KnE Life Sciences
ISSN 2413-0877 Volume 2 (2013)
International Conference on Biological Science 2013

DENSITY AND REPRODUCTIVE PATTERN OF *Rhinoclavissinensis*, Gmelin 1791 (GASTROPODA: CERITHIIDAE) AT THE KRAKAL BEACH, YOGYAKARTA

Felicia Zahida[1*], Jusup Subagja[2], Jesmandt Situmorang[2], Kamiso Handoyo Nitimulyo[3]

[1] Faculty of Technobiology, University of Atma Jaya Yogyakarta. Indonesia
Jl. Babarsari 44, Yogyakarta. Indonesia. 55281.
[2] Faculty of Biology, University of Gadjah Mada, Yogyakarta. Indonesia
[3] Faculty of Agriculture, University of Gadjah Mada, Yogyakarta. Indonesia*Correspondence author E-mail:feliciawibowo2012@gmail.com

INTRODUCTION

Krakal Beach Yogyakarta was the most disturbed beach among others in Yogyakarta in term of shells exploitation. Those shells had been traded not only locally at Krakal Beach, but also to Kukup Beach, Baron Beach,Yogyakarta city and for export purpose in the form of raw or handicraft material. Those activities makes the beach condition even much worse.

Some researches were done to reveal whether exploitations were done by tourists (Andi*et al*. 2005) or local people (Zahida*et al*. 2005), and the researched showed that it caused by local people. Further research wanted to elucidate the intensity and volume of harvested shells (Zahida and Sinulingga 2004), and the results showed that more shells were harvested before adults. This was an indication of overharvesting.

Overharvesting or commonly called as overfishing status of the shells exploitation was studied in Krakal Beach, Yogyakarta. King (2003) stated that the exploitation of gastropods for their shells is unquantified, but may account for a much larger live catch weight than does exploitation for food. The aim of this research was to study the density and reproductive pattern of *R. sinensis* from Krakal Beach, Yogyakarta.

MATERIALS AND METHODS

R. sinensis was collected by handpicking using census method once a month from year 2005 to 2008 for a period of an hour. The specimens were preserved in alcohol 70%. HCl 10% was used to digest shells to observe shell length at first maturation, gonad indexand sex ratio. Using micro dissecting kit, the female gonad was separated and weight digitally for gonad index.

RESULTS AND DISCUSSIONS

All of result data composition collected during research was summarized in Tabel 1.

Density of *R. sinensis*

Harvesting shells volume gathered from Krakal Beach showed in Figure 1. Density average in general increase from year 2005 to year 2008 i.e. 21±11,62, 31±11,93, 33±18,04 and 163±198,67 individual per month. Density were five to sixfold at the fourth year 2008.

Doi http://dx.doi.org/10.18502/kls.v2i1.146

Tabel 1. Data composition of R. sinensis from Krakal Beach year 2005-2008

Data composition	Data
Total Individu (N)	3067
L_{min}	2.5mm
L_{max}	41.5mm
L_c	12mm
L_∞	48.58mm
L at first maturation	28mm
$\bar{L} \pm sd$	30,25±1,1mm

Average of the first three years harvesting is 28±14,8 individual/month, this means that in year 2008 the density reach almost sixfold from the average. Density of the first three year always below 100 but on year 2008 above that number, especially on March (622 individual), April (253 individual) and June (371 individual) 2008.At this point the reason of this abundancy is unknown.

Graphic showed that year by year the fluctuation were similar. Yearly graph showed its peak on May, and the densities were 51 individual(2005), 56 individual(2006), and 62 individual(2007). To see the consistency of fluctuation graph year by year, average of three years graph was made (light blue line), and average of four years graph was also made (light brown line). The first three years graph shows that there are fluctuation consistency pattern compare to yearly graph lines. This means that the average of first three years graph shows intrinsic pattern of this population and shows its peak on May. Further, the fourth year graph shows similarity with others, except that the amplitude of some months (March, April and June) was so high, and we consider this, until this step, as an anomaly and unexplained.

