# Effect of natural feeding Oithona sp. Substitution Artemia sp. with Different compositions for growth and survival of cobia fish larvae (Rachycentron canadum)

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# Effect of Natural Feeding *Oithona* sp. Substitution *Artemia* sp. with Different Compositions for Growth and Survival of Cobia Fish Larvae (*Rachycentron canadum*)

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## Abstract

**Lukman Hakim, Slamet Budi Prayitno, Suryadi Saputra, Seto Windarto, Vivi Endar Herawati. 2021. Effect of Natural Feeding *Oithona* sp. Substitution *Artemia* sp. with Different Compositions for Growth and Survival of Cobia Fish Larvae (*Rachycentron canadum*). Aquacultura Indonesiana. 22(1): 58-71.** Cobia fish (*R. canadum*) has a fast growth rate and high-quality meat. The nutritional requirements for optimal growth of cobia fish are 44.5% protein and 5.76% fat. The purpose of this study was to determine the effect of natural feeding of Artemia sp. and Oithona sp. to increase the survival and growth of Cobia fish and to find out the best food for the growth and survival of Cobia fish. Cobia fish (*R. canadum*) was cultivated with a density of 50 fish/net each treatment for 14 days. The frequency of feeding was three times a day using the ad libitum method. The research method used was an experimental study using a completely randomized design of 3 treatments and three replications, namely Treatment A (*Artemia* sp. 100%), B (*Artemia* sp. 50% and *Oithona* sp. 50%), C (*Oithona* sp. 100%). The results showed that natural feeding of *Oithona* sp. and *artemia* sp. had a very significant effect (P<0.01) on the rate of utilization of natural feed (grazing rate) and had a significant effect (P<0.05) on the growth in absolute length, growth in absolute weight and SR. The value of absolute length growth, absolute weight growth, natural feed utilization rate (grazing rate), and the highest SR in treatment B (*Oithona* sp. 50% and *Artemia* sp. 50%) with consecutive values of 3.50 cm, 0.23 g, 489.85 individual/cell, and 79.33%. The water quality in the rearing medium during the rearing period was still in the acceptable range for cultivating the larvae of Cobia fish (*R. canadum*).

Keywords: Cobia fish larvae *(R. canadum)*; *Artemia* sp.; *Oithona* sp.; Performance.

## Introduction

The Cobia fish (*R. canadum*) is a carnivorous marine animal, a new meat-eating animal in aquaculture, and needs further development; the problem often occurs in the absence of appropriate feed to increase the growth of cobia fish (*R. canadum*) larvae. According to BBPBL Lampung (2016), Cobia fish has a high feed response, so its growth is relatively fast. According to Resley *et al*. (2006), Cobia fish has a fast growth rate and high-quality meat. The nutritional needs of fish strongly influence the growth rate of cultured fish. According to Aslianti *et al*. (2016), Cobia fish (*R. canadum*) is included in subtropical and tropical fish whose cultivation is widely developed in several countries such as Taiwan, Vietnam, Texas, America, and Australia.

Cobia's optimal growth requires 44.5% protein and 5.76% fat (Chou *et al*., 2001). According to Sajeevan and Kurup (2014), Cobia fish (*R. canadum*) eat various types of prey available in its ecosystem. Zooplankton is a type of plankton that is animal in nature used as a food source for small fish and crustacean

groups (Efendi and Ali, 2016). The use of natural *oithona* sp. feed as larvae feed very useful and practical because it can increase the growth and survival of fish larvae, and *oithona* sp. has a size that matches the mouth openings of the larvae (Septian *et al.,* 2017). The advantages of *oithona* sp. as natural food, namely because *oithona* sp. contains nutrients, namely 69% protein, 15% fat, 11% carbohydrates, 4.81% EPA, and 6.14% DHA (Santhanam and Perumal, 2012). Other types of zooplankton that can be used in cultivation are *Artemia* sp. *Artemia* sp. is zooplankton from the Arthropoda phylum and crustacean class, which is usually needed as natural food for various fish larvae and is a natural food for fish larvae widely used in hatcheries (Juanda *et al*., 2015). According to Bahari *et al*. (2014), the advantages of *Artemia* sp. as natural feed, because it has a high nutritional content so that it can support the growth and survival of fish larvae, where the nutritional content includes the protein of 48.87%, fat 10.85%, ash 11.25. % and 8.32% crude fiber (Herawati *et al*., 2020). This is also confirmed by Mana *et al*. (2014), 52-56% protein, 13-16% fat, 23-29% carbohydrates, 4-14% EPA fatty acid content, and 6-8% DHA.

