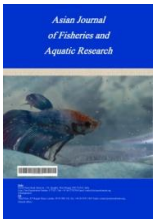

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The Use of Various Proportions of Rough Fish on Giant Trevally (*Caranx* sp.) Culture in the Floating Net Cages, Pangandaran, West Java

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

This research aims to determine the effect of providing rough fish and pellets with optimal dosages on the Giant Trevally culture to produce the highest growth in Pangandaran floating net cages. This research was conducted in August 2019 to September 2019 with 60 days fish rearing. The method used in this study was a Completely Randomized Design (CRD) with five treatments and three replications. The treatments were A (0% rough fish and 100% pellets), B (25% rough fish and 75% pellets), C (50% rough fish and 50% pellets), D (75% rough fish and 25% pellets) and E (100% rough fish and 0% pellets). The effect of each treatment was tested by analysis of variance (ANOVA) F test at an interval of 5%; if there were significant differences then followed by Duncan's multiple range test. The parameters observed in this study included fish survival (SR), Daily Growth Rate (LPH), Feed Efficiency (EPP) and water quality at the study site. The results obtained from this study were the provision of rough fish in Giant Trevally was able to increase the Daily Growth Rate (LPH) and the Efficiency of Feeding (EPP) for Giant Trevally. The highest growth value in this study was in treatment E (with 100% rough fish and 0% pellets) with LPH of 3.01%, total weight of 109.47gr and EPP of 30.60%.

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Keywords: Rough fish; pellets; daily growth rate; efficiency of feeding.

1. INTRODUCTION

Marine fish farming in Indonesia has actually begun to develop but is still not sufficiently well known in the community [1-3]. Some Research Centers (Fisheries) have done a lot of research on marine fish farming although most are still on an experimental scale to see the effect of certain aspects. Commercial-scale research has also been tried for several important economic commodities such as Giant Trevally (*Caranx* sp.), Snapper (*Lutjanus sp.*), Milkfish (*Chanos chanos*), napoleon fish (*Cheilinus sp.*), Red tilapia (*Oreochromis niloticus*) and others [15,16].

Giant Trevally has many advantages when cultivated such as resistant to environmental changes, resistant to disease, fast growing, easy maintenance and looking for easy seeds. Giant Trevally including predatory fish eats small fish and other animals. Giant Trevally has a higher growth rate compared to other types of fish and these fish are carnivorous [4,5].

One of the biggest production costs is pellets commercial feed which is so expensive that approximately 50% of the production cost is spent on feed costs during the cultivation. The price for Megami brand fish pellets weighing 1 kg was around IDR. 22,500.00. Therefore, alternative feed is needed to reduce production costs. One of the alternatives is by using rough fish feed which is still easy to find and has relatively low prices [6-9]. The protein of rough fish quality is as good as commercial feed. The range of rough fish prices in fishermen or markets is IDR 4,000 - 6,000/kg [10,6,7].

In intensive fish farming, the price of fish feed which is increasingly expensive becomes ones of the biggest problems faced by fishermen. Fish feed is divided into two namely natural feed and artificial feed. The availability of natural food is limited, therefore the need for artificial feed as an alternative to meet the nutritional needs of fish is unavoidable. A good artificial feed must contain all the nutrients needed by fish such as carbohydrates, fats, proteins, minerals and vitamins and essential amino acids in sufficient quantities and balanced. In intensive fish farming activities, the high price of commercial feed will affect the higher production costs.

Overcoming these problems requires cheaper and better feed for fish. Aquaculture of sea fish including Giant Trevally still relies on rough fish as an alternative feed. The availability of rough fish feed which is dependable on the season and the fact that rough fish is also a source of animal protein for some Indonesian people makes the alternative use of artificial feed in aquaculture activities is very important.

