

Effect of Natural Feed on Feed Consumption Level and Feed Conversion Ratio of Tropical Abalone *Haliotis asinina* on Sea Cage

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Abstract. The research was conducted from June to August 2015 in Barrang Lompo Island, District Ujung Tanah, Makassar. The animal sample used was abalone measuring 3 - 4 cm with the initial weight 6.2 g. The experimental design in this reaserch used Completely Randomized Design (CRD). There are three kinds of treatment are (A) *Gracillaria* sp., (B) *Halymenia* sp., and (C) *Sargassum* sp. The results showed that the different types of feed giving a very significant influence towards of level consumption and feed conversion ratio (FCR). The highest level of feed consumption on feed treatment is *Gracillaria* sp., while the best feed conversion ratio on feed treatment is *Sargassum* sp.

Introduction

Abalone is a type of shellfish that has become a commodity of the world fisheries in recently, especially international market. Japan, China and Hongkong are the largest country consumer of abalone [1,3,12]. The main factor why abalone become increasing commodity in every year is because abalone content high nutrition and good taste. Abalone *Haliotis asinina* classified into *Gastropods* class, family *Haliotidae* and it is a type of marine mollusc that has exotic and high economic value because its shell used as jewelry and its meat is a delicious also high nutritious meal [5,9].

In some countries such as Japan, New Zealand, Australia, USA, Mexico and South Africa, abalone technology aquaculture has been successfully developed [12]. Cultivation from this commodity is around in the development stage, and finding market request. It still rely on catches of nature in which these activities can threaten the existence of abalone population if it is done continuously. The decline of abalone population in Indonesia can be seen from the reduced size of shells that caught by Fisherman [2] and total catches diminishing [13]. Therefore, abalone cultivation techniques must be imaveragetely developed and implemented to reduce fishing pressure on abalone populations in the sea. In addition, through the cultivation, the increasing market request can be accepted without fishing activities.

To fullfill the scarcity of abalone population is needed abalone cultivation, either through the mass production of seeds and cultivate techniques of the sea. One of the most important breeding processes is the selection of suitable feed for the marine life. Abalone is herbivorous organism that consumes microalgae (diatoms) on the larval stages [3] and microalgae in the adult phase [7]. Feed is often used in the enlargement and parent abalone is a natural feed such as seaweed and *ad libitum* (until abalone is full). Some types of seaweed used as feed for abalone are *Gracillaria verrucosa*, *G. Arcuata*, *Ulva* and *Sargassum*. The different types of seaweed contain different nutrients indeed. Similarly, the growth rate generated of abalone predicted it will be different. The research of the effect level consumption of natural food and FCR abalone that reared in under the sea, has never been done in Indonesia so that this research should be done.

Material And Method

Experimental procedures and treatment. The research was conducted in Barrang Lompo Island , district Ujung Tanah , Makassar City, South Sulawesi , for 2 months from June to August

2015. Tools and materials used in this research was a basket plastic length 44 cm, width 32 cm and height 14 cm consist of 9 units. Iron frame of Cable Tie as a binder container, the pipe diameter of 3 inches were halved as many as 9 pieces. Scales electrically accuracy of 0.01 grams, water thermometer, pH meter, salinometer and underwater camera. The research material was abaloneseed measuring 3-5 cm consist of 180 fishes, natural feed used were *Gracillaria sp.*, *Halymenia sp.* and *Sargassum sp.*

The cage for enlargement abalone is made by plastic material with a rectangular form - shaped container that has small holes as the flow of the water flow, the length basket is 44 cm, width 32 cm and height 14 cm. So that the material easily obtained, then used a cube fruit basket. Fruit basket has a handful cover associated with a cable tie. In each fruit basket included parts of the pipe measuring 3 inches by 2 pieces, each hemisphere has length 30 cm. Parts of the pipe was sanded surface so that the surface is not slippery. The function of this pipe sticking place and refuge for abalone during in the cage. As a buffer container, so shelf made of metal shaped like a table and place it in the area of coral reefs, with length 38 cm, width 34 cm and height 105 cm. Adaptation of abalone researched was taken from the hatchery and then transported by boat to the hatchery in around Barrang Lompo Island sea, so abalone adapted for 1 month. During the adaptation feed given was *Gracillaria sp.* [14,15,16].