The results of research conducted by Zhang *et al*. (2021) showed that Cobia larvae fed with *rotifers* and copepods had a daily growth rate ranging from 17% -60% and an average daily growth rate of 35% (Zhang *et al*., 2021). Other studies have also been conducted by Nhu *et al*. (2009), cultivating Cobia (*R. canadum*) in the larval stage using natural *rotifer* and *artemia* sp. feeds obtained long growth and longevity results (6.4-11.4 cm and 75.7%) by *Rotifer* treatment, (6.2 -11.6 cm and 68.9%) *Rotifer* and *Artemia* sp. treatment, (6.2-11.3 cm and 60%) treatment *Artemia* sp. This means that there is no significant difference in fish larvae's growth rate and survival (*R. canadum*). According to Benetti *et al*. (2007), the enrichment of natural *rotifer* feed is still less precise than brine shrimp for the cultivation of Cobia (*R. canadum*) in the larval stage, this is due to the short feeding period of *rotifers*.

## Material and Methods

The test animal used in this study was the Cobia fish larvae (*R. canadum*) from the Lampung Center for Marine Cultivation Fisheries (BBPBL). The Cobia larvae used were D8 - D20, which were fed with *Artemia* sp. substitution *Oithona* sp. with a different composition. There were 50 animals tested/net. The length of rearing the Cobia fish larva is for 14 days. The net size used in the study was 80 cm (w) x 80 cm (l) x 1 m (t) using a non-recirculating system for 14 days of maintenance. Cobia fish larvae (*R. canadum*) at the beginning and end of the past rearing period were measured absolute weight growth using analytical scales with an accuracy of 0.001, and absolute length growth was measured using millimeter blocks. This is done to determine the growth in absolute weight and absolute length during the maintenance period.

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The container used in this study is a concrete tub that is indoors. The containers that will be used previously are cleaned by brushing and flushing with water first. Then do the watering with chlorine and deposited for one day. Next, the net was given aeration that has been provided in the concrete tub. The hafa size used in the study was 80 cm (w) x 80 cm (l) x 1 m (t), and the hafa density size used was 250 microns. Size 250 microns in the net were used for natural food for *Artemia* sp. *Oithona* sp. did not come out of the rearing container. The water used during the maintenance period is seawater that has been previously collected and filtered so that the water used is in good condition.

The experimental design used in this study was a completely randomized design (RAL). According to Sudjana (1991), RAL is used inhomogeneous (single treatment) research and treatment due to being completely randomized to experimental units. This study used three treatments, and each treatment was repeated three times; the arrangement of the treatments was as follows:

Treatment A: Natural Feed *Artemia* sp. 100%
Treatment B: Natural Feed *Artemia* sp. 50% and *Oithona* sp. 50%
Treatment C: Natural Feed *Oithona* sp. 100%

Determination of the density dose of natural food given to Cobia fish larvae (*R. canadum*) was carried out based on a preliminary test carried out before the study was carried out. Observations were made using two 500 ml Erlenmeyer tubes, each containing 5 Cobia fish larvae (*R. canadum*). The feed doses given were 7,000 cells/heads of Artemia sp and 7,000 cells/heads for *Oithona* sp. The results obtained after the experiment were that the dose of feed given was more or less following the feed needs of Cobia fish larvae (*R. canadum*) which ranged from 110-140 individual/cell. This is because there is very little leftover feed in the maintenance container. The results of this preliminary test are then used to determine the dosage of natural feed used at the time of treatment.

The data displayed includes absolute length growth, absolute weight growth, natural feed utilization rate (*grazing rate*), survival rate (SR), and water quality.