Petek fish is one of the most rough fish that reaches thousands of tons in Indonesian waters and this fish has not been used optimally. Petek is available in sufficient quantities and has a relatively cheap price and has high enough protein content. Usually, these fish are only used as salted fish. Protein content contained in petek fish is quite high (50.53%), so petek fish can be used as an inexpensive alternative raw material compared to imported fish feed [13,14].

Protein is the most important nutrient as material for forming body tissue in the growth process. Besides, protein is also very efficient as a source of energy for aquatic animals, especially carnivorous fish. The amount and quality of feed protein will affect growth. If the protein in the feed is low, the protein in the body's tissues will be utilized to maintain more important tissue functions [15,16]. On the contrary, if the excess protein is not used in protein synthesis and the body of the fish, it will be accreted as nitrogen waste, especially in the form of ammonia. This ammonia will then be accreted into the water which can eventually increase the level of ammonia in the waters and this of course can endanger fish life [17].

Giant Trevally is very responsive to areas with low salinity, has a fast growth rate, is quite efficient at utilizing feed and is also favored by domestic and foreign people. The high consumer demand for the Giant Trevally is due to the relatively high price of Giant Trevally fish which is able to reach IDR 70,000/kg. The impact of the high demand is the size of the Giant Trevally fish caught is not selective.

2. MATERIALS AND METHODS

The study was conducted with an experimental method using a Completely Randomized Design (CRD) consisting of 5 treatments and 3 replication with the contrast of increment on ratio of rough fish and commercial feed as follows:

1. Treatment A: 0% of rough fish + 100% of commercial feed
2. Treatment B: 25% of rough fish + 75% of commercial feed
3. Treatment A: 50% of rough fish + 50% of commercial feed
4. Treatment A: 75% of rough fish + 25% of commercial feed
5. Treatment A: 100% of rough fish + 0% of commercial feed

3. RESULTS AND DISCUSSION

3.1 Survival Rate (SR)

The survival rate is a comparison value between the number of organisms that live at the end of maintenance and the number of initial organisms at stocking which is expressed in terms of percentages where the greater the percentage value indicates that more organisms live during a certain maintenance period in a culture container. Survival can be used as a benchmark to find out tolerance and the ability of aquatic organisms to live. Survival Rate of Giant Trevally Fish based on all treatment presented in Fig. 1.

Based on observations of the Giant Trevally for 60 days showed that the survival rate value of all treatments A to E was 100%. During the study, the treatment given were A: 0% rough fish and 100% pellets, B: 25% rough fish and 75% pellets, C: 50% rough fish and 50% pellets, D: 75% rough fish and 25% pellets and treatment E: 100% rough fish and 0% pellets.

The treatment resulted in the survival of fish growing and living well until the study was completed. Providing adequate quantity and quality of feed as well as good environmental conditions will increase the survival of the fish being kept. Conversely, the lack of feed and poor environmental conditions will have an impact on fish health and will reduce the survival of the fish being kept.

Factors that can cause growth in the survival rate of Giant Trevally are internal and external factors. Internal factors that influence are resistance to disease, food and age. Foods that have good nutrition play an important role in maintaining survival and accelerating fish growth. External factors that influence are stocking density, disease and water quality. Foods that have good nutrition play an important role in maintaining survival and accelerating fish growth.

3.2 Daily Growth Rate

Growth is the process of changing individuals or biomass over a certain period. Fish growth is influenced by external and internal factors. Internal factors are difficult to control, including heredity, gender and age. External factors include parasites and disease, but the main factors affecting growth are water temperatures and food.

