

Effect of Sea Worm Enrichment (*Nereis* sp.) with DHA Selco on The Growth and Survival Rate of Cobia Fish (*Rachycentron canadum*)

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Abstract

Erlin Hana Andung, Pinandoyo, Suryadi Saputra, Seto Windarto, Vivi Endar Herawati. 2021. Effect of Sea Worm Enrichment (*Nereis* sp.) with DHA Selco on the Growth and Survival Rate of Cobia Fish (*Rachycentron canadum*). *Aquacultura Indonesiana*. 22(1): 48-57. Sea worms (*Nereis* sp.) is one of the natural diets that can increase the production of shrimp and fish eggs. DHA selco is a commercial product commonly used as an enrichment ingredient in natural diets to increase nutrient content. The purpose of the study was to find out the influence of sea worms (*Nereis* sp.) enriched with DHA selco on the growth and survival of cobia fish and to find out the best dose of DHA Selco used for enriching *Nereis* sp. The study use a complete randomized design (CDR) of the 4 treatments and 3 replications. Addition of DHA selco in different dose: A (without DHA selco), B (0.6 g/l DHA selco), C (0.9 g/l DHA selco), and D (1.2 g/l DHA selco). The maintenance is a period of 21 days with a solid spread of 50 heads/hapa. Frequency of feeding 3 times a day, by method at satiation. The results showed that the addition of DHA selco had a significant effect ($P > 0.05$) on feed utilization efficiency, relative growth rate, absolute length, biomass weight, protein efficiency ratio and SR. Feed utilization efficiency, relative growth rate value, absolute length, biomass weight, protein efficiency ratio and Survival rate were highest in D treatment (1.2 g/l DHA selco) with consecutive values of 47.67 ± 1.15 g/day, 82.27 ± 5.30 %, 16.47 ± 1.22 %, 4.07 ± 0.15 %, 1.28 ± 0.10 g, 2.43 ± 0.09 %, 49.33 ± 4.16 %. Water quality during the study ranged still in optimal conditions for the growth of cobia fish, the temperature of $28.4-28.6$ °C; pH 7.57; salinity 32-33 ppt; DO 5.12-5.33 mg/l.

Keywords: Enrichment; Sea worm; DHA selco; *Nereis* sp.

Introduction

Cobia fish (*R. canadum*) have a rapid growth ranging from 4 - 6 kg/year (Chou *et al.*, 2001). According to Syuhriatin, (2020) the growth rate of fish is greatly influenced by the type and quality of die provided, if the diet provided is of good quality, the amount is sufficient and the environment supports it will produce a good growth rate. Natural diets is a sea worm (*Nereis* sp.) that is a member of the invertebrate Family Nereidae, Classis Polychaeta that lives in the estuary ecosystem as a benthic. Sea worms (*Nereis* sp.) are one of the natural diets

that can increase the production of shrimp and fish eggs. Sea worms are easy to find along the sea in Indonesia, thus making sea worms a natural diet for the seeds of Cobia fish (Wibowo *et al.*, 2019).

The nutritional content of sea worm flour (*Nereis* sp.) has a protein content of 56.29 %, fat 11.32%, ash 14.34%, coarse fiber 1.19%, and water 5.63 % (Rachmad and yuwono, 2000). DHA selco, because DHA Selco is a source of essential fatty acids sold commercially. The content of DHA selco is 67% fat, phosphorus 0.2 %, Vitamin A (1,500,000 IU/kg), vitamin D3 (150,000 IU/kg), vitamin E (3600 mg/kg),

vitamin C (800 mg/kg) and antioxidants (Admiral Senthil *et al.*, 2011).

Some enrichment research using DHA selco has been applied on some natural diet such as *Artemia* sp. tested on comet fish (Mulianiet *al.*, 2016). Enrichment with DHA selco has also been done on *Rotifer* sp. tested on vannamei shrimp (Wahyudin, 2005). Therefore, in this study enrichment with DHA Selco in sea worms in the hope that it can increase the levels of fatty acids and can also increase the survival rate and growth in Cobia fish.

Methodology

The research tools used during this study in the form of hapa as a container of cultivation as a seed, refractometer to measure salinity, COD meter to measure dissolved oxygen, pH meter to determine acidity and basicity of water. The materials used are sea worms (*Nereis* sp.), DHA selco, 21-day-old Cobia fish seed with biomass

Total feed consumption is the amount of feed consumed by fish from the total feed given during the study (Peraira *et al.*, 2007).

