THE BIOLOGICAL ASPECTS of TROPICAL ABALONE (Haliotis asinina L) IN TANAKEKE ISLAND WATERS, SOUTH SULAWESI

Hadijah1, Ambo Tuwo2, Muh. Iqbal Djawad2 dan Magdalena Litaay3

1 Fishery Department, Faculty of Agriculture University 45 Makassar e-mail: hadijahmahyuddin @yahoo.com

2 Faculty of Marine Science and Fishery University Hasanuddin Makassar

3 Faculty of Mathematic and Science University Hasanuddin Makassar Jl. Perintis Kemerdekaan KM. 10, Kampus Tamalanrea, Makassar 90245, Indonesia

ABSTRACT

This study aims to analyze the biological aspects of tropical abalone (Haliotis asinina L) comprising distribution of abalone size, length and weight correlation and feeding habit. The study was conducted in Tanakeke Island waters, Takalar regency, South Sulawesi. The selection of station for samples was based on dissemination of coral reefs around the islands. The data were collected through a survey, and analyzed qualitatively. The results of the study indicated that the size distribution of male abalone shell length is 32.00 – 89.00 mm and body weight is 2.90 – 94.52 g. The female shell length is 3.00-81.00 mm and body weight is 3.72 -123.53 g. The shell length of most of male caught abalone is 50.00-55.00 mm, and 60,00 -65.00 mm for female abalone. The correlation between shell length and body weight for both male and female abalones is isometric. Abalone is herbivorous feeding on benthic diatom and red algae.

Keywords: biological aspects, length and weight correlation, isometric, herbivorous feeding.

INTRODUCTION

Abalone (Haliotis asinina) is a kind of gastropoda. The shape is almost like ear, so why it is called 'donkey ear'. Abalone H. asinina is an export commodity. The price is about Rp. 1000.000/kg. This king of seafood is a favorite food of people of Japan, United States of America, Europe, Columbia and Canada, because the meat is very delicious. 100 g of abalones meat comprises 83 calories, 59 mg cholesterol (low cholesterol), 18 g protein, 0,1 g fat, 2,7 carbohidrate, and some vitamins such as B1, B2, B6 and B16 and also comprises of some minerals such as calcium, iron, zink, magnecium, and celenium (Setyono, 2009).

The high demand of market causes the population of abalones are exploited more and more, so they are getting less and less in some exploitation area. Before the exploitation, abalones were easily be found in some certain area, but now it is difficult to find them and the location of catching the abalones is also deeper (Maliao et. al.,2004).

Beside that, the way of catching abalones is usually done by turning the coral reef over. This is the way to take the abalones which hiding in the bottom of coral reef. As a result. It destroys the coral reefs (destructive fishing).

One way to save the population of abalones is to do cultivation. The cultivation of abalones can be done if the germ is available continuously. The way to get the abalone germ continuously can be done by producing the germ. The producing of abalone can be done successfully if both the quality and the quantity of abalones' mother can be recognized from biological aspect.

One of the potential areas to produce local mother of abalone is Tanakeke islands. The island is part of Spermonde islands where the abalones were caught. These islands consist of some islands i.e. Tanakeke island, Lantang Pao island, Bauluang island and Satangnga island. Beside that, around the islands there are atols where many coral reefs grow in (Yunus, 2009).

One of the problems of abalones cultivation is the available of their local mother. That is why the information of the available and the potency of the local mother are needed as the source mother of abalones cultivation in South Sulawesi. In accordance with it, the analysis of biological aspects of abalones becomes important. The potency can be developed, when these things are known; (a). what is the length and weight of the catching abalones, (b). the correlation of their length and weight, and (c). how is their feeding habit in nature.

METHOD OF RESEARCH

This study was done by using survey method. The abalones were caught around the location of Tanakeke islands waters, Mangarabombang sub district, Takalar regency on the center 05O 29 10,9 LS and 119 O 18' 54.6"BT. The taken station was chosen based on the spread of coral reef found around the islands. The time of sampling was conducted in the second week every month. The sample was taken for one year, started from April 2008 to March 2009. The biological parameter was searched in Biological fishery laboratory Faculty of marine science and fishery Hasanuddin University. There were 60 samples of abalone were used in various size for feedIng habit analysis.

a. The correlation of the length-weight. In gaining the data it was used formula (Ricker 1975 in Schiel and Breen, 1991)

$W = aL\ b$

W = body weight (g). L = total length, a and b constant b. Feeding Habit, to analyze the caught abalones feeding, it was used action frequency method.