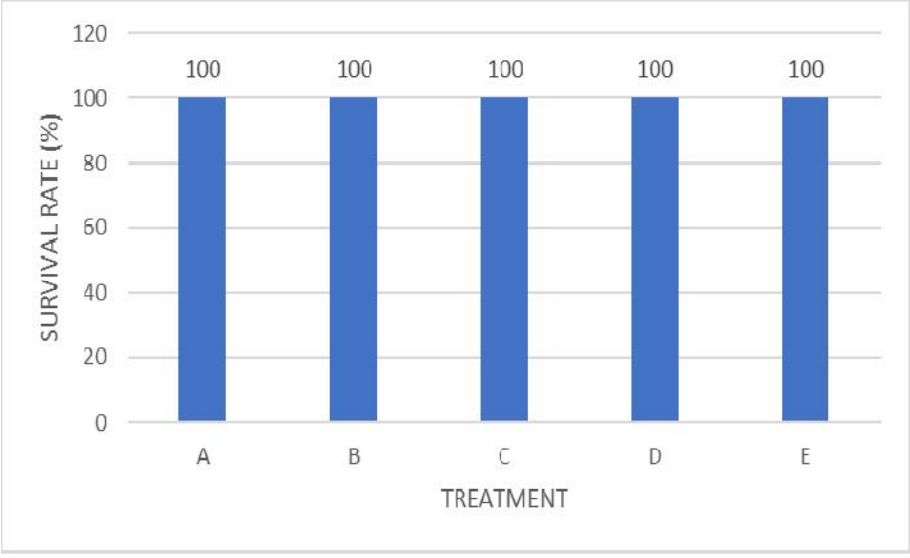

Fig. 1. Result of survival rate

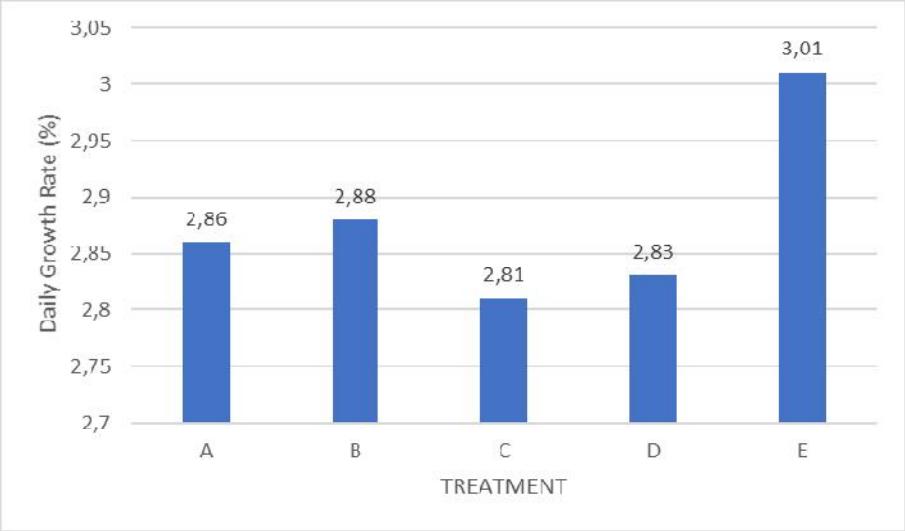

Fig. 2. Daily growth rate

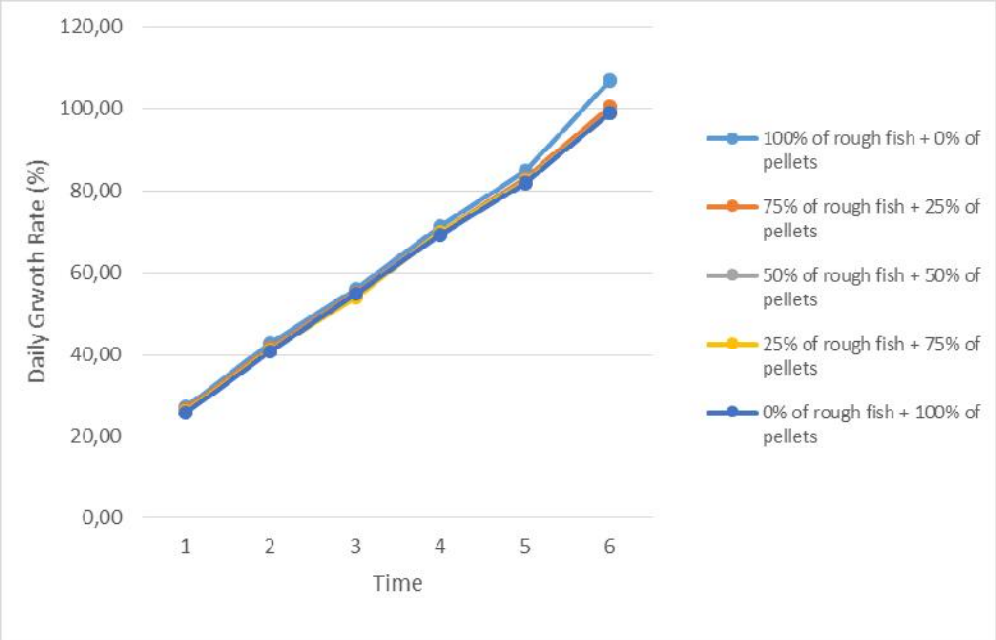

Fig. 3. Growth curve for 60 days

Based on Fig. 2, it can be seen that the daily growth rate of Giant Trevally ranges from 2.81% to 3.01%. The highest daily growth rate value is treatment E at 3.01%, followed by treatment B at 2.88%, treatment A at 2.86%, treatment D at 2.83% and the lowest daily growth rate is treatment C with the value of 2.81%.

The factor that influences the growth of fish is the protein content in the feed because the protein functions to form new tissue for growth and replace damaged tissue. Lack of protein has a negative effect on feed consumption, consequently a decrease in weight growth. Excess protein and fat can cause fat accumulation, reduced fish appetite. Nutritional value (nutrition) of feed is generally seen from the composition of nutrients and how many important nutritional components and must be available in feed, including proteins, fats,

carbohydrates, and vitamins. The protein contained in rough fish is 52.26%, while fat is 1.49% and carbohydrate is 1.79% which makes Giant Trevally grow well when research compared pellets.

Table 1. Duncan double range test of daily growth rate

Treatments	Average of daily growth rate (%)
A	2.86±0.068 a
B	2.88±0.070 ab
C	2.81±0.074 bc
D	2.83±0.076 c
E	3.01±0.077 d

Where: The value followed by the same letter is not significantly different according to Duncan's Multiple Rang Test at 95% of the confidence interval