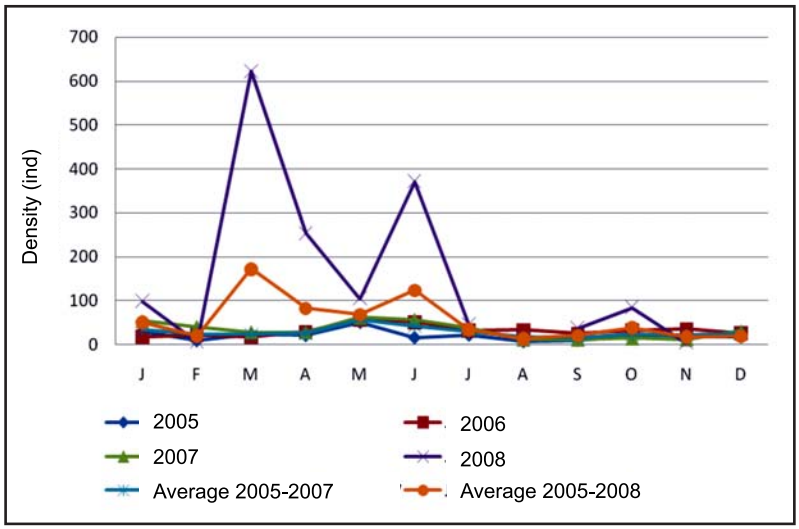

Figure 1. Density oscillations of *R. sinensis* harvested at year 2005-2008. Average of the first three years 2005-2007 compared with average of four years 2005-2008. There was an abrupt change at the fourth year, at March, April and June 2008.

When population graph fluctuation shows different pattern, we can say that there is/are an extrinsic factor/s involved. These factors may be an environmental factor, such as climate

change or even an earthquake effect. The influencing factor might come earlier far before the increasing density. However, change in amplitude at 2008 might be very natural and maybe intrinsic factor when we able to see similar pattern every four year cycle, where population abundant.

Fisheries study shows that population grows when catch intense specifically for virgin population. Graph shows that there is an increase of *R. sinensis*density year by year. Increase in density for year 2008 might not new evidence specifically for Mollusks, even though very rare report on Gastropods in Indonesia. Around year 2000, in Karimunjawa island, north of Central Java, one kind of Gastropods namely *Strombuscanarium*, often consume by local people. By observing the shells remained overnight surround the camp fire, there was a certainty that they easily collected abundance amount of the organisms.

The presence of Cerithidea, Potaminidae, that have been recorded in Indonesia was stated by Hartati and Widianingsih (2009) from estuary of Ijo Bodo river Kebumen, and Adiraja river Cilacap. In this manggrove environment, they found *Cerithidea cingulata*, *Cerithidea quadrata* and *Cerithidea sp*. Their absolut density were 0,66-21,66 ind/m^2, 0,66-4,66 ind/m^2, 24-109 ind/m^2 respectively. Hasri*et al.*(2009) found a number of 27 ind/m^2Cerithiidae which consist of: *Cerithiumpatulum*, 8 ind/m^2, *Cerithideacingulata, Clypeomorusgronosum*, 17 ind/m^2 and *Clypeomorusmonileferum*, 2 ind/m^2.This study was done in mangrove ecosystem, Ulee Lheue Beach, Banda Aceh, NAD. As a comparison, Ujianti *et al.*(2009) studying mangrove area at Surodadi, Sayung Demak municipality, found seven species of Potaminidae, i.e. *Cerithidea obtusa*, 100 ind, *Cerithidea cingulata* 59 ind, *Cerithidea allata* 73 ind, *Cerithidea sp* 21 ind, *Terebraria sp* 18 ind*Telescopium telescopium* 58 ind only from 2.5m^2 area.

Probability of capture of *R. sinensis* was also studied (Figure 2). It shows that probability of capture was L25 = 37,31, L50 = 38,32, and L75 = 39,33. It means that to be able to catch shell size 39,33 had a probalility of 75%, to be able to catch size 38.32 had a probalibity of 50%, and to be able to catch shell size 37,31 had a probalility of 25%. Trend shows that the smaller the shell size of *R. sinensis*, the probability of capture was getting smaller. It seems that the mode of capture (handpicking) has a main role in this result compare to other fisheries method results (using net) that usually has a normal curve.