DISCUSSION

The Distribution of the Shell Length and the Body Weight

The distribution of abalone's shell length and the body weight described the specific biometric parameter in the production period. The finding was based on the survey started from April 2008 to March 2009. It was found 296 samples, consist of 167 male abalones (56,42%) and 129 female abalones (43.58%). The shell lengths of male abalones were about 32.00 to 89.00 mm and the weight were about 2.90 to 94.52 g. The shell lengths of female abalones were about 30.00 to 81.00 mm and the weight were about 3.72 to 123.53 g.

Based on the shell length, the frequency of the caught abalones at the time when the abalones were caught as the sample was given on picture 1 and 2. Based on picture 2, it can be said that on April 2008 the caught abalones were 45-50 mm length of shell (16%), and most of their shell length were 50-55mm (36%). On May 2008 the length of the caught abalones were 50-55 mm (3,85%) most of them were 60-65 mm (50%) On June 2008 they started to show the addition of new population. The indication was shown when there was a small size of abalone H. Asinina that is 30-35 shell length (8%) and there was also found big size of abalone, that is 80-85 mm (4%) of length. The size of the abalone grew bigger

on July 2008, that is 45-50 mm length (6,25%). The general size was 65-70 mm length (43,75%). On this month there were found many of the abalones are gonad mature.

Figure 1. Picture of shell abalone H asinina in other size

Next, on August 2008, there were caught various abalones and this was also happened on September and October 2008. However, on November 2008 it was found again the recruitment or the addition of new members in the waters. This was indicated when there was found 35-40 mm length even though only in small amount (4,35%).

It was also happened on March of the next year. When there were found small abalone with 30-35 mm of shell length (3,3%) The abalone was assumed as a result of spawning from October last year, in which it was the culminating point of abalones spawning. Nash (1992) stated that the successful recruitment rarely happened and sometime the recruitment in some years are not enough to support fishery. The survey to the distribution of abalones shell length shows that the size of male abalones came from group 50-55 mm shell length. Whereas, female abalones came from 60-65 mm length group (picture 3).

The amount of female abalones with 60-65 shell length then correlates to the level of gonad mature shows that the size of these abalones started to be mature and some of them started to be gonad mature. The population of the structure of this size are bigger in nature, because in this period the addition of shell length got down. This is the longest period in Abalone live cycles. The statement is in line with Bardos' et.al (2006).