Absolute Length Growth

According to Zonneveld *et al*. (1991), the daily growth rate can be calculated using the following formula:

$$L = Lt - Lo$$

Information:
L : Absolute growth length (cm)
Lt : Body length of fish larvae at the end of the study (cm)
Lo : Body length of fish larvae at the beginning of the study (cm)

Absolute Weight Growth

The growth of biomass weight can be calculated using the formula from Dedi *et al*., (2018), as follows :

$$W = Wt - Wo$$

Information:

W : Total growth of fish biomass weight (g)

Wt: Final weight of fish (g)

Wo: Fish initial weight (g)

Survival Rate (SR)

The survival rate of Cobia fish larvae (*R. canadum*) is calculated based on the number of initial stockings in the pond, then the number of larvae is calculated at the end of the maintenance and then entered into the formula. Measuring life graduation can be measured using the formula from Effendi (1997), namely:

$$SR = \frac{No - Nt}{No} X\ 100\%$$

Information :

SR : Survival (%)

Nt : Number of test animals at the end of the rearing

No : Number of test animals at the beginning of rearing

Natural Feed Utilization Rate (Grazing Rate)

The grazing rate shows the amount of natural food eaten by Cobia fish larvae during the rearing period. The grazing rate can be calculated by knowing the amount of initial feed given and the remaining feed during maintenance by comparing the amount of feed given with the remaining amount of natural feed on the maintenance media. According to Widiastuti *et al*. (2012), the level of natural feed consumption can be calculated by dividing the amount of feed consumed during the rearing period by the number of Cobia fish larvae reared.

Water Quality

Measurement of water quality was carried out using a Quality Water Checker (WQC). Measurement of water quality includes parameters of salinity (ppt), pH, temperature (°C), and dissolved oxygen (mg/l). WQC for water quality measurements is carried out by inserting the instrument into the culture media water and seeing the value of each measured parameter; after completion, the WQC measurement is calibrated with plain water and dried with a dry cloth before storage.

The data obtained were analyzed using Analysis of Variance (ANOVA), which first carried out the normality test, homogeneity test, and additivity test to determine that the data were regular, homogeneous, and additive. Suppose it is known that there is a significant ($P < 0.05$) or very significant ($P < 0.01$) effect, then proceed with the Duncan Multiple Area Test to determine the difference in the mean between treatments and determine the best treatment. Water quality data were analyzed descriptively.

## Result

Absolute Growth

Based on the data on the absolute length growth of Cobia fish larvae (*R. canadum*) during the study, a histogram can be made, which is presented in Figure 1

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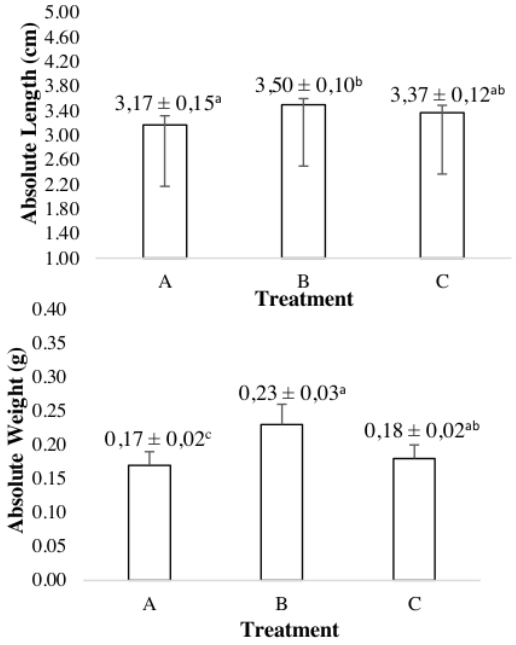


Figure 1. The absolute growth histogram of the Cobia fish (*R. canadum*) larvae during the study.
Description: Treatment A: *Artemia* sp. 100%., Treatment B: *Artemia* sp. 50% and *Oithona* sp. 50% and Treatment C: *Oithona* sp. 100%

The highest absolute length histogram showed the highest absolute length value, namely 3.50 cm in the feeding treatment (B) *Artemia* sp. 50% and *Oithona* sp. 50%, while the lowest absolute length in treatment (A) *Artemia* sp. 100%, which is 3.17 cm. The histogram of absolute weight growth shows the highest absolute weight value, namely 0.23 grams in the feeding treatment (B) *Oithona* sp. 50% and *Artemia* sp. 50%, while the lowest absolute weight is 0.17 grams treatment (A) *Artemia* sp. 100%. Analysis of variance (ANOVA) showed a significant effect (P> 0.05) on the absolute length and absolute weight.