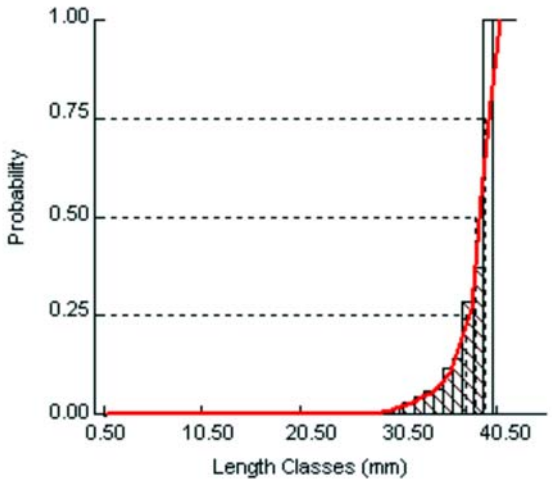

Figure 2. Probability of capture based on length classessize of *R. sinensis.* Probability of catch were L25 = 37,31, L50 = 38,32, and L75 = 39,33.

Apparently, it is clear that bigger snails will have a bigger probability to catch compare to smaller ones. Harvesters took the bigger size because it has a higher economic value. This characteristic is specific for natural resources, specifically snails, which taken by hand picking. Other fisheries product usually has different limit size, which is always bigger than its mesh size. Usually the result of the graph form normal curve.On snails, which is collected by hand picking, the bigger the shell size, the visibility and susceptibility also bigger.

Roy *et al.* (2003) studying the effect of harvesting of four types of snails, with a time range of 40 years. Every 20 years, there were tend decrease in shell size. Those are *Lotia gigantea* (local food item), *Fissurella volcano* (small size), *Tegula aureotincta* (herbivores), and *Acanthinucella spirata* (carnivores). Similar trend also happen with *R. sinensis:* Houbrick (1978) with adult size 20-70mm, Dharma (2005) with adult size 33-41mm. Specimen from Krakal Beach has size of 41mm. There was a time lack about 20 years between Houbrick and Dharma. More over tropical shell size compare to subtropical shell size might have a different size (smaller in tropical area).

Reproductive Pattern of *R. sinensis*

One way to understand the reproductive activity of organism is to study the gonad index. Gonad index increase and reach its peak before breeding. Some snails have dimorphisms sexual, some monomorphic. Dimorphisms sexual snails shows differentiation between male and female shells, some of them can be recognized easily, such as male to its female of Golden Apple Snails *Pomacea canaliculata* (Zahida, 1999), where females bigger than the males. In the case of *R. sinensis*, the differentiation was not so clear, there is a need to open up the shells and observed the gonad index.

First time of maturation was observed by studying the smallest group class that have 50% of gonad maturation. The result shows that first maturation size was 28mm. This size then use to separate mature snails to the premature ones. Later we separate female to male and the sex ratio was 100:150. The gonad index of female snails of 12 months then projected to the graph.

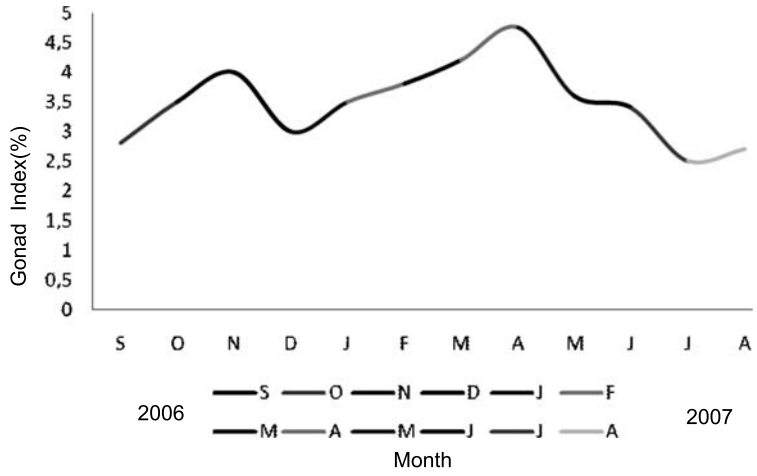

Figure 3.GonadIndex of *R. sinensis* for 12 months observation year 2006-2007.