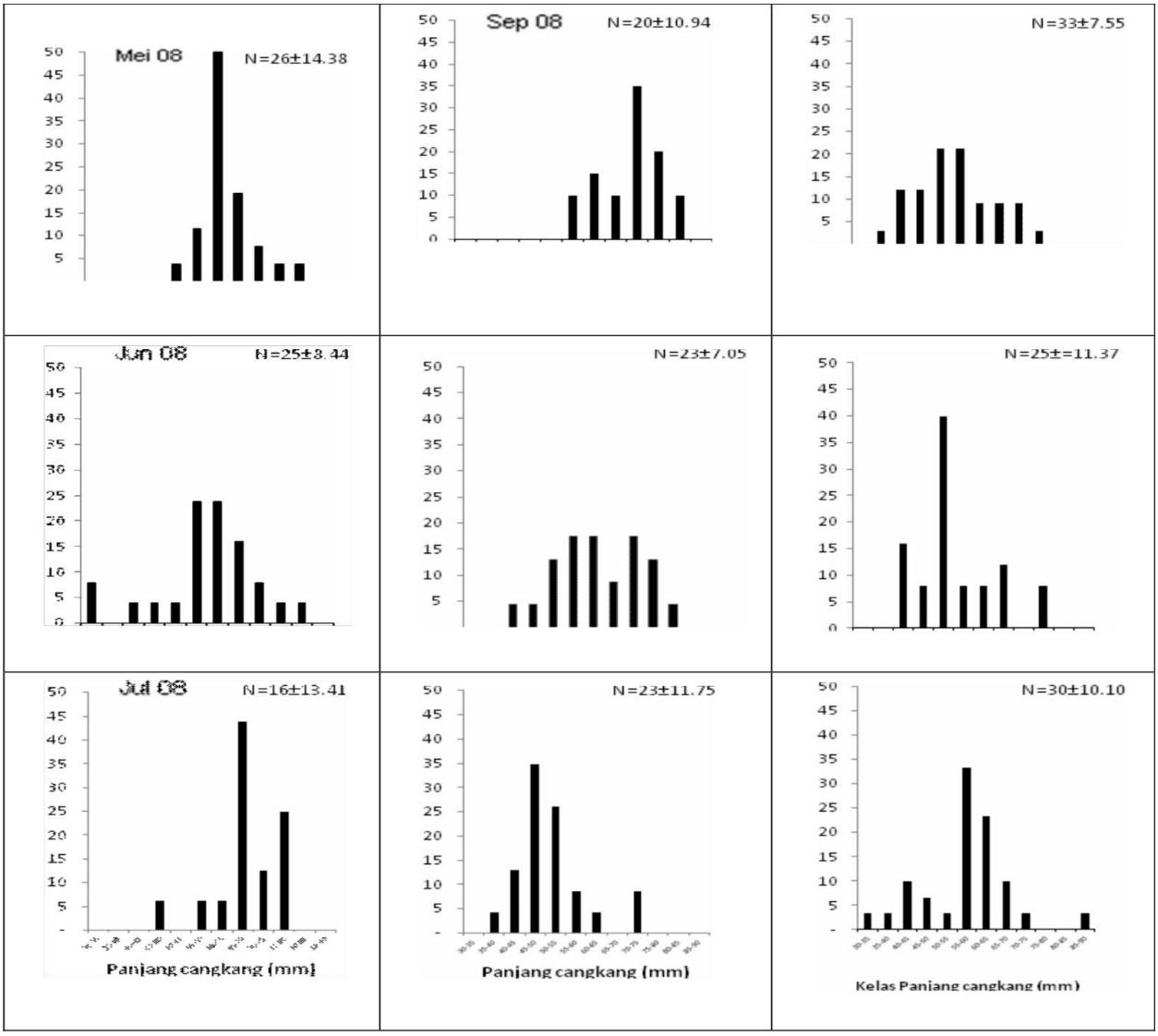

Figure 2. PDistribution of abalone's shell length periode April 2008 to March 2009

The smallest amount of the catching abalones (less than 5%) were from under 40 mm and upper 80 mm shell length group. This is because the improvement of shell length size and some factors. One of the factors, the abalones started to be in reproduction age,because they got older, beside the death of abalones caused by disease or catching activity. This in line with Bardos' et. al (2006) who stated that the proportion of mature abalones H. Asinina in nature is getting less and less because the natural death and because they were caught.

The small abalones with less than 40 mm shell length were also found in very small amount. This is because at the time of juvenile, the abalones were competed for food, beside the environment factor. This is in accordance with Lafferty and Kuris (1993) who stated that the causes of abalones mortality in California was caused by disease, water temperature, over exploitation, pollution, physiological pressure,

starvation and competition. This statement is in accordance with Bardos et. al (2006) and Griffith and Gosselin (2008) who reported that the main cause of death of invertebrate in the sea in the time of juvenile was caused by the high amount of predator, environment factors and the high of juvenile density in one habitat. Beside that the movement of abalones with 40mm and less are friskier than the old one.(Mc.Shane , 1992). The presentation of distribution of abalones H. Laevigata and H. Roel shell length size had been measured by using video in Western Australia. It was found that the abalones with < 30mm shell length are 5%, 30-39 mm (7 %), 40-49 mm (15%) 50-59 mm (23%) 60-69mm (27%), 70-79 mm (20%) and 80> (4%) (Hart et.al, 2008).

