Artificial Feeding with Different Protein Content in Seed Coral Trout Grouper, *Plectropomus leopardus* in Controlled Tank

Anak Agung Alit

Institute for Mariculture Research and Fisheries Extension Gondol-Bali
Corresponding Email: a_alit@yahoo.com

Received : 24 March 2020; Accepted: 22 April 2020

Abstract

Anak Agung Alit. 2020. Artificial Feeding with Different Protein Content in Seed Coral Trout Grouper, *Plectropomus leopardus* in Controlled Tank. *Aquacultura Indonesiana*, 21 (1): 1-7. Coral trout grouper seed have high economic value, but the population in nature has started to decline. The purpose of this study was to obtain a good quality of feed on the growth and stability of seeds of coral trout grouper. Research has been done with experiment container used is fiber tank with size 1m³ counted 6 tanks. The test animals used in the study were the grouper seeds from the culture. The treatments were A = protein content in 48% feed, and treatment B = feed pellet import protein content in feed 55%. Coral trout groupers are kept in fiber tanks. Density of each tank 200 etc /m³. The study used a descriptive design with 2 treatments, each treatment repeated 3 times. Data were analyzed by using T, and at the end of the research was done profit ratio analysis. The results showed that both treatments were significantly different ($P < 0.05$) on survival and daily growth (GR). The highest survival and daily growth in treatment B (SR 97.45%; GR 0,26g/ day) followed by treatment A (SR 85,50 %; GR 0,15g/day). From the economic analysis the best profit B/C ratio was 1.51 treatment B, and followed treatment A was 1.09.

Keywords: coral trout of grouper seed, pellet feed, fiber tank, and profit ratio.

Preliminary

The coral trout grouper fish, *Plectropomus leopardus* is an export commodity and has economic value, the culture business is still being carried out to anticipate the decline, such as research on the hatchery and enlargement of the grouper coral trout conducted by the Research Center for Marine Aquaculture and Fisheries Extension, and continues done, although until now the results of survival (SR) larvae are still low. Therefore it is necessary to carry out artificial hatchery cultured activities to anticipate the needs that are sustainable (Sutarmat *et al*, 2003).

Enlargement of coral trout grouper in floating net cages with the provision of artificial feed (pellets) at this time, still get obstacles such as: death of the seed at a body size of 3-4 cm, due to the physical body of the coral trout grouper seed body is not so strong to be raised in

the net cage floating, and so is the management of feeding that is not optimal. The best solution is through nursery which can be done at the hatchery by providing artificial feed and additional feed. Feeding management is an activity that plays an important role in achieving a success in aquaculture with the hope of providing increased and healthy growth, and can prevent the entry of a disease.

At body lengths above 8 cm or more, the grouper seeds of coral trout grouper are resilient and strong, both for long distance transport and can be raised in floating net cages. Floating net cages with initial stocking using initial weights of 102.3 - 106.6 g with survival rate of 81.00-82.20% (Setiwati, K.M. *et al.*, 2016). Therefore, through the nursery process it is necessary to anticipate the demand for market segments or to be raised in floating net cages as consumption fish. Artificial feed or pellets for the distribution of coral

trout grouper seeds requires a protein content of 48% (Marzuqi., 2012) and can increase growth, whereas to increase growth and survival in protein content with 55% content derived from commercial pellet feed has never been done. The purpose of this study was to obtain information about the quality of artificial feed with the best protein content in order to increase growth and survival. The data obtained can later be used as a reference for nursery of tiger grouper fish.

Materials and Research Methods

The study was carried out using 6 fiber tanks, with each tank volume of 1 m³ and stocked sunflower coral trout grouper seeds originating with a total body length of an average of 3.5 cm, and a weight of about 0.92 - 0.95g/etc. Density of each fiber tank 200 etc /tank. Treatment A = artificial feed with a protein content of 48%, and treatment B = artificial feed from imports with a protein content of 55%. The study was conducted for 56 days (8 weeks). Each tank is equipped with aeration using a blower to supply oxygen. Substitution of water with the circulation system every day and carried out a siphon to remove dirt and then replaced with water that is siphoned off. The experimental design used was a descriptive design with a level 2 treatment. Each treatment with 3 replications. Feeding is done 3 times a day. Treatment = A is a commercial artificial feed (pellet) with 48% protein content, 10% fat, 2.00% ash, and 18.00% crude fiber. Treatment = B is commercial artificial feed containing 55% protein, 10% fat, 2.00% ash, and 18% crude fiber (Table 1). Sampling is done every 2 weeks, the growth includes the total body length and weight of the coral trout grouper by taking 25 coral trout grouper fishes using scoop, then the measured fish seed survival is calculated by the Effendi formula (1979), namely:

$$S = N_t / N_o \times 100 \text{ ----- (1)}$$

Where S = survival. N_t = total population end of study (etc). N_o = number of initial population of study (etc).