Feed utilization efficiency

Feed utilization efficiency is calculated using the 1993 Tacon formula, as follows:

$$EPP = \frac{W_t - W_o}{F} \times 100 \%$$

Description:

EPP : Feed utilization efficiency (%)

Wt : Fish biomass at the end of the study (g)

W0 : Fish biomass at the beginning of the study (g)

F : Amount of fish feed consumed during the study (using a scale to make sure the diets everyday) (g)

Relative Growth Rate

Growth rate or Specific Growth Rate of weight gain per day. Weight Growth Rate can be calculated by Formula (Steffens, 1989):

$$RGR = \frac{W_t - W_o}{W_o \times T} \times 100 \%$$

average of 0.38 g and length average of 4.20 cm. Cobia fish in maintenance for 21 days with a density of 50 heads/ hapa.

This study used a Complete Random Design (RAL) with 4 treatments and 3 replays. A: sea Worms Without DHA Selco; B: 0.6 g/ l DHA Selco; C: 0.9 g/ l DHA selco; D: 1.2 g/ l DHA Selco. Sea worms enriched with a 2-hour soaking of Yunuset *al.*, (1996). The enriched worms are then in the oven at a temperature of 40-50°C until the sea worms become dry. The dried worms will then be in a bender, sifted using a sieve until it becomes a small crumble that can be floated and stored in a closed container that is dry and room temperature.

The data taken during the study were total feed consumption, feed utilization efficiency, Relative Growth Rate, Absolute length, biomass weight, Protein Efficiency Ratio, survival rate, water quality.

Description:

RGR : Relative Growth Rate (% / day)

Wt : Biomass weight of cobia fish at the end of the study (g)

Wo : Biomass weight of the Cobia fish at the beginning of the study (g)

T : Maintenance Duration (day)

Absolute Length

Long measurements in Cobia fish were conducted at the beginning of the study and the end of the study. Absolute Length Growth can be measured by Zonneveld *et al.*, (1991) formula:

$$L = L_t - L_o$$

Description:

L : Absolute Growth Length (cm)

Lo : Length of fish body at the beginning of the study (cm)

Lt : Fish body length at the end of the study (cm)

Biomassa Weight

The growth of fish biomass weight is the difference from fish biomass at the end of maintenance with fish biomass at the beginning of maintenance and is stated in grams. According to Effendi (1997), biomass weight growth can be calculated by the formula:

$$W = W_t - W_o$$

Description:

W : Biomass weight growth(g)
Wt : Fish biomass at the end of the study (g)
Wo : Fish biomass at the beginning of research (g)

Protein Efficiency Ratio

Protein efficiency ratio calculation can use tacon formula (1987):

$$PER : \frac{W_t - W_o}{Pi} \times 100 \%$$

Description :

PER : Protein Efficiency Ratio (%)
Wt : Fish biomass test at the end of the study (g)
Wo : Biomass fish test at the end of the study (g)
Pi : Protein weight consumed (g)

Survival Rate

Survival Rate (SR) is calculated by the formula Effendi (1997):

$$SR = \frac{N_t}{N_o} \times 100 \%$$

Description:

SR : Survival rate (%)
Nt : Number of fish that live at the end of the study (tail)
No: Number of Fish at the beginning of the study (tail)

Water quality

The water quality parameters observed are water quality measurement with thermometer to measure temperature, pH Meter to determines acidity and basicity of water, DO meter to measure dissolved oxygen, and refractometer to measure salinity. Water quality measurement is done once a week at 7.00. Water quality management is carried out from the beginning of the distribution. The feeding is carried out every day after feeding. Water change every 3 times a day as much as 50% of the tub water.

The data obtained during the study in statistic analysis with Normality test, Homogeneity test, Additivitas test, a variety test analyse (anova), and Duncan's advanced test.

Result

Total feed consumption

The results of the measurement of total consumption of Cobia fish feed (*R. canadum*) can be seen in figure 1.