Measurement of abalone using a ruler centimeter scale. Measurements carried out on all abalone in any container in 20 abalone. The length of abalone's shell is measured and weighed one by one for each experimental. Natural feed is an algae *Gracillaria sp.*, *Halymenia sp.* and *Sargassum sp.* and weighed the as much as 20 % of the total weight of 20 abalone. The animal sampling is used an abalone seeds that measuring about 3-6 cm and weight about 6.2 to 42.2 g. The amount of each container is 20 fishes. Feeding fresh seaweed is compare with the treatment. Treatment A type of seaweed feed *Gracillaria sp.*, treatment B types of seaweed feed *Halymenia sp.* and treatment C types of seaweed feed *Sargassum sp.* Feeding dose is given for 20 % of body weight. Observation and dose feed for every week when measuring the length and weight of abalone seed.

Design of The Experiments. The research method used a Completely Randomized Design (CRD), with three treatments and three replications, namely: 1. Treatment A with feeding natural feed (*Gracillaria sp.*); 2. Treatment B with feeding natural feed (*Halymenia sp.*); 3. Treatment C with feeding natural feed (*Sargassum sp.*). The placement of the research container by doing randomly.

Variable and Statistical Analysis. Feed consumption in this research calculated by using the formula recommended by [21] as follows: $C = F1 - F2$ (g) where: FC = Feed Consumption, F1 = Initial Feed Weight (g) and F2 = End Feed Weight (g). Feed conversion ratio calculated based on the Watanabe formula [26] as follows: $FCR = \sum F/W$, where: FCR = Feed Conversion Ratio, $\sum F$ = Number of Feed Given (g) and W = Biomass Animal sample' weight (g). Data presented in averagen and one-way analysis of variance (SPSS for Windows ver. 16) for testing the difference treatments. If there is a treatment effect parameters test, So it will be continued with W-Tukey test at 5 % validity level.

Result And Discussion

Weekly Feed Consumption Level. The result of the averagen observation towards abalone H. Asinina feed consumption level for every week during in Barang Lompo Island sea, breaded in sea cage by feeding the different natural feed (*Gracillaria sp.*, *Halymenia sp.* and *Sargassum sp.*) can be seen in figures 1, 2 and 3.

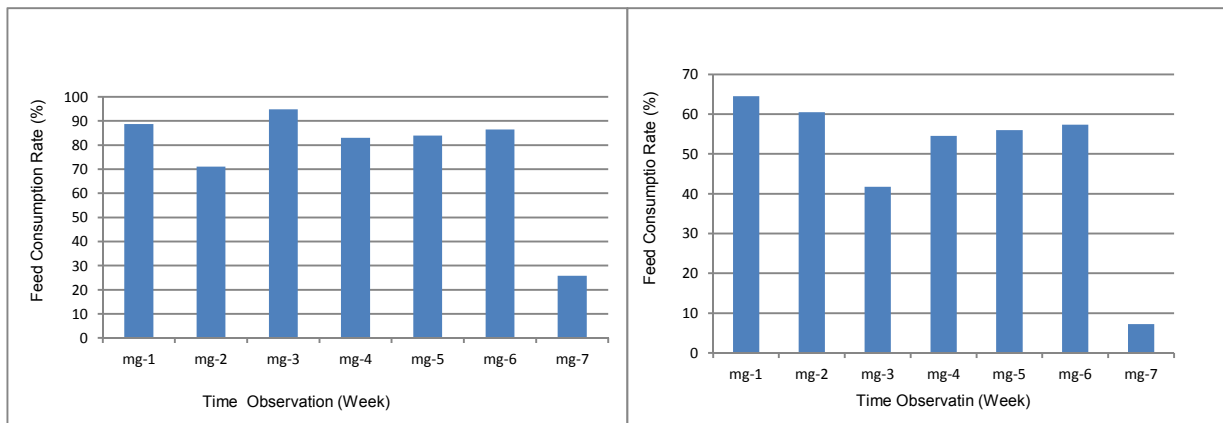


Figure 1. Graph of abalone feed consumption rate of feeding natural feed *Gracillaria sp.* (left)
 Figure 2. Graph of abalone feed consumption rate of feeding natural feed *Halymenia sp.* (right)

In Figure 1, shows that feed consumption rate of Abalone *H. asinina* for *Gracillaria sp.* showed different values in each week. Feed consumption of *Gracillaria sp.* is the highest in the 1st and 3rd week each 89 % and 95 %. However, in the 2nd week feed consumption rate dropped to 71 %. While in the 4th, 5th and 6th week was almost the same 83 %, 84 % and 86 %. The lowest feed consumption was recorded in the 7th week which is only 26 %.

In Figure 2 natural feed types *Halymenia sp.* by abalone in the 1st and 2nd week showed a high level of feed consumption 65 % and 60 %. While in the 3rd week, feed consumption is lower than the 1st and 2nd week which is only about 42 %. For the 4th, 5th and 6th week showed feed consumption rate is almost the same 55 %, 56 % and 57 %. While in 7th week is only about 7 %.