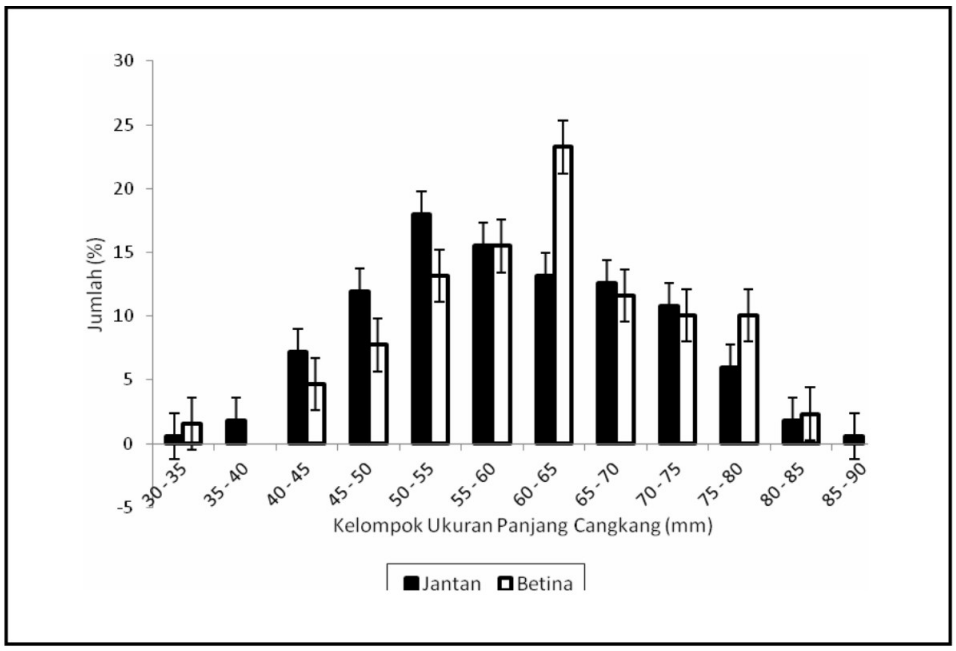

Figure 3. Histogram presentation of Abalone based on the shell length and kind of gender during the survey (N=296)

The presentation and distribution of abalones size based on its body weight found during the survey, is given on picture 4. Male abalones with 12.1 -22 g weight group were the biggest amount, whereas female abalones with 22.1-32g weight group. The smallest amount were from 62.1 g and up weight group.

Andy Omar at. al (2006) found about 30-55mm shell length and 20-25 mm wide and 6-9 mm high in Bone Tambu Island waters. If we compare the abalones of this island to the abalones of Tanakeke, it was found that abalones of Bone Tambu island was bigger. Maliao at al (2004) also found small tropical abalones (H.Asinina) in Sagai Waters of Philipines. The difference size bring us to the conclusion that even though the statistic of abalones shows the smaller size, but the abalones in Tanakeke were bigger than the abalones from South Lombok and from

Sagay Philippines waters. This is because some factors such as environment factor, in which it is known that the coral reef in this waters are still good (Yunus,2009). According to Chen (2007) abalones will grow successfully if the food are available in nature.

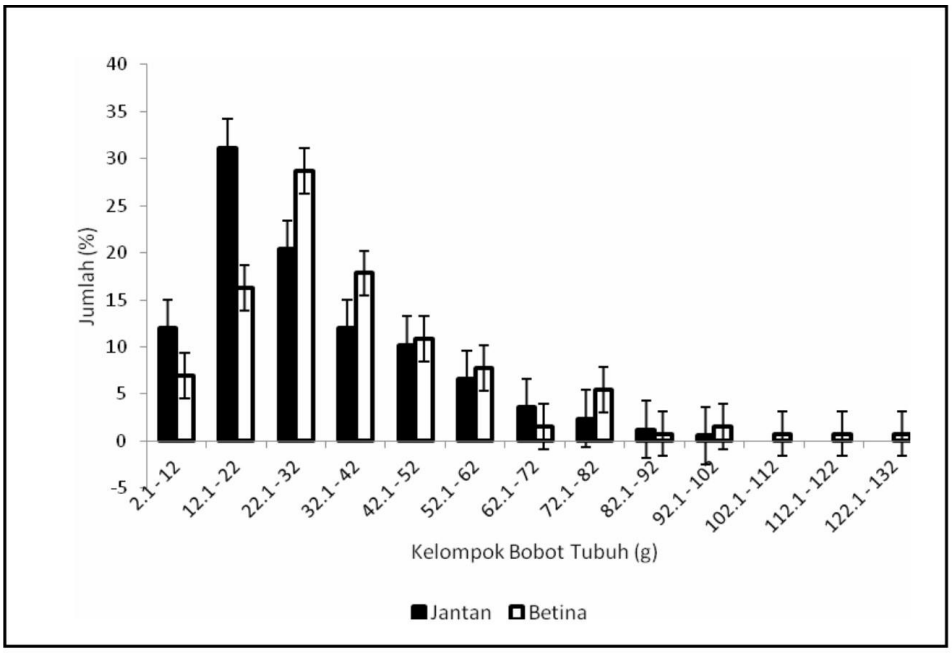

Figure 4. Histogram presentation of Abalones based on weight group and gender during the presentation (N=296)

The mean of abalones shell length and weight which are found during the survey showed the variation in every month. The longest abalone shell was found on August and September 2008, both male and female abalones. The smallest male abalone was caught on November 2008 and the smallest female one was caught on February 2009. The mean of the biggest body of male and female abalone were found on July 2008. Whereas, the smallest male abalone was caught on November 2008 and the smallest female one was caught on February 2009.