Figure 3.show that April was the first peak of female gonad maturation, the second peak was on November. This graph show bimodal pattern. This pattern was common for tropical organism. The first peak was on dry season at April 2007. July August and September were the lowest among others in term of gonad index. November 2006 was the second peak and also the peak of reproduction on rainy season. No male gonad index was developed in this study since Lester *et al*. (2004) said that energy used for sperm production far less compared to ovum production.

REFERENCES

Andi, S.A., F. Zahida, and B.B.R. Sidharta. 2005. Preliminary study of marine snails harvesting (Gastropods) at Krakal Beach, Yogyakarta III: Tourists activities. *Biota* X: 114-119.

Dharma, B. 2005.*Recent and Fossil Indonesia Shells*. ConchBook, Jakarta.

Hartati, R., and Widianingsih. 2009. Identification and abundance of Gastropods in Mangrove area IjoBodo River Kebumen and Adiraja River Cilacap. Pages II 120-129 in F. Yulianda, N.T.M. Pratiwi, Y. Mayalanda, & M.R. Cordova, eds. *Proceeding of National Seminar of Mollusks 2*. Department of Resource Management, Faculty of Fisheries and Marine Science, IPB, Bogor.

Hasri, I., F. Yulianda, and I. Dewiyanti. 2009. Mollusks community structure (Gastropods and Bivalvia) and its association to Mangrove Ecosystem, UleeLheue Beach Banda Aceh, NAD. Pages II 130-150in F. Yulianda, N.T.M. Pratiwi, Y. Mayalanda, & M.R. Cordova, eds. *Proceeding of National Seminar of Mollusks 2*. Department of Resource Management, Faculty of Fisheries and Marine Science, IPB, Bogor.

Houbrick, R.S. 1978. *The Family Cerithiidae in the Indo-Pacific Part 1: The genera Rhinoclavis, Pseudovertagus and Clavocerithium*. American Malacologist, Inc.

King, M. 2003. *Fisheries Biology Assessment and Management*. Blackwell Science.

Lester, N.P., B.J. Shutter, and P.A. Abrams. 2004. Interpreting the von Bertallanffy model of somatic growth in fishes: the cost of reproduction. *Proceeding of the Royal Society London* 271: 1625-1631.

Roy, K., A.G. Collins, B.J. Becker, E. Begovic, and J.M. Engle. 2003. Antropogenic impacts and historical decline in body size of rocky intertidal gastropods in Southern California. *Ecology Letters* 6: 205-211.

Ujianti, R.M.D., B. Hendrarto, and S. Rudiyanti. 2009. Distribution and abundance of Gastropoda at mangrove area Surodadi Village, Sayung Municipality Demak, pages II 151-160 in F. Yulianda, N.T.M. Pratiwi, Y. Mayalanda, & M.R. Cordova, eds. *Proceeding of National Seminar of Mollusks 2*. Department of Resource Management, Faculty of Fisheries and Marine Science, IPB, Bogor.

Zahida, F., M.B. Sinulingga, and W.N. Jati. 2005. Preliminary study of marine snail harvesting (Gastropods) at Krakal Beach, Yogyakarta II: Harvesters activities. *Biota* X: 24-30.

Zahida, F., and M.B. Sinulingga. 2004. Preliminary study of marine snail harvesting (Gastropods) at Krakal Beach, Yogyakarta I: Harvest volume. *Biota* IX: 136-143.

Zahida, F. 1999. Assessment of some characters of *Pomaceacanaliculata* spp. In Luzon, Philippines: I. Breeding, Operculum, and Anatomy of Reproductive System. *Biota* IV: 11-21.