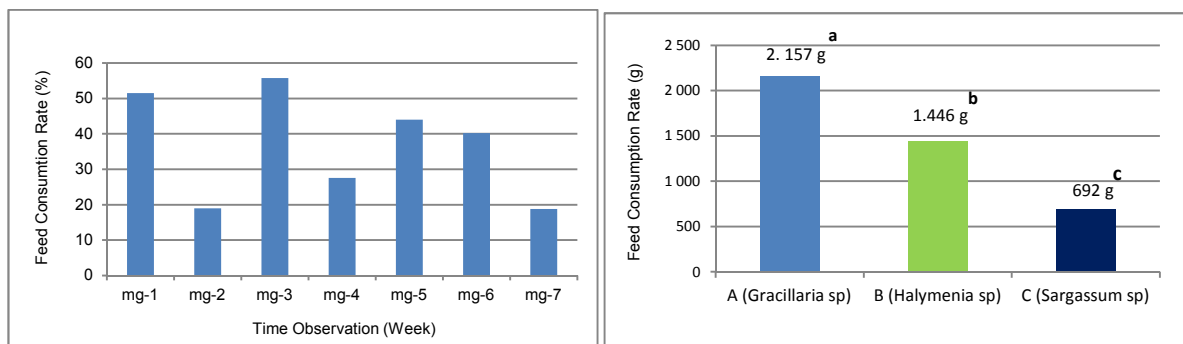


Figure 3. Graph of abalone feed consumption rate of feeding natural feed *Sargassum sp.* (left)
 Figure 4. Graph of abalone feed consumption rate in the different feeding natural feed. (right)

Figure 3 above shows that the natural feed of *Sargassum sp.* is the highest feed consumption rate in the 1st and 3rd week (51 % and 56 %). However, in the 2nd and 7th week showed the lowest feed consumption rate with the same value that is 19 %. At the 4th week recorded increased feed consumption rate than the 2nd and 7th week that is 28 %. Followed at the 6th and 5th week (51 % and 56 %). Based on the observations of feed consumption rate of abalone *H. asinina* for every week on different feeding natural (*Gracillaria sp.*, *Halymenia sp.*, and *Sargassum sp.*) and that's all showed the differences number of feed consumption in every week. At the 1st week showed a high level of feed consumption for all treatments. This is presumably because the abalone has been through a period of fasting which is during in the carriage container abalone where there is no any feed. The consumption of natural feed for abalone is varies by time. It depends on several factors that influence it. The differences of feed consumption rate for every week in all treatments it's because the abalone feed consumption rate influenced by environmental conditions. these stated that the environmental conditions, namely water quality (pH, salinity, DO, photoperiod and temperature) can also affect of abalone feed consumption rate [7,17].

Feed Consumption During The Research. The average observation result of total abalone feed consumption rate during the research is shown in Figure 4. Figure 4 shows that the highest abalone

feed consumption rate obtained in treatment A (*Gracillaria sp.*) with consumption rate 2,157 g , then followed by treatment B (*Halymenia sp.*) with the averagen consumption rate 1,446 g and treatment C (*Sargassum sp.*) is the lowest of the averagen consumption rate 692 g .

Based on the observations result of the value feed consumption rate on treatment A with feeding *Gracillaria* shows that the highest feed consumption rate than in treatment B with feeding *Halymenia sp* and treatment C with feeding *Sargassum sp*. It's because of the feed treatment A (*Gracillaria sp.*) has smaller branches that can escape from container through water circulation holes on the container. In the treatment B (*Halymenia sp.*) has a large thallus, flat with the end branching rounded straight, slightly curved and serrated edge. As well as in treatment C (*Sargassum sp.*) has large twigs and wide leaves, rough and jagged edges. Another thing also, presumably because the natural feed is red algae (*Gracillaria sp.*) known as commonly consumed food abalone in the wild and being a favored food for abalone. According to [23, 24] states that most of types of abalone consume 70 to 80% a red algae and only a little bit consume a brown algae. *Sargassum* also is consumed by abalone if red algae less abundant. According to [10,20] stated that the results of laboratory studies obviously looks that the adult abalone likes red algae. *Gracillaria sp* is a species of Rhodophyceae red algae.

Results of variance analysis showed that the treatment tested is very significant effect of abalone feed consumption rate. Tukey HSD test results showed that feed consumption rate by feeding natural feed is different. Feed consumption rate in the treatment A (*Gracillaria sp.*) significantly different with treatment B (*Halymenia sp.*) and treatment C (*Sargassum sp.*).