The Correlation of Body Weight and Shell Length

The analysis of correlation of body weight and shell length during the survey can be seen on table 8. Based on the analysis, it was found the similarities between the correlation of male abalone body weight and the shell length i.e. BW= 0.000104PC3.05557, r = 0.9040 (picture 5). For female abalones it was found BW = 0,000145PC2.9991, r = 0,8691 (picture 6).

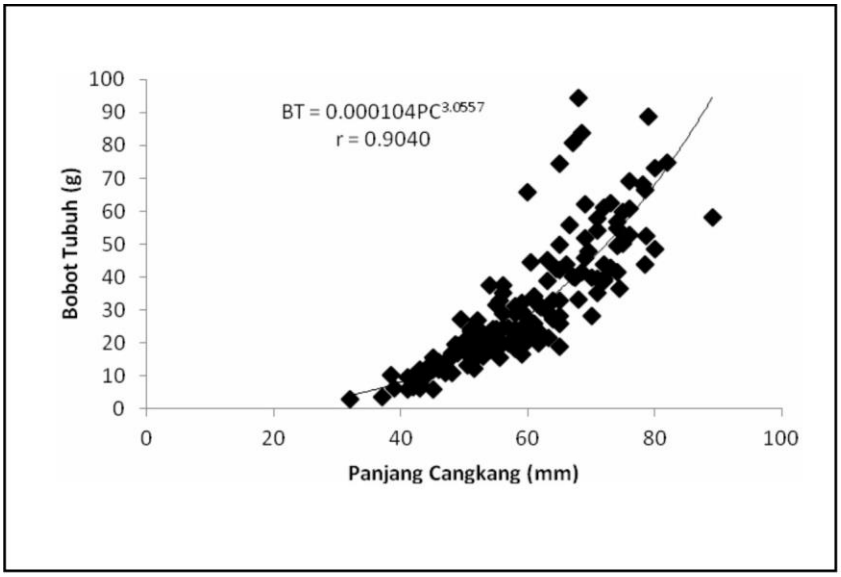

Figure 5. The correlation of body weight and shell length of male Tropical Abalone H. asinina.

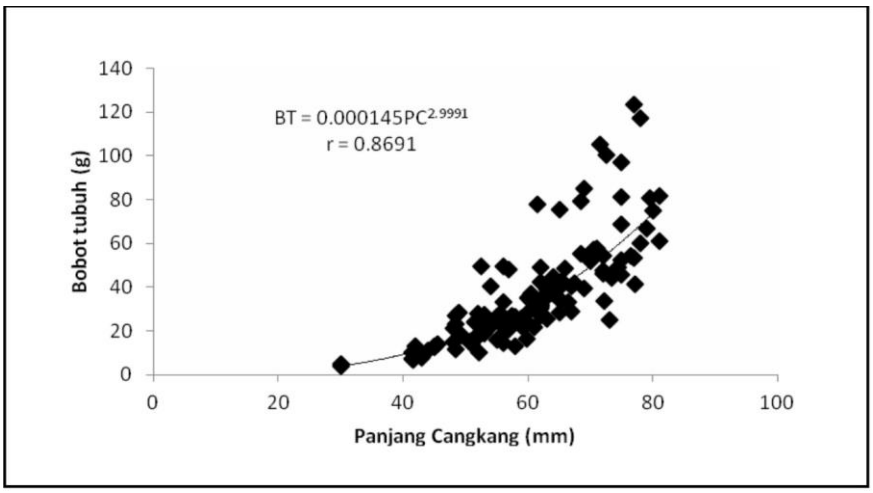

Figure 6. The correlation of body weight and shell length of female Tropical Abalone H. asinina.

The correlation of shell length and body weight of male and female abalones shows the isometric correlation. The result of statistic test does not show the difference of regression point (b) with 3. It means that the weight of most of the found samples getting better as their shell grown long.

