	100,00	b
J3	75,55	a

Based on Table 1 above, 5% LSD test results showed that the J2 treatment had no significant effect to J1 but was significant to J3. The survival value of Climbing perch seed with different sex ranged from 75.55 to 100%. The highest survival value was found in the J2 treatment of female fish by 100%. All the treatments were above 50%. The high survival value of the female was because female fish preferred to migrate from the bottom to the surface, and vice versa, while male fish preferred to be in the bottom. When the female fish were on the surface of the net, artificial feed which was supplied was directly consumed by fish seed etching, in addition to natural food as

well. Furthermore, when the female fish moved to the bottom of net, remnants of feed that fell to the bottom of the net were also eaten by Climbing perch, in addition to the natural food form of benthos, which was also favored by the fish. Meanwhile, the lowest survival rate was in the mixed gender, between male and female, due to competition in fighting for food as each male and female fish was trying to get food. If available food was less than required, they would be cannibal. Then at the time of stocking fish of Climbing perch species between male and female, many could not survive or could not adapt with the new environment so that its survival rate was low.

The growth of length and weight of Climbing perch with different sexes

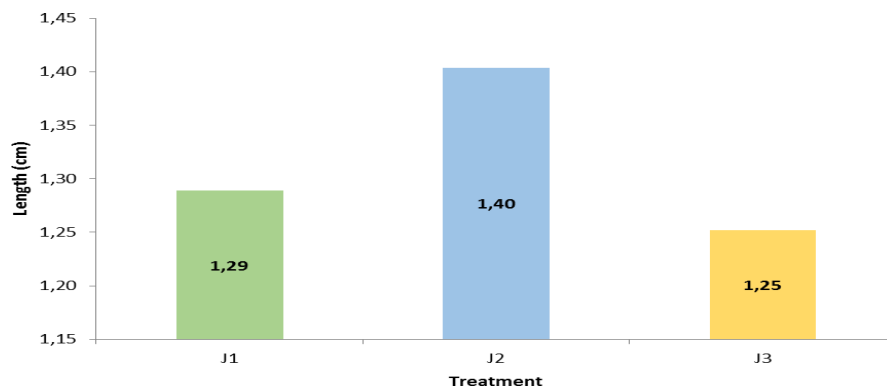


Fig. 2. Graph of the average length of Climbing perch growth during the research

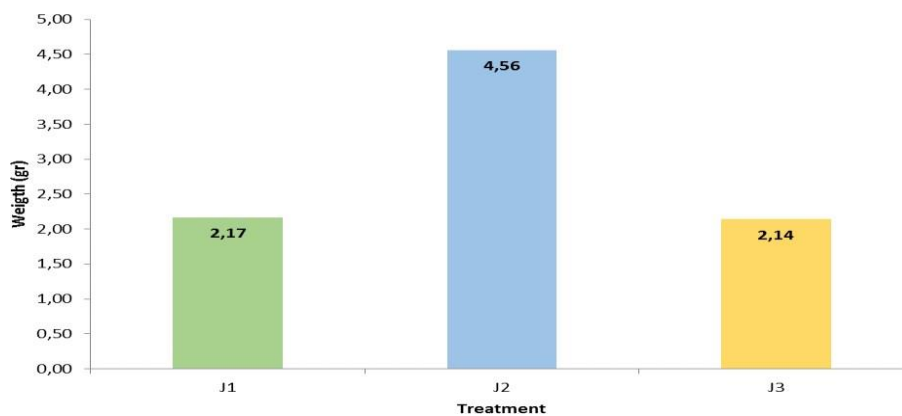


Fig. 3. Graph of the average weight of Climbing perch growth during the research

Table 2. Test on the smallest significant differences of Climbing perch

Treatment	Average	
J ₁	2,17	a
J ₂	4,56	b
J ₃	2,14	a

BNT_{0,05} = 1,60

Figure 2 shows that the highest length growth was in J2 treatment (female) with 1.40 cm, while the lowest one was in the J3 (male and female) of 1.25 cm. The diversity of the data analysis results shows that treatment with the opposite sex did not really affect the length growth of the Climbing perch, where F count was smaller than F table 5%.

Also Fig. 3 shows the biggest weight gain was in J2 treatment (female) with 4.56 g, while the lowest one was in J3 (male and female) with 2.14 g. From the data analysis results, it showed that the diversity in treatment of the different sex significantly affected the weight gain of the Climbing perch, where F count was larger than F table 5%. The same letter means very significant (5%).

Based on Table 2, the results of 5% LSD indicate that J2 treatment had a significant effect on J1 and J3 treatments. From the observations that have been made, the study of water quality was still feasible for the life of the seeds that were maintained. From the research of growth of mixed gender Climbing perch fish, on the seed, the highest length and weight growth was in J2 treatment, amounting to 1.40 cm length and 4.56 g weight for female. Female Climbing perch grew faster than males because female Climbing perch were more active either in eating eat the feed or in swimming from the bottom to the surface in addition to the quality of the water supports. Natural food was spread on the surface to settle to the bottom of the water, so the natural food at the bottom of a pool / net could be eaten by the female fish on the surface and the artificial feed was also eaten by the female fish. The results of this study according to Kocour et al., (2003) who conducted research on goldfish that showed that carps which were kept in population of female fish grew faster than the mix (male-female), and carps which were maintained with one type of gender would have faster growth (Wohlfarth et al., 1975 in Kocour et al., 2003). The lowest value was found in J3 treatment with 1.25 cm for the length and 2.14 g for the weight of the male and female fish. The male and female Climbing perch competed in eating feed, thus the growth for each fish was slow. It

was also caused by environmental conditions, which were less supportive for fish to grow and even caused the fish to become stressed. This is in line with the opinion from (Wedemeyer, 1996 in priyadi et al., 2010) that health issues and chronic stress are the results of social dominance of fish that are found in the interaction between the fish and are common in an intensive culture system, where the fish are subordinate (weak) and have very little access to take food and tend to grow more slowly; this is because of the caloric energy produced slightly as a result of a chronic stress condition. In the chronic condition, fish tend to be slow growing because they use more energy to survive rather than to grow.