Body weight gain is calculated by the formula:

$$B = W_t - W_o \text{ ----- (2)}$$

Where B = absolute weight gain, W_t = average weight of end of study (g), W_o = average weight of end of study (etc).

The total body length increase is calculated by the formula:

$$L = L_t - L_o \text{ ----- (3)}$$

Where L = increase in absolute length, L_t = total average end of study length (cm), L_o = total average length of initial study (cm).

Daily length growth rate follows the formula of Zonneveld *et al.*, (1991):

$$Gr = \{(L_t - L_o / t)\} \text{ ----- (4)}$$

Where Gr = growth rate (cm/day), L_t = length at the end of the study (cm), L_o = length at the beginning of the study (cm), and t = length of study (days).

Daily weight growth rate follows the formula Zonneveld *et al.*, (1991):

$$Gr = \{(W_t - W_o) / t\} \text{ ----- (5)}$$

Where Gr = growth rate of daily weights (g/day), W_t daily weights at the end of the study (g), W_o = weights at the beginning of the study (g), and t = length of study (days).

Feed conversion is calculated using the formula Sedgwick (1979):

$$FCR = \{(W_t - W_o) / F\} \text{ ----- (6)}$$

Where: FCR = feed conversion, W_t = fish weight at the end of the study (g), W_o = fish weight at the beginning of the study (g) and F = amount of feed used during maintenance.

At the end of the study an economic analysis was carried out, using the calculation of Soekarwi, (1995):

Business profits are calculated using the formula:

$$KU = TR - TC \text{ ----- (7)}$$

Dima KU = Business profit, TR = total revenue, TC = total cost

The acceptance ratio is calculated using the formula:

$$RCR = TR / TC \dots\dots\dots (8)$$

Where RCR = Revenue Cost Ratio (profit ratio).

As supporting data, the measurement of water quality of the media in the form of temperature using a digital thermometer, salinity with Atago S-100 refractometer, pH with a TPX-90i digital pH meter, DO with a digital Y meter DO model YSI 58, ammonia, nitrite, and phosphate with a spectrometer.

Table 1. The content of feed proximates used in each treatment

Composition	The Protein 48%
Protein 55%	
Protein	48.00%
55.00%	
Fat	10.00%
10.00%	
Ash	2.00%
2.00%	
Crude fiber	18.00%
18.00%	

Results and Discussion

On observing body weight growth, the grouper seed of the coral trout grouper from both treatments, body weight gain of the grouper seed from the start of the second week of sampling, the growth seems to increase and significantly after the sampling of the third week of cultured, because in the third week of sampling the fish seeds can adapt to the maintenance environment. While the 48% treatment of artificial protein-fed feed, the more obvious with the longer the culture, until the end of the study (8 weeks of cultured). The provision of artificial protein feed 55% (treatment B), had better weight growth and was significantly different ($P > 0.05$), compared to 48% protein artificial feeding (treatment A) in (Table 1). And also more quickly adapt to the environment so that

every 2 weeks in the 3rd week sampling seen, increased weight growth. The use of artificial feed in the maintenance of grouper seed influences growth because feed functions as an energy supplier to spur growth (Melianawati and Suwirya, 2005).