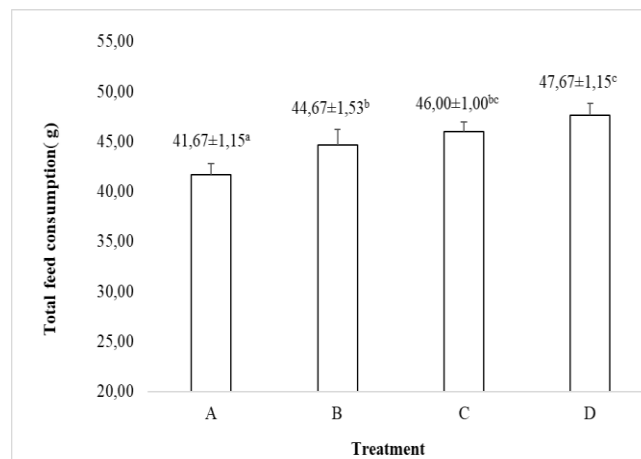


Figure 1. Graph of total consumption of Cobia fish feed for 21 days.

Data are given as the mean $\pm$ SD. In the each line, different superscript letters indicate significant differences among treatments ($P>0,05$).

Feed utilization efficiency

Feed utilization efficiency results (%) Kobia fish (*R. canadum*) that are kept for 21 days can be seen in Figure 2.

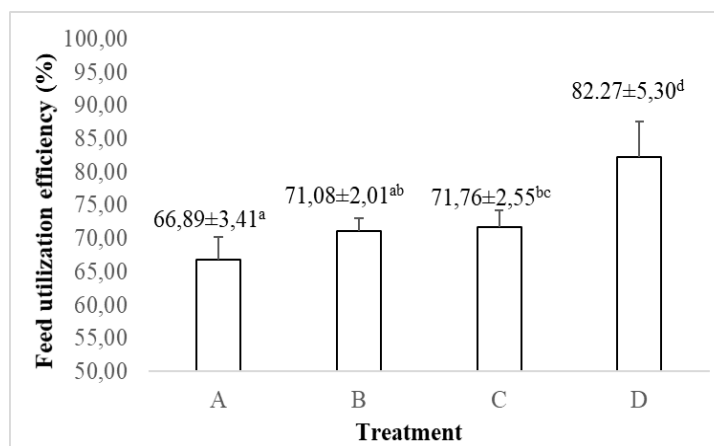


Figure 2. Graph of feed utilization efficiency for 21 days of feeding.

Data are given as the mean $\pm$ SD. In the each line, different superscript letters indicate significant differences among treatments ($P>0,05$).

Relatif Growth Rate

Relative growth rate (%/day) results of Cobia fish (*R. canadum*) maintained for 21 days can be seen in Figure 3.

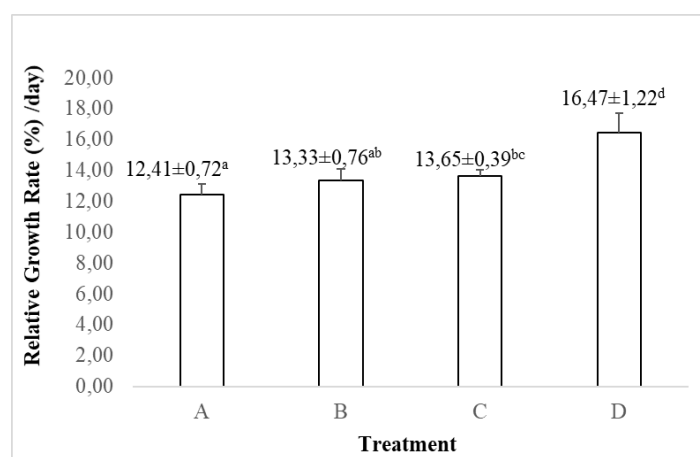


Figure 3. Relatively Efficient Rate chart for 21 days of exercise.

Data are given as the mean $\pm$ SD. In the each line, different superscript letters indicate significant differences among treatments ($P>0,05$).

Absolute Length

Growth result Absolute length (cm) of Cobia fish (*R. canadum*) maintained for 21 days can be seen in Figure 4.

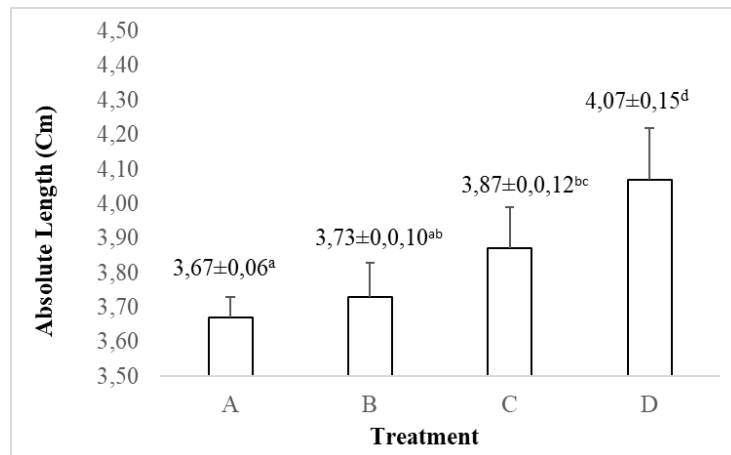


Figure 4. Absolute Length Growth Chart for 21 days of maintenance.