Survival Rate (SR)

Based on the *survival rate* (SR) data of Cobia fish larvae (*R. canadum*) during the study, a histogram can be made, which is presented in Figure 2.

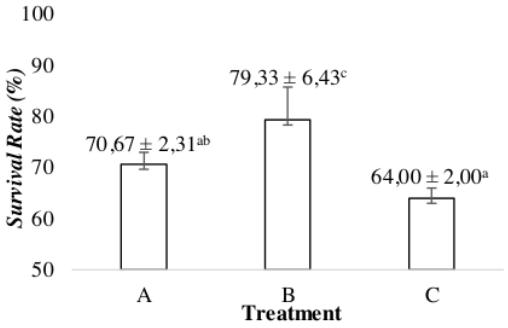


Figure 2. Histogram survival rate (SR) of Cobia fish (*R. canadum*) larvae during the study.
Description: Treatment A: *Artemia* sp. 100%., Treatment B: *Artemia* sp. 50% and *Oithona* sp. 50% and Treatment C: *Oithona* sp. 100%

The highest survival rate (SR) value, namely 79.33%, occurred in the feeding treatment (B) *Oithona* sp. 50% and *Artemia* sp. 50%, while the lowest SR was 64.00% in treatment (C) *Oithona* sp. 50%. The results of the analysis of variance (ANOVA) showed a significant effect (P> 0.05).

Natural Feed Utilization Rate (Grazing Rate)

Based on the data on the rate of utilization of natural food (*grazing rate*) Cobia fish larvae (*R. canadum*) during the study, a histogram can be made, which is presented in Figure 3.

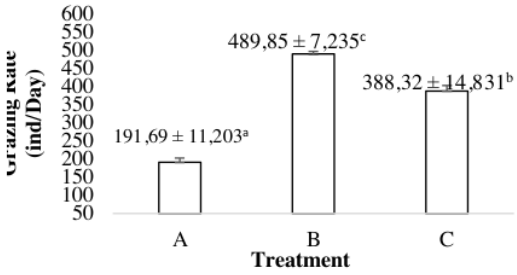


Figure 3. Histogram of Natural Feed Utilization Rate of Cobia fish (*R. canadum*) larvae during the study.
Description: Treatment A: *Artemia* sp. 100%., Treatment B: *Artemia* sp. 50% and *Oithona* sp. 50% and Treatment C: *Oithona* sp. 100%

The Grazing Rate histogram shows that the highest *Grazing Rate* value of 489.85 individual/day is found in the feeding treatment (B) *Artemia* sp. 50% and *Oithona* sp. 50%, while the lowest Grazing Rate value was 191.69 individual/day in the feeding treatment (A) *Artemia* sp. 100%. The results of the analysis of variance (ANOVA) showed a significant effect (P> 0.05).

Water Quality

Based on the research that has been done, it is obtained the value of water quality as supporting data, including dissolved oxygen (DO), salinity, degree of acidity or power of hydrogen (pH), the temperature of which the results are presented in Table 1.

Table 1. Water Quality

| Parameters | Measurement result | Feasibility |
|---|---|---|
| DO (mg/L) | 5,29-5,68 | >4* |
| Salinitas (ppt) | 30-32 | 30-34* |
| pH | 7,28-7,78 | 7.0-8.5* |
| Suhu ($^0$C) | 28-29 | 28-29* |

Source: * Laboratory of Health and Environmental Examination BBPBL Lampung.

The results of measuring water quality parameters in raising Cobia (*R. canadum*) larvae for 14 days indicate that the values of the DO, salinity, pH, temperature variables are still in the appropriate range to be used as cultivation media to support the life of Cobia fish larvae (*R. canadum*). This is confirmed by the laboratory tests of health and environmental examiners of BBPBL Lampung regarding the optimum water quality conditions for the cultivation of Cobia fish larvae (*R. canadum*).