There is strong correlation of shell length and body weight. It shows with coefficient value, each 0.9040 for male abalones and 0.8691 for the female

ones. Based on the t-test to the coefficient regression, it was found different result between the regression of male and female abalones.

The value of regression (b) found on the survey each 3.0557 for male abalones and 2.991 for the female ones. From the information, it can be known that the addition of shell length and weight goes in the same time.

Based on picture 5 and 6, it can be said that in 30-60mm length of male and female abalones curve shows the same trend. However, as the shell length grew longer it began to show the difference, in which the weight of female abalones grew bigger than the addition of their shell length. It was happed because when the abalones get mature gonad, the weight of the gonad were added 10-25 % from their body weight. The addition of gonad weight at the spawn time was caused by the addition of oosit size in the same time with the heap of nutrient in the process of getting mature. The composition of 'karkas' especially fat was saved as nutrition source which will be used as the development of embryo (Hahn.1989b)

Feeding group N % Fitoplankton : Bacillariophyceae 35 58.33 Acnanthales 1 1.67 Rhizosoleniales 4 6.67 Coscinodiscophyceae 2 3.33 Prasinophyceae 1 1.67 Zooplankton : Dinophyceae 9 15.00 Chroobacteria 1 1.67 Algae Fiber 7 11.67 Amount sample 60 100

Table 1. Frequency of occurance kind of food abalone H. asinina (n = 60)

Feeding group	N	%
Fitoplankton :		
Bacillariophyceae	35	58.33
Acnanthales	1	1.67
Rhizosoleniales	4	6.67
Coscinodiscophyceae	2	3.33
Prasinophyceae	1	1.67
Zooplankton :		
Dinophyceae	9	15.00
Chroobacteria	1	1.67
Algae Fiber	7	11.67
Amount sample	60	100

Fukazawa at. al.(2007) explained that at the time of gonad mature Abalones H. Discus Hannai, there is the heighten of total fat an d protein in abalones' eggs, and this value got bigger at the second time of than at the first time of spawn. Maliao et. al (2004) found in Philippines the correlation of coefficient of the Abalones H. Asinina body weight and the shell length was 0.833. The regression value were not very different than the abalones found in Baja shore waters in

California.(Del Proo, 19992) who found regression point value (b) 3.43 for H. Fulgens kind; 3.03 for H. Corrugata kind and 3.02 for H. Rufencens kind.

Feeding Habit

The abalones H. Asinina feeding habit was analyzed by using frequency of occurance. The result of the analysis shows that as a whole, in the flank of Abalones H. Asinina they can be differentiated on fitoplankton and zooplankton group. (Table 1). Fitoplankton group consist of Bacillariophyceae, Rhizosoleniales, Acnanthales, Prasinophyceae, and Phyrophyceae group of zooplankton are in Dinophyceae, and Chroobacteria class. Kind of food found in Abalon H. Asinina digestion during the survey, can be seen in Table 2.

Klass Spesies

Bacillariophyceae Bacillaria paradoxa Nitzchia sigma Nitzchia pungens Nitzchia seriata Acnanthales Cocconeis scutellum Coscinodiscophyceae Dactyliosolen antarticus Eucampia zoodiacus Pleurosigma acuminatum Skeletonema costatum Rhizosoleniales Rhizosolenia alata Rhizosolenia bergonii Rhizosolenia calcaravis Rhizosolenia setigera Lauderia borealis Rhizosolenia shrubsolei Guinardia flaccid Triceratium sp Prasinophyceae Halosphaera viridis Chroobacteria Trichodesmium erythreum Dinophyceae Ceratium articum Ceratium furca Ceratium longipes Ceratium macroceros

Table 2. Kind of food found in abalone H. asinina digestion during the survey

Klass	Spesies
Bacillariophyceae	*Bacillaria paradoxa*
	Nitzchia sigma
	Nitzchia pungens
	Nitzchia seriata
Acnanthales	*Cocconeis scutellum*
Coscinodiscophyceae	*Dactyliosolen antarticus*
	Eucampia zoodiacus
	Pleurosigma acuminatum
	Skeletonema costatum
Rhizosoleniales	*Rhizosolenia alata*
	Rhizosolenia bergonii
	Rhizosolenia calcaravis
	Rhizosolenia setigera
	Lauderia borealis
	Rhizosolenia shrubsolei
	Guinardia flaccid
	Triceratium sp
Prasinophyceae	*Halosphaera viridis*
Chroobacteria	*Trichodesmium erythreum*
Dinophyceae	*Ceratium articum*
	Ceratium furca
	Ceratium longipes
	Ceratium macroceros