Based on Fig. 3, the growth pattern of Giant Trevally as a whole starting from day 1 to day 60 shows the logarithmic phase where in this phase the growth goes quickly and the fish's weight increases every day. The highest average weight of fish on the 60th day was on treatment E with a weight of 109.47 grams/head, then treatment D was 101.07 grams/head, C treatment was 99.70 grams/head, treatment B was 99.03 grams/head, and the smallest one is treatment A which was 99.22 grams/head. Growth in fish is influenced by internal and external factors. Internal factors include heredity, sex and age while external factors include food and water quality.

3.3 Efficiency of Feeding

Feeding efficiency is the ratio between body weight produced and the amount of feed given during the study. The efficiency of feeding is directly proportional to the increase in body weight, so the higher the value of the efficiency of feeding means the more efficient the fish use the food consumed for growth.

As shown by Fig. 3, the highest value of feeding efficiency was found in treatment E at 30.60%, then followed by treatment D at 24.89%, treatment C at 24.38%, treatment B at 23.00%, and treatment with the smallest value of feeding efficiency was treatment A with a value of feeding efficiency of 22.52%. The efficiency of feeding can be influenced by the quality of rough fish. Fish growth occurs due to the intake of food that enters the body and is converted into energy for activity and metabolism.

Table 2. Duncan double range test of the efficiency of feeding

Treatments	Efficiency of feeding (%)
A	22.52±1.201 a
B	23.00±1.234 ab
C	24.38±1.293 bc
D	24.89±1.320 c
E	30.60 ±1.344 d

Where: The value followed by the same letter is not significantly different according to Duncan's Multiple Rang Test at 95% of the confidence interval

The size of the mouth opening will be one of the easy factors in the process of getting food into the body. The size of fish food that is larger than the mouth opening will cause the ability to eat food will be hampered and as well as the growth.