## Discussion

Absolute Growth

Feed is essential in supporting the survival and growth rate of the Cobia larva *(R. canadum*). The availability of feed-in aquaculture is one factor that significantly affects the survival and growth rate of fish. According to Riani *et al*. (2012); Pratama *et al*. (2019), growth is an increase in the size of both length and weight of an individual after feeding starting from the beginning to the end of maintenance, in which many factors influence it, such as genetics, hormones, and the environment. The environment is an external

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factor that significantly influences the growth process of an organism being maintained (Yuliana, 2014). Growth can occur due to mitotic cell division (Akbar *et al*., 2011). This happens because of the excess input of energy and amino acids essentials (protein) from the feed given. The specific length growth rate of Cobia fish (*R. canadum*) larvae were calculated to determine the growth during the study. Based on the research results that have been done, the highest results were obtained in treatment B (*Artemia* sp. 50% and *Oithona* sp. 50%). The results obtained are 3.50 ± 0.10 cm/day. This is because *Artemia* sp. The size follows the mouth opening of the Cobia fish larvae, namely ± 800-900 µm and easy to digest and *Oithona* sp. It has a slow-motion characteristic so that the two natural foods given in this study are very easy for the larvae of Cobia fish (*R. canadum*) to eat. According to Nugroho *et al*. (2015), Artemia sp. widely used in cultivation because it has a high nutritional content. Feed with nutrients that follow the mouth openings of larvae can increase growth and survival (Herawati *et al*., 2014). *Oithona* sp. has a slow movement, making it easier for fish larvae to eat them (Setyowati *et al*., 2015).

The provision of natural food for *Artemia* sp and *Oithona* sp. in the study showed a prolonged growth in each treatment. Growth is a process of increasing the length or weight of an organism maintained from the beginning to the end of the rearing period. Growth can be influenced by several factors, one of which is feed. According to Djunaedi *et al*. (2016), fish growth can be influenced by several factors: feed, cultivation container, temperature, salinity, season, and physical activity. The more feed consumed by the organisms maintained and the use of efficient feed, the more protein will be retained so that growth in these organisms increases (Amin *et al*., 2011; Pratama *et al*., 2015). Based on research that has been done on Cobia fish larvae (*R. canadum*), it shows that natural food feeding of *Artemia* sp. and *Oithona* sp. had a significant effect on the absolute length growth of Cobia fish larvae (*R. canadum*). The highest absolute length growth value is 3.50 cm in treatment B with feeding *Artemia* sp. 50% and *Oithona* sp. 50%, while the lowest absolute length growth was 3.17 cm in treatment A with feeding Artemia sp. 100%. The high absolute length growth in Cobia fish larvae (*R. canadum*) is due to the nutritional content in the feed of *Artemia* sp and *Oithona* sp. complement each other to meet the needs of the reared fish larvae. According to Santhanam and Perumal (2012), the content of *Oithona* sp is 69% protein, 15% fat, 11% carbohydrates, 4.81% EPA, and 6.14% DHA, while according to Herawati *et al*. (2020), the nutritional content of *Artemia* sp, namely 48.87% protein, 10.85% fat, 11.25% ash and 8.32% crude fiber. This is also confirmed by Mana *et al*. (2014), 52-56% protein, 13-16% fat, 23-29% carbohydrates, 4-14% EPA fatty acid content, and 6-8% DHA. The lowest absolute length growth yield of Cobia (*R. canadum*) larvae were found in treatment A with 100% *Artemia* feeding, which was 3.17 cm. One of the factors that influence the growth rate of the absolute length of the

Cobia larva (*R. canadum*) is the lack of oxygen levels in the water and insufficient primary nutritional needs of the reared fish so that the resulting absolute length growth is less good or less than optimal. This is reinforced by Ridwan and Idris (2014), Yaqin *et al*. (2018), who found that protein is one of the primary nutrients in the fish feed that can affect the growth rate of fish by providing basic needs and essential amino acids whose purpose is to synthesize body protein and energy for maintenance. Diets that have the same amino acid composition as the fish amino acid composition can provide a reasonable growth rate, but if a deficiency of one of the essential amino acids can interfere with the growth rate of the fish being maintained (Wulandari *et al*., 2019). According to Yaqin *et al*. (2018), unfulfilled protein requirements in fish can lead to poor fish growth rates, and if excess protein can cause an increase in ammonia excretion, which impacts the surrounding environment and high feed costs.