This suggests that feeding the different naturally feed give affect of the feed consumption rate. This is presumably because abalone consume more *Gracillaria sp.* According to the research [18], stated that abalonefeed species *Sargassum sp.*, preferred feed *Gracillaria sp.* Moreover, according to Hadijah [18], the shape and texture of the feed such as stems are small and delicate in *Gracillaria sp.* can also facilitate abalone in consuming the feed easily.

Abalone could grow well in good conditions and can take the advantage of the feed given optimally. This is supported by a statement of [11] which stated that most of the type of aquatic organisms cultured consumes feed in early organisms development and higher than when at the adult phase , so that the animal sample could grow well.

Feed Conversion Ratio (FCR) and Water Quality. Feed conversion ratio based on observations result abalone research that kept in the sea cage in Figure 5 :

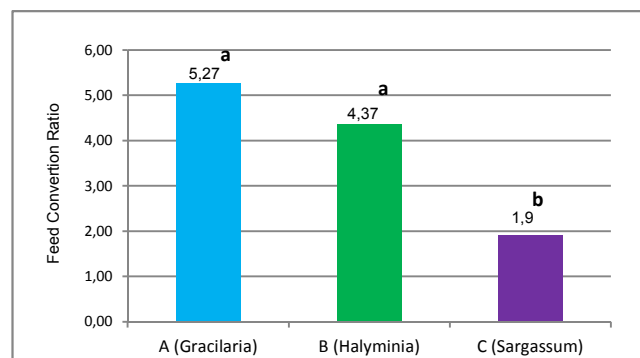


Figure 5. Graph of abalone FCR in different feeding natural feed.

Figure 5 shows that the abalone FCR is the highest obtained in treatment A (*Gracillaria sp.*) with average FCR 5.27, followed by treatment B (*Halymenia sp.*) with average FCR 4.37 and treatment C (*Sargassum sp.*) is lowest with FCR 1.9. It means that to add weight 1g abalone requires 5.27g a natural feed *Gracillaria sp.* Thus it can be said that the best feed conversion ratio is *Sargassum sp.*

Results of analysis of variance showed that the experiments conducted is very significant effect on FCR abalone. W-Tukey test result showed that the treatment A(*Gracillaria sp.*) was not significantly different with feed in treatment B (*Halymenia sp.*), but significantly different with feed in treatment C (*Sargassum sp.*). FCR feed on treatment B (*Halymenia sp.*) is also significantly different with feed in treatment C (*Sargassum sp.*) This is because in treatment C with natural feeding *Sargassum sp.* only can be reduced except abalone which consumes it. It is because the

natural feed *Sargassum sp.* has large twigs, wide leaves and dense so that the feed cannot come out of the container through a hole circulation of water even by flow press whether by feeding a natural feed in other treatments. At the same case also happened in treatment C (*Sargassum sp.*) that has a nutrient that suitable with abalone needs because it has a high protein and low fat than the other treatments.

The difference of level food preference on abalone caused by the ability to consume the certain components such as carbohydrates. Abalone in the wild will choose any foods that have a balance of nutrients but in some time it may change because influenced by several factors, such as availability of food, chemical contains and the inability to consume a hard foods [7,17,25]. Based on the research result that the smaller of FCR is the best feed to consume in supporting the growth of pet fish and conversely, the bigger FCR ratio shows the ineffective feed to support the growth of fish [6]. The best abalone's feed for weight is a feed that contain a low fat and more carbohydrate reserves [19]. Abalone has a capability for synthesizing fat from carbohydrate sources [4]. Actually, there is still a technical obstacle in this research where the pieces of residual feed still come out from the holes of maintenance cart. So it may give the impact with decrease of the residual feed that unconsumed by abalone.

During the research there are several measurements of water quality parameters includes temperature, salinity and pH. The value of the water quality parameters in temperature about 28-30°C, salinity 29-32 ‰ and pH 7-8. Based on the measurement of water quality parameters shows all of parameters are still in available for abalone maintenance. The water temperature for abalone is about 26-30°C, salinity 32-35 ppt, and pH 7.5 to 8.7 [8].

Conclusion

Based on the results of the research, it can be concluded as follows:

1. There is a significant difference on abalone feed consumption rate by feeding a natural feed from macro algae (*Gracillaria sp.*, *Halymenia sp.* and *Sargassum sp.*).
2. There is a significant difference on Feed Conversion Ratio (FCR) of the 3 kinds of natural feed (*Gracillaria sp.*, *Halymenia sp.* and *Sargassum sp.*).
3. The lowest Feed Conversion Ratio (FCR) noted on feeding natural feed treatment of *Sargassum sp.* (1.9) and the highest is feeding a natural feed of *Gracillaria sp.*

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