The observations of the survival of the coral trout grouper seeds from each treatment are presented in (Table 2). Survival of the seeds of the coral trout grouper can only be seen at the end of the study for 56 days (8 weeks cultured). Seedlings of coral trout grouper with artificial protein feed 55% better survival rate is $97, 45 \pm 3.55\%$, compared with 48% artificial protein feed is $85.50 \pm 3.15\%$ (Table 2). Because in the first week of sampling, the provision of artificial feed containing 48% protein content of coral trout grouper fish is still weak and tends to be eaten by friends or high cannibalism so that it can affect survival. Besides that, there is a slight shaking, as at the beginning of the first sampling and also sensitive to environmental changes, and fish are easily stressed so that the fish die quickly. After a body length of up to 4 cm, the cannibal influence of coral trout grouper seeds has decreased or is almost invisible, provided that the intake of artificial feed or pellets must be continuous and should not be lacking. Grouper fish requires better quality feed, such as pellets, which is absolutely necessary to add, and replace or supplement feed nutrition when needed by coral trout grouper seedlings at all times. Sutarmat *et al.*, (2003), said that the type of artificial feed also gives better growth than the duck grouper fish (*Cromileptes altivelis*). Then groupers require high protein concentration of food which is 45 - 60% (Akbar *et al.*, 2013, Giri *et al.*, 1999; 2004; Kabangga *et al.*, 2004. And also some studies nursery juvenile batik grouper (*E. polyphemus*) requires 48% protein (Marzuqi *et al.*, 2004), duck grouper (*Cromileptes altivelis*) weighs 5.5 g and size 7.7 g requires 50.1% protein (Giri *et al.*, 1999; 2002, juvenile coral trout grouper (*Plectropomus leopardus*) requires 48% protein (Marzuqi *et al.*, 2007). In fish rearing, feed dosage is one of the important elements, because 35 - 60% of the total production cost of production (Sukadi, 2003). After

maintenance of 2 weeks at the time of initial sampling and until the end of the study 8 weeks, weight growth and body length of juvenile coral trout grouper continue to increase rapidly in the initial 3.5 cm long treatment. stocking compared to

the initial 2.5 length stocking treatment, artificial pellet feed given to the nursery breed of coral trout grouper fish of different lengths can be used effectively, and whole grouper seed of coral trout grouper fish gets pellet feed.

Table 2. Growth in total length and weight, survival rate and conversion ratio feed on grouper of the coral trout fish in nursery techniques with different proteins.

Parameter	Treatment of feeding with different proteins	
	A(feed of protein 48%)	B (feed of protein 55%)
Initial total length (cm)	3,5 cm± 0,24	3,5±0,33
Final total length (cm)	8,00±0,42 ^a	10,20±0,55b
Growth length (cm)	4,5±0,56 ^a	6,7±0,68b
Daily length growth	0,080 cm/day ^a	0,119 cm/dayb
Initial body weight (g)	0,92±0,032	0,95±0,034
Final body weight (g)	9,40±5,84 ^a	15,41±6,75b
Weight gain (g)	8,53±5,45 ^a	14,46±6,35b
Daily weight gain	0.15g/day ^a	0.26g/dayb
Survival (%)	85,50±3,15 ^a	97.45± 3.55
Feed conversion ratio	1.20 ^a	1.25 ^a

Feeding of pellets in the research conducted can be applied to the efforts of nursery coral trout grouper seeds for culture with 48% protein, can produce better growth and survival. Enrichment of feed with vitamin C and calcium can increase the vitality of mud groupers (Aslianti and Priyono., 2009). In addition, artificial feed can be stored for a long time to make it easier for supply. Whereas fish protein requirements are influenced by fish size and age, protein quality and feed energy content as well as feed nutrition balance. In Table 2, it can be seen that the value of the feed conversion ratio in both treatments is quite good, the more the conversion ratio becomes low, the better the feed, because the amount of feed spent on growth of a certain weight and length is less. The provision of artificial feed and trash fish to duck fish for 4 months of rearing resulted in a conversion ratio value of 1.54 and 5.82, respectively (Suwirya *et al.*, 2005). While the growth of grouper sunu seedlings by providing different protein feeds in each treatment of artificial feed the conversion ratio of protein feed 48% was 1.28 and treatment of protein feed 55% was 1.24 (Table 2).

Water Quality Maintenance

The results of observing water quality in the cultured media tank in Table 3, temperature, pH, salinity, ammonia, phosphate and nitrate in the two treatments observed are almost the same, where the temperature ranges from 27.50 - 29.25°C, pH ranges from 7.00 - 8, 05, dissolved oxygen values range from 5.00 - 7.85 mg/L, salinity ranges from 33.20 - 34.00 ppt, Ammonia content values 0.0135 - 0.0145 ppm, phosphate 0.0321 - 0.0452 ppm, and nitrite from 0.0037 to 0.0052 ppm. The two treatments carried out in the maintenance fiber tank still show a reasonable value for the growth of the coral trout grouper fish, according to Ismi *et al* (2013), that safe water quality for grouper nursery is at a temperature of 25-32°C, pH 7.5 -8 , 3, DO 4-8 mg / L, salinity 20 - 35 ppt, and ammonia <0.02 ppm. The water quality results at the time of the study in Table 3. Show that juvenile coral trout fish are always healthy, growth and survival (SR) are quite high.