Fish will be able to grow optimally if maintained properly by differentiating the gender (Kocour et al., 2003). There are several species of fish that have the capability for optimal growth with such distinction, such as tilapia (*Oreochromis niloticus*), in which male tilapia will grow faster than the female tilapia due to the ability to grow physically (Schreiber, et al., 2007). Things that make male tilapia grow faster are such as anabolism of the effects of androgen hormone, genotype, the quantity and quality of feed, stock management, and environment. Moreover, male tilapia have hyperphagia (high appetite) because they do not spend energy on reproduction (Bareeto et al., 2003; Dagne et al., 2013). In addition to tilapia, common carp (*Cyprinus carpio L.*) is also fish whose growth rate is affected by gender. Special care to the female fish has a positive effect on growth when compared to pisciculture as bisexual (mixed male and female) (Kocour et al., 2003). Unisexual female tilapia also have the ability to grow faster than the male tilapia when reared individually. This is because the female fish are able to perform with good energy retention; it relates to the habit of female fish in storing food, especially to perform mouth-breeding (hatch and giving the intake of fish larvae in the mouth) that shows a low rate of fish metabolism and oxygen consumption rate. There are several things that affect the growth of male and female tilapia, namely physiological factors, environmental,

and genetic factors (Schreiber, et al., 2007). In this study, female Climbing perch fish had a larger size compared with that of the male. This was because female Climbing perch fish was better in preparing for reproductive activity, especially in May (Alam et al., 2010). It is one of the habits of the Climbing perch in the face of time prior to mating, which contrasts with female tilapia that reduce feeding, especially during the mouth-brooding (Schreiber et al., 2007). During the growth period of the Climbing perch, the most influential factor is feed; feed with the right content and appropriate level of protein, such as pellets with 50.92% protein, will cause fish etching to be optimal compared to 30% and 20% protein of pellets (Alam et al., 2010). In this study, fish etching was given feed with 30% protein for Climbing perch fish maintained in a net for only a single sex. The results on female fish show that they had optimal growth compared to the male fish that were kept in one net or mixture. Thus, the Climbing perch fish growth capability would be optimum with mono-sex maintenance, but it still needs further research for pisciculture of mono-sex etching accompanied by other factors that affect growth.

Water Quality

From the observations (table 3) which have been conducted during the study, it shows that the temperature ranged from 27.0 to 30.0 °C; pH ranged from 7.2 to 8.2, dissolved oxygen 7.20 to 8.96 mg^l⁻¹; and ammonia ranged from 0.0485 to 0.0562 mg^l⁻¹. The water quality during the study was still feasible for the life of the seeds which were kept.

4. Conclusion

From the research that has been done, several things can be concluded as follows: Fish survival etching with different sex was highest in J2 treatment (female fish) by 100% and the lowest one was in J3 treatment (male and female) by 75.55%. The highest length growth was found in J2 treatment (female) amounting to 1.40 cm, while the lowest one was in J3 (male) with 1.25 cm and weight growth was the highest in J2 treatment (female) with 4.56 g, while the lowest was in J3 treatment (male and female) with 2.14 g.

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References

- Alam, J., Mustafa, G., Islam, M. 2010. "Effects of some artificial diets on the growth performance, survival rate and biomass of the fry of Climbing perch, *Anabas*". *Journal of Nature and Science* 8 (2): 36-42.
- Barreto, R.E., Moreira, P.S.A., Carvalho, R.F. 2003. "Sex-specific compensatory growth in food-deprived Nile tilapia". *Journal of Medical and Biological Research* 36: 477-483.
- Dagne, A., Degefu, F., Lakew, A. 2013. "Comparative growth Performance of Mono-Sex and Mixed-Sex Nile Tilapia (*Oreochromis niloticus* L.) in Pond Culture System at Sebeta, Ethiopian". *International Journal of Aquaculture* 3 (7): 30-34.
- Effendi, I. 2004. *Pengantar Akuakultur*. Penerbit Swadaya. Jakarta.
- Kocour, M., Linhart, O., Gela, D., 2003. "Results of comparative growing test of all-female and bisexual population in two-year-old common carp (*Cyprinus carpio* L.)". *Journal of Aquaculture International* 11 (4): 369-378.
- Priyadi, A., Ginanjar, R., Permana, A., Slembrouck, J. 2010. "Tingkat Densitas Larva Botia (*Chromobotia macracanthus*) dalam Satuan Volume Air pada Akuarium Sistem Resirkulasi". *Prosiding Forum Inovasi Teknologi Akuakultur*. 439-446.
- Schreiber, S., Focken, U., Becker, K. 2007. "Individually reared female Nile tilapia (*Oreochromis niloticus*) can grow faster than the males". *Journal of Applied Ichthyology* 4: 43-47.