Fish weight growth calculates the difference between fish weight growth after the rearing process of fish larvae and the initial maintenance weight growth (Saputra *et al*., 2017). The feeding process must pay attention to the needs of larvae because appropriate feeding will lead to optimal growth (Hermawan *et al*., 2015). The absolute weight growth is calculated based on the difference between the final weight of maintenance and the initial weight of maintenance. The difference is obtained from calculating the final weight and the total weight at the beginning of the maintenance and then averaged. The results of the study showed that the absolute weight growth of Cobia fish larvae (*R. canadum*) showed that the feeding of *Artemia* sp and *Oithona* sp. give significant impact results. The absolute weight growth of Cobia fish larvae (*R. canadum*) with the highest value was obtained in treatment B by feeding *Artemia* sp. 50% and *Oithona* sp. 50%. The results obtained were 0.23 grams, while the lowest absolute weight growth was found in treatment A by giving 100% *Artemia* sp as much as 0.17 grams. High or high weight growth in Cobia fish larvae (*R. canadum*) in the treatment of *Artemia* sp. 50% and *Oithona* sp. 50% is suspected because fish larvae can make good use of the nutritional content of the two types of natural feed so that it can support their growth compared to other treatments, although the weight growth results from other treatments are not much different. The absolute weight growth that occurs is due to the nutritional content of *Artemia* sp. and *Oithona* sp. not much different, so the results of the weight growth of each treatment are not much different. Masitoh *et al*. (2015) stated that diets containing high protein do not necessarily result in rapid growth. This is due to the low level of feed digestibility. Jaya *et al*. (2013) stated that the need for protein in fish is influenced by several factors: the size of the fish, water temperature, the amount of feed eaten, the availability and quality of natural food, and the environment. The lowest yields on weight growth were found in treatment A with

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feeding *Artemia* sp. 100%. The results obtained are 0.17 grams. This occurs due to insufficient main nutritional content in the fish being raised. Another factor that can inhibit larval weight growth is the lack of oxygen levels in the rearing container. The level of oxygen consumption in the waters is one of the essential aspects that significantly affect life and the growth rate of farmed fish. This is confirmed by Ezraneti *et al*. (2019), oxygen is a limiting factor; if its availability in the water is not sufficient for fish needs, it will affect the activity and growth of the fish being kept.

The rate of utilization of natural food (*Grazing rate*) shows the amount of natural food eaten by Cobia fish larvae (*R. canadum*) during the rearing period. Based on the results of the research that has been done, it was found that the rate of utilization of natural feed (*Grazing rate*) from the treatment of *Artemia* sp. and *Oithona* sp. the amount eaten increases with increasing age of the Cobia fish larvae (*R. canadum*). The utilization of natural food can be assumed to be an indirect factor that supports larval growth. The results obtained during the rearing period of Cobia fish (*R. canadum*) larvae were the highest average utilization rate of natural food found in treatment B with 50% *Artemia* sp. and *Oithona* sp 50% with the results obtained at 489.85 individual/day. This is because *Artemia* sp. and *Oithona* sp. can complement each other in providing nutritional intake to help support the growth of Cobia fish larvae (*R. canadum*). Based on the nutritional content value, protein *Oithona* sp. higher than the protein content in *Artemia* sp. The nutritional content of the two natural feeds, namely according to Santhanam and Perumal (2012), contains 69% protein, 15% fat, 11% carbohydrates, 4.81% EPA, and 6.14% DHA, while according to Herawati *et al*. (2020) ), the nutritional content of *Artemia* sp is 48.87% protein, 10.85% fat, 11.25% ash and 8.32% crude fiber. This is also confirmed by Mana et al. (2014), 52-56% protein, 13-16% fat, 23-29% carbohydrates, 4-14% EPA fatty acid content, and 6-8% DHA. The nutritional content contained in complementary feeds can support the growth rate of Cobia fish larvae (*R. canadum*) so that the rate of utilization of natural food with the treatment of *Artemia* sp 50% and *Oithona* sp. 50% higher result compared to other treatments. According to Mulyana *et al*. (2020); Tanake *et al*. (2013) stated that high or optimal protein content in the feed is needed to increase the survival rate and accelerate the growth rate of reared fish larvae. According to Yulisman *et al*. (2012), high and low protein levels in feed can affect the growth rate and efficiency of the feed consumed by fish. Diets containing low or high protein, apart from reducing fish growth, can also cause the feed to be inefficient to increase production costs derived from feed.