Data are given as the mean $\pm$ SD. In the each line, different superscript letters indicate significant differences among treatments ($P > 0,05$).

Biomassa weight

The result of the growth of biomass weight (g) of Cobia fish (*R. canadum*) maintained for 21 days can be seen in Figure 5.

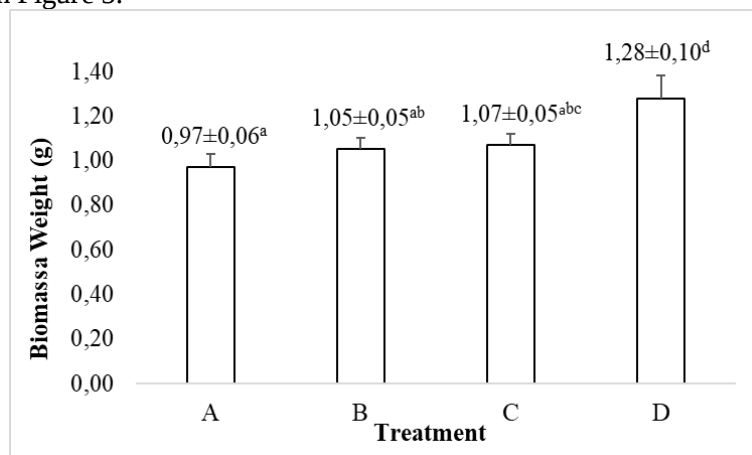


Figure 5. Biomassa Weight Growth Graph for 21 days of maintenance

Data are given as the mean $\pm$ SD. In the each line, different superscript letters indicate significant differences among treatments ($P > 0,05$).

Protein Efficiency Ratio

Results of protein efficiency ratio (%) kobia fish (*R. canadum*) that are kept for 21 days can be seen in Figure 6.

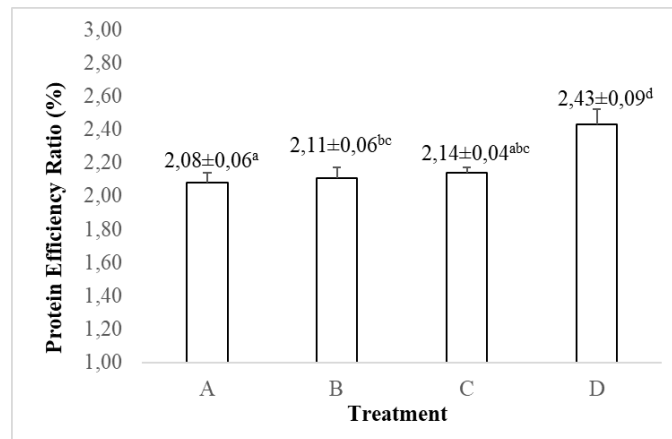


Figure 6. Graph protein efficient ratio for 21 days of maintenance.

Data are given as the mean $\pm$ SD. In the each line, different superscript letters indicate significant differences among treatmens ($P>0,05$).

Survival Rate

Survival Rate results (%) cobia fish (*R. canadum*) that are kept for 21 days canbe seen in Figure 7.

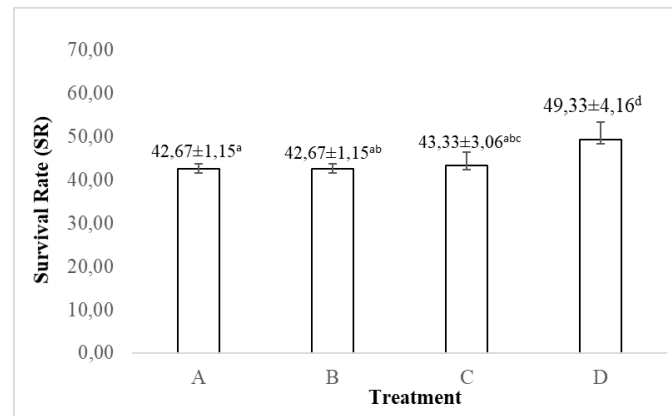


Figure 7. Graph of life delays during 21 days of maintenance.