Table 3. The quality of water in artificial feeding of the coral trout grouper seeds, *Plectropomus Leopardus* is sown in the fiber tank during culture.

Parameter	Treatment of feed artificial pellet with different protein	
	A(feed protein 48%)	B (feed protein 48%)
Temperature (°C)	27.50 – 30.90	28,50 – 30.45
pH	7,00 – 8,05	7,04 - 8,10
DO (Disolve Oksigen)		
mg/L	5,00 – 7,85	5,80 - 7,65
Salinity	33.20 – 34.00	33,12 – 34,10
Ammonia (ppm)	0,0135– 0,0145	0,0125– 0,0160
Fosfat/Phosphat (ppm)	0,0321- 0,0452	0,0358- 0,0542
NO2/nitrit (ppm)	0,0037- 0,0052	0,0030- 0,0054

Economic Business Analysis.

The results of the calculation of economic business analysis (Table 4) on the feeding of artificial protein with different protein in the nursery of the coral trout grouper fish, *Plectropomus Leopardus*, in the treatment of artificial feed with a protein content of 55% is the best and obtaining a higher profit ratio with B /C ratio of 1.51, and followed by the provision of artificial feed with a protein content of 48% with a fairly decent profit ratio with a B/C ratio of 1.09. With a B / C ratio greater than 1 meaning that the use of expenditure costs for operational business nursery is quite efficient or economical. The business of separating the coral trout grouper seeds, *Plectropomus Leopardus* which is sown in the fiber tank by using artificial feed or pellets can be applied as a practical and

easy model to do. The profit ratio results obtained from this treatment, are still higher than the results of Slamet's research (2016) on the application of artificial feed with different protein contents in the nursery of blacksaddled coral grouper seeds, *Plectropomus laevis* and Alit (2015) in the financial feasibility analysis of the fish seed nursery business the coral trout grouper, *Plectropomus leopardus*.

Table.4. Profit and profit ratio with expenditure on feed artificial with different proteins in the nursery grouper seeds trout for 8 weeks.

Production factors	Treatment A (pellet feed of protein 48%)	Total (Rp)	Treatment B (pellet feed of protein 55%)	Total(Rp)
Fish seeds Size 3,5 cm	450 ekor x 1.200 x 3.5 cm	1.890.000	450 ekor x 1.200 x 3.5 cm	1.890.000
Feed	Pelet 15 kg x Rp 20.000	300.000	Pelet 25 kg x Rp 25.000	625.000
Electric 2 bln	2 x Rp 250.000	250.000	2 x Rp 250.000	250.000
Etc	500.000	250.000	500.000	250.000
Total Spending		2.690.000		3.015.000
Harvest (Price 1.750/cm)	80,50% x 600 ek x 7.5 cm x Rp 1.750	6.339.375	90,30% x 600 ek x 9,2 cm x Rp 1.750	8.722.980
Technician 20% x Rp	56 days	729.875	56 days	1.141.596
B/C		1.09		1.51
Conclusion		pretty decent		more feasible

Conclusion

Artificial feed (pellets) with a protein content of 55% can be applied to the nursery business, can increase growth, and survival by getting a better profit ratio.