Survival Rate (SR)

The survival rate of larvae can be determined by counting the number of larvae of Cobia (*R. canadum*) at the beginning of stocking and the end of rearing or when the larvae of Cobia (*R. canadum*) are ready to be harvested. *Survival rate* aims to know the

number of dead fish during research. According to Setiawati *et al*. (2013), survival is the percentage of an organism that lives at the end of the rearing period of the number of stocked organisms during rearing in a container. The *survival rate* can be influenced by the type and quality of feed and environmental conditions that support the survival of fish (Karimah *et al*., 2018; Syuhriatin, 2020).

Based on the results of research that has been carried out by providing natural food for *Artemia* sp. and *Oithona* sp. gave a significant effect on the survival of Cobia fish larvae (*R. canadum*). The highest survival rate was found in treatment B, 79.33%, with feeding *Artemia* sp. 50% and *Oithona* sp. 50%. Meanwhile, the lowest survival rate was found in treatment C with treatment *Oithona* sp. 100%. The results obtained are 64%. A high survival value indicates that the quality and quantity of feed given to larvae has met basic needs and can even be used for larval growth during the rearing period. According to Febrianti *et al*. (2016), factors affecting survival are usually determined by feed and environmental conditions. The provision of sufficient feed in reasonable quantity and quality and suitable environmental conditions will increase the survival of the organisms being kept. According to Simatupang *et al*. (2017), The survival rate of the organisms being reared can be influenced by internal factors consisting of sex, heredity, age, reproduction, resistance to disease, and external factors consisting of water quality, stocking density, the number and composition of amino acid completeness in the feed. Deaths that occur during the maintenance period can come from unfavorable environmental factors. Changes in extreme environmental conditions can cause fish to become stressed, reducing growth rates. Furthermore, it can cause death in an organism (Kilawati and Maimunah, 2015).

Water Quality

The environment is an external factor that greatly influences the growth of a maintained organism (Yuliana, 2014). Changes in poor water quality conditions can cause fish mortality, reduce growth rates, reduce disease resistance, prevent successful development of fish eggs and larvae and affect natural movement and fish migration (Ramadhan and Muhammad, 2017). According to Prawira (2017), the factors that most influence the survival rate of larvae are the quality of water in the maintenance container and the quality of the feed given. This is because the nutritional content and water quality can affect the survival rate of larvae. The physical and chemical parameters of water are essential for the life of a seawater biota, namely salinity, temperature, pH, and DO (Puspitasari and Natsir, 2016). This research was conducted inhomogeneous conditions. This is done so that environmental conditions remain normal and can be controlled to cultivate Cobia fish larvae (*R. canadum*). The results obtained from the study showed that there was no fluctuation in the measured parameters, where each measured parameter indicated that the water quality was good

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enough for the growth and survival process of Cobia fish larvae (*R. canadum*). The range of water quality obtained during maintenance, namely dissolved oxygen (DO), ranges from 5.29 to 6.68 mg / L, pH ranges from 7.28 - 7.78, temperatures range from 28-29 oC, and salinity ranges from 30 - 32 ppt. According to Benetti *et al*. (2008), the feasibility of water quality for the cultivation of Cobia *(R. canadum*), namely temperatures ranging from 24.3 - 31.8 oC, salinity ranging from 26-34 ppt, pH ranging from 7.92-8.16 and NH3 < 0.18 mg / l, while dissolved oxygen ranges from 7.0-9.0 mg / L.

Water quality during the rearing period of Cobia (*R. canadum*) larvae can be said to be in a suitable condition for use in aquaculture activities. This can be seen from the results of the growth and survival of the cultivated larvae. The survival rate of an organism can be affected by good culture management, whether it is stocking density, feed quality, water quality, parasites, or disease. According to Jumaidi et al. (2016), good water quality will affect fish survival and fish growth. The difference in water quality is one of the factors that influence fish growth. So it can be concluded that good water quality makes fish live well and grow quickly.

## Conclusions

*Artemia* sp. and oithona sp. effects apparent (P<0.05) of absolute weight growth 0.023 grams, 3.50 cm of absolute growth, 489.85 individual/day of grazing rate, (SR) 79.33 % of living rate, while treatment B by giving a combination of *Artemia* sp 50% and *Oithona* sp.50% is the best given by absolute weight growth, absolute long growth, increased rate and survival rate (SR).

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