Data are given as the mean $\pm$ SD. In theeach line, different superscript letters indicate significant differences among treatmens ($P>0,05$).

Water quality

Water quality measurements include Temperature, pH, Do and salinity. The tools used to measure water quality are WQC (Water Quality Control) and Refractometer can be seen in table 1. Table 1. Results of water quality measurement on the maintenance media of Cobia fish seed (*R. canadum*) during maintenance.

Parameters	Measurement results	Feasibility
temperature (°C)	28,4- 28,6	Alami
pH	7,57	7 – 8,5*
salinity (psu)	32- 33	30 – 34*
Do (mg/l)	5,12 -5,33	>4

Information: *: Kepmenlingkunganhidup No.51 Tahun 2004.

Discussion

Growth

Growth is one of the parameters that can be measured and can be calculated as a sign of physical changes in fish. Growth includes the increase in biomass weight and length in fish. Some variables that can affect fish growth are diet variables namely total feed consumption, Feed utilization efficiency, protein efficiency ratio and environmental support capacity, namely water quality. Based on the results of research on Cobia fish (*R. canadum*) given seaworm diet (*Nereis* sp.) that has been enriched with DHA selco shows the presence of weight gain and a significantly different length ($P > 0.05$). The increase in length and weight in Cobia fish (*R. canadum*) indicates the presence of good feed consumed and optimal use of worm proteins so that growth occurs. This is strengthened by Putri *et al.*, (2012) which states that growth occurs due to the use of feed that enters the body so that there is excess energy for growth.

Observations on cobia fish (*R. canadum*) include absolute growth and relative growth. The daily growth rate in cobia fish (*R. canadum*) was highest in D treatment (1.2 g/l DHA selco) with a value of 16.47 ± 1.22 %/day. The daily growth rate in cobia fish is directly proportional to the absolute length and weight of biomass in

cobia fish, namely in treatment D (1.2 g /l DHA selco) which is 4.07 ± 0.15 cm and 1.28 ± 0.10 g. Daily growth rate and absolute growth in Cobia fish are influenced by good feed consumption rate and optimal feed utilization. According to Setiowati *et al.*, (2013) The value of feed efficiency is related to the rate of growth because the higher the growth rate, the greater the weight gain of fish and the greater the value of feed efficiency. The addition of DHA selco with the highest dose in sea worms gives the highest influence on the efficiency of feed consumption and the amount of feed consumed. Fatty acid content increases appetite and feed fatigation in Cobia fish. This is also reinforced by Hasyim *et al.*, (2017) who stated that feeds that has higher fatty acids is responded better than feed with low fatty acids.

The level of feed consumption in Cobia fish (*R. canadum*) is influenced by the addition of dhaselco in sea worms (*Nereis* sp.). The addition of DHA selco as enrichment in sea worms (*Nereis* sp.) can increase the nutritional content in Cobia fish (*R. canadum*) as well as an attractant that gives odors to the worm feed so that the cod are easier to respond to the feed given. The level of feed consumption increases along with the increase in the dose of DHA selco. The function of attractant in feed will increase appetite and also the amount of feed

consumption in fish. This is reinforced by Izalet *al.*, (2019) which states that the attractant serves as an additional ingredient to stimulate appetite in fish in an effort to increase feed consumption in fish. Good feed consumption will affect growth in fish.

Based on the results of the analysis on the efficiency of feed utilization in Cobia fish (*R. canadum*) showed that the addition of DHA selco as an enrichment material in sea worms (*Nereis* sp.) will affect the utilization rate of feed significantly different ($P > 0.05$). DHA selco contains fatty acids ω -3 PUFA – DHA and EPA which can affect the process of feed absorption in marine fish. The fatty acid chain from DHA selco will improve the absorption process of proteins and other nutrients in fish feed. According to Pangkey (2011), fatty acids play a role in normal growth and fish farming. Sea fish do not have an enzyme system as in freshwaterfish, therefore it is in desperate need of fatty acids with long chains of n-3 and n-6 from feed for optimal growth. Indispensable essential fatty acids are eicosapentaenoic acid (EPA) (20:4N-6) and also docosahexaenoic acid (DHA)(22;n4-6).