3.4 Water Quality Parameters

Water quality is the feasibility of water to support life and growth whose value is expressed in a certain value range (Boyd 1990). Temperature can affect the activity of eating fish, an increase in temperature can affect the metabolic activity of fish, the higher the temperature, the faster the waters will experience oxygen saturation. The temperature on the coast of the East Coast of Pangandaran has an average of 25-28°C which is not too good for the growth of Giant Trevally because of the long dry season.

The degree of acidity (pH) that is too low or too high can cause stunted fish growth due to stress on the fish. According to SNI, the optimal pH for raising Giant Trevally with age over 60 days is 8.0 - 8.2. Meanwhile, the pH on the East Coast of Pangandaran is 7.1 and can be said to be in accordance with quality standards.

Oxygen levels (DO) on the East Coast of Pangandaran have an average of 5.3 mg/L. Temperature is a factor that can affect the level of dissolved oxygen (DO) in waters. Low temperatures can increase the dissolved oxygen content (DO) which will then increase the metabolic rate of aquatic organisms. Dissolved oxygen is a factor that is needed for fish to breathe and metabolism in the body that will produce movement, growth and reproduction. If the oxygen content is low then it can cause the fish to lose its appetite and can result in stunted growth.

Table 3. Value of water quality range on KJA

Parameters	Water quality on KJA	Quality standards*	Units
Suhu	25– 28	27 – 29	°C
DO	5.3	> 5	mg/L
pH	7.1	8.0 – 8.2	-

**Anonim 2012. Kumpulan Standar Nasional Indonesia (SNI) Bidang Pembudidayaan Air Payau dan Laut*

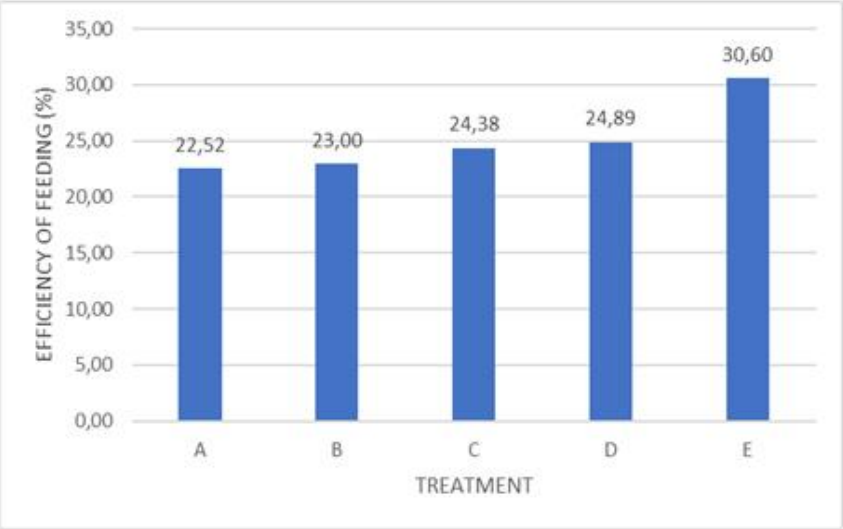

Fig. 4. The efficiency of feeding result for 60 days

4. CONCLUSION

Based on observations of the Giant Trevally for 60 days showed that the survival value of all treatments was 100%. As a whole, the highest average weight of fish on the 60th day is treatment E with a weight of 109.47, the growth rate of 3.01 and the highest feeding efficiency value of 30.60% which could be influenced by the quality of rough fish.

5. SUGGESTION

Fish feeding with 100% rough fish without the use of pellets (0%) can be recommended as a fish feed that gives the best growth results in the cultivation of Giant Trevally in the floating net cages.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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