The profile of *Carassius auratus* growth and hepatosomatic index in different salinity

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**Abstract.** Carassius fish culture is usually carried out in freshwater with 0 ppt salinity, but the maintenance of 0 ppt salinity is less comprehensive in distributing fish culture itself. Therefore maintenance of fish with raised salinity is one of the solutions for cultivators so that fish farming can optimally be distributed. This study aims to determine the growth and hepatosomatic index (HSI) of *Carassius auratus* that are maintained at different salinity for 30 days. This experimental study used a Completely Randomized Design (CRD) with four treatments, namely P0 (0 ppt), P1 (4 ppt), P2 (8 ppt), and P3 (12 ppt) with five replications. The parameters of this study were fish growth, hepatosomatic index (HSI), and survival rate (SR). The results showed that the salinity of 12 ppt gave a low growth value and the highest HSI value. The survival rate that is generated at all events is 100%.

1. Introduction

Carassius fish is one of high marketed commodity fish in Indonesia. The high demand for freshwater aquarium fish in another area besides the center of cultivation can lower the quality of the fish. In aquarium fish cultivation, one of the low-quality problems is in the delivery process [1]. The most significant area of freshwater aquarium fish cultivation center is East Java (Blitar, Tulungagung dan Kediri), Jawa Barat, DKI Jakarta, Banten, and Daerah Istimewa Yogyakarta, from the recorded data. It is concluded that the widespread of Carassius fish in Indonesia is less evenly distributed, which is necessary to create equitable distribution in its cultivation.

Environmental changes, specifical salinity in fish tend to affect fish growth [2]. Energy source in fish is obtained from food then turns into body metabolism process as well as the adaptation process from environmental change. Environmental changes in pisciculture particularly from the change of salinity level is able to be a parameter to acknowledge fish's response because every fish, in general, has high sensitivity towards environmental change [3].

Hepatosomatic index and growth observation of Carassius fish can be an innovation in Carassius cultivation with the media of maintaining salinity water to produce high growth outcomes. Judging from the various benefits from the research, it is essential to support the effort of optimizing Carassius fish cultivation in every region with the reference of hepasmotic index and growth of Carassius fish in different water salinity obtained by the current observation.
2. Material and method
This research was conducted at the PSDKU Banyuwangi education laboratory, Faculty of Fisheries and Marine, Universitas Airlangga.

2.1. Test organism
In this study, the fish observed were carassius fish with 11-12 cm in size from cultivators in Banyuwangi.

2.2. Fish rearing
The cyprinid were reared in a 3 L of volume at a density of 1 fish/L for each treatment.

2.3. Treatment
This study employed a complete randomized design for the experimental method with four treatment of different salinity and five replication, respectively. Before the different salinity treatment was done, environmental adaptation was conducted by slowly increasing the salinity level, from 0,4, 8 and 12 ppt.

2.4. Data analysis
The observation data were analyzed using ANOVA, whether or not the results from the analysis of variant showed significantly different results, then it was followed by Duncan's Multiple Range Test to determine the treatment with the best response at 95% degree.

3. Result and discussions
3.1 Result
Based on observations of different salinity treatment for Carassius fish in rearing media, it influences the growth but does not affect the hepatosomatic index (HSI) and survival rate. Growth rate, hepatosomatic index and survival rate of Carassius fish is presented in Table 1.

Table 1. Growth rate, hepatosomatic index, and survival rate of Carassius auratus.

| Treatment | Weight (gram) ± SD | Length (cm) ± SD | HSI (%) ± SD | SR (%) |
|-----------|--------------------|-----------------|--------------|--------|
| P0        | 1.37 ± 0.04        | 2.43 ± 0.25     | 0.457 ± 0.06 | 100    |
| P1        | 1.15 ± 0.03        | 2.04 ± 0.03     | 0.462 ± 0.07 | 100    |
| P2        | 1.14 ± 0.04        | 1.46 ± 0.03     | 0.485 ± 0.03 | 100    |
| P3        | 0.21 ± 0.03        | 1.10 ± 0.02     | 0.508 ± 0.02 | 100    |

Explanation: letters above the bar is similar indicate that there is no difference in the effect of salinity (P ≥ 0, 05) which was tested by Duncan. P0 : Salinity Level is 0 ppt ; P1 : Salinity Level is 4 ppt; P2 : Salinity Level is 8 ppt; P3 : Salinity Level is 12 ppt

3.2 Discussion
Salinity is a total concentration of ion solved in the water [4]. Salinity is strongly related to ionic and osmotic pressure in water as the internal and external media. Salinity is necessary for fish to regulate the balance between the body and water environment. Balance water stimulates a high growth rate due to the balancing of body fluids, then the energy from feed nutrition will be used for growth. On the contrary, if the fluids are an imbalance, the energy will be spent to maintain the balance of fish body fluids. In order of the physiological process of the body can normally run, thus a process to regulate different osmotic pressure between the environment and fish body is necessary. Body fluids of freshwater fish are more prominent than its habitat which causes salts to tend to excrete from the body and water diffuse into the body osmotically through the surface semipermeable skin [5].