The growth is influenced by the use and good use of proteins in the body of fish. Based on the results of proximate analysis on sea worms, treatment D has the highest amount of protein as much as 50.85 %, and fat 7.99 %. The protein and fat content of sea worms is influenced by seafood. This is reinforced by Herawati *et al.*, (2020) which states that the balance of protein nutrients and Fatty acid in worm feed will determine the quality of sea worms. The high protein contained in the worm sea (*Nereis* sp.) and a good absorption process will affect the growth. The amount of protein absorbed and the amount of energy used for activities are met, then the amount of protein used as energy will be converted into the meat so that it will increase growth in Cobia fish (*R. canadum*). The high absorption process of sea worm protein (*Nereis* sp.) will provide good

growth also for Cobia fish (*R. canadum*). This is reinforced by Herawati *et al.*, (2017) which state that the feed consumed by fish will be used first for basic metabolism, movement, production of sexual organs, and replacing damaged cells. The remaining energy from the feed will be used after meeting the needs of the activity.

Maximum utilization of consumption feed is supported by good water quality. One parameter that speeds up metabolism and increases activity is temperature. Because the temperature has a very important role in the use of feed that has been consumed. Temperature affects the growth of Cobia fish. Therefore the optimal temperature during the study is indispensable for optimal growth. The maintenance containers used are concrete tubs and indoors so that the temperature on the water medium does not change significantly. Based on the results of measurements on the water media of breeding fish is still within the standard limits of marine fish maintenance. This is reinforced by Sun and Chen, (2014) who stated that temperatures between 27 °C – 33 °C still use the same energy budget.

Survival Rate

Fish life can be affected by several factors such as diets and water quality. Diet and the content of nutrients contained in the diet have an influence on the life of Cobia fish. Based on the results of a variety of tests on the life of Cobia fish (*R. canadum*) showed that the addition of DHA selco in sea worms (*Nereis* sp.) had a noticeable effect ($P > 0.05$) on the life of Cobia fish (*R. canadum*). The highest survival rate in Cobia fish was found in treatment D (1.2 g/l DHA selco) which was $49.33 \pm 4.16\%$. and the lowest survival rate is in treatment A (without the addition of DHA selco) and treatment B (DHA selco 0.6 g / l) is $42.67 \pm 1.15 \%$. The less the DHA selco dose, the lower the level of fish's life, this is that due to the low level of feed

consumption and the lack of attractants that it affects cannibalism in fish. According to Hasyim *et al.*, (2017) the addition of oil as a community will increase the good response to smell and so it will affect the high level of feed consumption and absorbed nutrition. Cobia fish (*R. canadum*) are cannibal fish, so at times of lack of food large fish tend to attack smaller fish. The growth in cobia fish is rapid so it should often be done grading process to separate smaller sizes. The 21-day study resulted in the growth of fish that were not very uniform, resulting in cannibalism in cobia fish. Sizes that are not uniform or homogeneous affect the growth of fish. This is also reinforced by Ni'matullohet *al.*, (2018) who stated that the nature of cannibalism is where fish eat their own species, where large fish prey on small dredged fish so that the grading process is required.

During water media research is a medium that has an important role in the research so that the role of each water quality parameter will also affect the growth and survival life of Cobia fish (*R. canadum*). Good and non-toxic media will also support the survival life of Cobia fish. According to Setianingsih *et al.*, (2019) the state of each standardized parameter will affect the growth and health of fish. A good, non-toxic medium will also support the survival life of Cobia fish. The results of water quality

measurement in Cobia fish are temperatures ranging from 28.4 – 28.6 °C, pH 7.57, salinity between 32-33 (psu), and DO between 5.12 – 5.33. The optimum water quality state is influenced by the system of running water, aeration, and also concrete containers in the room so that salinity, pH, temperature and DO in the water are relatively constant and sufficient to support the life of Cobia fish. This is reinforced by Nazaret *al.*, (2020) who stated that the environmental conditions required for Cobia fish are DO > 5 mg/l, pH 7.8 -8.4, and salinity 25-35 ppt.

Conclusion

Based on the research results conducted on Cobia fish, sea worm enrichment (*Nereis* sp.) with DHA selco influences cobia fish's real growth and survival life (*R. Canadum*). Enrichment of sea worms (*Nereis* sp.) with DHA selco had a significant effect ($P > 0.05$) on total feed consumption (TFC), Feed utilization efficiency (FUE), Relative Growth Rate (RGR), Protein efficiency ratio (PER). The increasingly high dose of DHA selco enrichment provides diet consumption and utilization.

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