Table 1 shows Bacillariophyceae is the most kind of food in abalones digestion, that is 58,33% followed by 15% of Dinophyceae and about 11,67% Algae fiber, and only 10% of others kind of food. Based on what was found in Abalones' digestion organ, it clearly shows that the abalones is plankton eater, especially bentik diatom, sub kind of fitoplankton from Bacillariophyceae class. Beside that, it was also found any fiber that assumed as any red algae fiber. In accordance with this, Hahn (1989 d) stated that Bacillariophyceae is the main food for abalones. Bautista-Teruel et al. (2003) further explained the juvenile of tropical abalones H.asinina the high protein source is needed. The high protein can be found from Spirulina sp and meat. Singhagraiwan and Doi (1992) found that Bacillariophyceae is good food for the growth of abalones' mother gonad.

The finding of Dinophyceae and Chroobacteria group in abalones digestion organ indicates that even though abalone is herbivore, they also consume a little of animal on the shell reef surface. This is supported by Bautista-Teruel et. al (2003) that abalones need animal protein as at the cultivation time of abalones juvenile. This way will result quickly growth.

Based on the experiment result and Shepered and Steinberg opinion (1992) kind of H. Laevigata and H. rubra abalones eat more red algae and only a little of brown algae. They also consume sargassum if there is only a little red algae around them. Most of Australian abalones consumes more red algae than brown algae. According to Effendi and Patadjai (2009) some of diatomic spawn from Bacillariophyceae such as Navicula,Nitzchia, Coconeis, Crustose and Corraline Algae are be able to defend the growth of abalones larva.

The comparison of survey finding shows that the main food of abalones is filatoplankton that is litophyta (diatomic spawn) which grow on the surface of strong coral. Based on the habitat and the way of abalones live, it can be seen abalones is a kind of Makrozoobentas , means they live and adhering on the coral surface. Abalones meve with one organ, that is foot to go along the coral surface or strong stone to find food. Tropical Abalones H. Asinina take food around them by scrape using their radula. Appendix 2. Table of kind of food found in the caught abalones H. Asinina digestion during the survey. According to Geiger (1999) in Abalone H. Asinina there is a radula or 3-5 small tooth . The function is to cut the food in their mouth. When the abalones eat, their mouth adhere to and press the food and their radula move to scrape and tear the food. Abalones eat 10-30 % of algae of their body weight.(Hahn, 1989)and they

usually eat in the night (nocturnal) even though is also possible for them to eat at noon. Abalones ia a kind of grouping animal (Hadijah.2007a).

Their movement is very limited and they rarely move far from their group. Their movement will get less as their shell going long (Mc Shane. 1992). That is why abalones will eat the available food around their habitat. If the food around them are enough the abalones will grow quickly. On the contrary, if the food are not enough. They will grow slowly (Andy Omar. 2000 and Setyono, 2009). The abalones will leave their live environment if the quantity and the quality of the food getting less. Abalones will eat low nutrition food if there is no more food. (Fleming et. al., and Setyono, 2009).

Chen (2007) found 12 kinds of bentik diatom that usually consumed by abalone Haliotis diversicolor which contains high nutrient to spur on the growth of abalones, those are: Nitzchia grossestriata. This is very suitable as the adhesion place of larva. Coconies scutellum. Bentik diatom Calonies platycephala contain of high protein (17,4%), Seminavis Gracilenta contain of high fat (20,3%) and Cylindrotheca sp contain of high carbohydrate (340,14pg/100m2).

CONCLUSION AND SUGGESTION

Conclusion

The distribution of caught abalones, shell length 32.00-89.00 mm and body weight 2.90- 94.52 g for male abalones and 30.00-81mm and 3.72-123.53 g for female abalones. The most size of caught abalones were in shell length 50-55 mm for male abalones and 60-65 mm for female abalones.

a. The correlation of shell length and the body weight of male tropical abalones and the female ones shows isometric correlation.

b. Abalone is herbivore. The specification is diatomic spawn and red algae eater.

Suggestion

a. For the need of germ is it suggested using male abalones with 64.50 mm shell length, and female abalones with 64.09 mm shell length.

b. To save the eternality of Abalone H. Asinina , it is suggested that fishermen should not catch abalones under 40 mm length and they should decrease the intensity of catching at the peak season.

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