This research conducted using salinity susceptibility in the treatment of Carassius fish is determined by the previous research and literature review of goldfish research which live and grow well in a pond with low salinity level [5]. Carassius fish in P0 treatment is 0 ppt salinity, fish are in isotonic condition
with their environment, in result, the energy is optimally utilized for growth. Fish farming in isoosmotic condition has a beneficial effect due to energy storage by the low energy for the osmosis process and ionic effect so that the growth increases [6].

In accord with research result in four weeks, the value of HSI of Carassius fish (Table 1.) does not have any significant difference due to Carassius fish adaptation to balance their body fluids with external fluids. Carassius fish needs more energy to balance their body fluids, as a consequence, the breakdown of glucose in glycolysis process causes the fish liver to excrete lipid and decrease liver weight. [7] stated that fish which undergo adaptation process to its environment then causes liver cell to release glucose and lipid when glycolysis process to alleviate fish’s liver weight. The condition indicates that the exposure of salinity is still unable to influence liver weight change as the parameter of HSI value. The statement is supported with research that shows the significant result of HSI in 96 days of treatment with different salinity level among others 2 ppt, 4 ppt, 6 ppt, 8 ppt, 10 ppt dan 12 ppt to common carp fish [8]. Therefore, from this study, HSI of Carassius fish does not appear any significant difference because of the periodicity of treatment is unable to affect the change of Carassius fish HSI. Beside, adaptation process by the drip acclimation method can keep down the fish from stress which affects to the lipolysis process. In result, Carassius fish does show any significant difference.

Length of growth of salinity treatment does show significant difference (p<0,05) (Table 1.). Length of Carassius fish gives the best result at P0 which is 0 ppt salinity level, this result is due to the original habitat of Carassius fish at 0 ppt salinity [9].

The highest length in Carassius fish at 0 ppt salinity aside from similar condition with its original habitat is because of salinity is one of environmental factors that can give stressor to fish and causes fish to adapt or balance the fluids between the fish body and external environment. With the result, if salinity level is higher then the energy need is also higher and energy for the growth will be used to adapt which makes the growth rate become slower [10].

Based on table 1, it could be seen that the highest length of growth is P0 (0 ppt salinity) and the lowest is P2 and P3 which is in 8-12 ppt salinity level. The result is due to the environment factor [11]. The environment factor leads to unstable metabolism performance, thus the eaten feed is not utilized properly. A type of fish growth will be slower compared to a fish in optimal conditions if the fish are experiencing conditions that are not in accordance with the fish's living habits, so also in areas with hot climates the growth of fish will be faster than in cold area [6]. According to [6], velocity length growth of individual and long frequency distribution is the characteristic of the fish population. Generally, fish have an erratic growth rate, and all ages and sizes cannot be separated from growth [11].

Weight growth of Carassius fish from this research shows different result significantly among treatments, and the best treatment is P0 at 0 ppt salinity, it was the same as the growth of length. Weight of fish would be better if environmental conditions following the original habitat of the Carassius fish, such as the results obtained from research conducted, i.e. in addition to salinity at 0 ppt is salinity under the original salinity of Carassius fish [12].

The increase in salinity causes fish to adapt continuously and tends to spend more energy. For this matter, consequently, the body's condition becomes isoosmotic so that the fish can carry out metabolic processes and weight growth will be better [6]. The study states that the increased salinity level in rearing the fish decreases in weight growth rate and this is consistent with the results obtained in research conducted on carassius fish, which is the growth of Carassius fish weight decreases at higher salinity.

4. Conclusion
The value of HSI value in each treatment of the research does not show any significant result (P<0,05), it is due to the time of salinity exposure still less. The given salinity treatment influences the growth and length of Carassius fish. It has been presented from the data analysis, which shows that P0 (0 ppt) is the best treatment with the highest length-weight compares to other treatments at 4 ppt, 8 ppt and 12 ppt salinity.
5. References

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