References

- Alit., A.A. 2015. Analisa kelayakan finansial usaha pendederan benih ikan kerapu sunu, *Plectropomus leopardus*. J. Sain dan Teknologi, 10(1):91-99.
- Akbar, S. Marsoedi., Soemarno, dan Kuesnendar. 2013. Pertumbuhan benih kerapu macan pada Fase Pendederan dengan kepadatan berbeda di karamba jaring apung. J. Tenplogi Pangan, 1(2): 93-101
- Aslianti, T. dan A. Priyono. 2009. Peningkatan vitalitas dan kelangsungan hidup benih kerapu Lumpur, *Epinephelus coioides* melalui pakan yang diperkaya dengan vitamin C dan kalsium. J. Ilmu Kelautan dan Perikanan, 19(1); 74 -81
- Effendie M.I. 1979. Metode biologi Perikanan. Cetakan Yayasan Dewi Sri Bogor. 112 pp. Giri, N.A., K. Suwirya, dan M. Marzuqi 1999. Kebutuhan protein, lemak, dan vitamin C pada yuwana ikan kerapu bebek, *Cromileptes altivelis*. J. Penelitian Indonesia, 5(3): 38-49.
- Giri, N. A., K. Suwirya, dan M. Marzuqi. 2002. Effect of dietary protein and energy on geowth of juvenile humpback grouper (*Cromileptes altivelis*), Indonesia Fisherie Riseach 8(1): 5-9.
- Ismi S., T. Sutarmat, NA Giri, M.A. Rimmer, R.M.J. Knuckey, A.C. Berding dan ngK. Sugama. 2013. Pengelolaan pendederan ikan kerapu: suatu panduan praktik terbaik. Monograf ACIAR No. 150a. Australian Centra for International Agriculture Research: Canberra. 44hlm
- Marzuqi. M., N.A. Giri, dan K. Suwirya. 2004. Kebutuhan protein dalam pakan untuk pertumbuhan yuwana ikan kerapu batik (*Epinephelus polyphekadion*). J

- Penelitian Perikanan Indonesia*. 10(1):25-32.
- Marzuqi, M., N.A. Giri, dan K. Suwirya. 2007. Kebutuhan protein optimal dan pencernaan nutrient pakan untuk benih ikan kerapu sunu (*P. leopardus*). *J.Aquaculture Indonesia*. 8 (2): 113-119.
- Marzuqi, M., W.W. Astuti, dan K. Suwirya. 2012. Pengaruh kadar protein dan rasio pemberian pakan terhadap pertumbuhan ikan kerapu macan (*Epinephelus fuscoguttatus*). *J. Ilmu dan Teknologi Kelautan Tropis*. 4(1):55-65.
- Melianawati, R, dan K. Suwirya. 2005. Pengaruh dosis pakan terhadap pertumbuhan juvenile kakap merah, *L. arentimaculatus*. Buku perikanan budidaya berkelanjutan. Hlm: 135-142.
- Slamet, B. 2016. Aplikasi pakan buatan dengan kandungan protein berbeda pada pendederan benih ikan kerapu raja sunu *Plectropomus laevis*. *J. Ilmu dan Teknologi Kelautan Tropis*, 8(2): 493-502.
- Setiawati, K. M., Zafran, dan D. Kusumawati. 2016. Pembesaran kerapu sunu *Plectropomus leopardus* dalam keramba jaring apung dengan frekuensi pakan yang berbeda. *J. Ilmu dan teknologi Kelautan Tropis*, 8(2):605-611.
- Suwirya, K., N. A. Giri, dan M. Marzuqi. 2005. Kebutuhan kadar protein terhadap pertumbuhan benih ikan kerpu lumpur (*Epinephelus coioides*). *Pen. Per. Indonesia*, 11(1):63-68.
- Sukadi. F.M. 2003. Strategi dan Kebijakan Pengembangan Pakan Dalam Budidaya Perikanan. Balai Riset Budidaya Departemen Kelautan dan Perikanan. 11-21 hal.
- Sedgwick, R.W. 1979. Influence of Diatory Protein and Energy on Growth, Food Consumption and Elsevier Science Publisher.B.V., Amsterdam Aquaculture (6) : 7 – 30.
- Sutarmat. T. S. Ismi, A. Hanafi dan S. Kawahara 2003. Petunjuk Teknis Budidaya kerapu bebek (*Chromileptes altivelis*) di KJA. Balai Besar Riset Perikanan Budidaya Laut Gondol, Pusat Riset Perikanan Budidaya. Badan Riset Kelautan dan Perikanan Departemen Kelautan Perikanan dan Japan International Cooperation Agency. 56 p.
- Soekartawi. 1995. Analisis usahatani. Jakarta: Universitas Indonesia Press.110p.
- Sedgwick, R.W. 1979. Influence of Diatory Protein and Energy on Growth, Food Consumption and Elsevier Science Publisher.B.V., Amsterdam Aquaculture (6) : 7 – 30.
- Wedemeyer. A. 1996. Physiologi of fish in Intensive Culture System. International Thompson Publishing. New York. 227 pp.
- Zonneveld, N., E.A. Huisman, dan J.H. Boon. 1991. Prinsip-prinsip Budidaya ikan. Pustaka Utama Gramedia Jakarta. 71 pp.