

The Indication of Gastropods Extinction at Intertidal Zone of The Teluk Nipah Waters, The Pesisir Selatan Regency The Province of The West Sumatera

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ABSTRACT

Intensive observation on gastropods, every Mart from the year of 2008 to the year of 2012, was carried out to document some indicators of gastropods extinction. The purposive sampling technik was used in this work. The psyciochemical parameters of its habitat were also monitored every sampling done. It was found that the intertidal zone substrate consists of sand, while the habitat parameters were more than 5,6 mg/l¹ dissolved oxygen, pH arround 7,0–7,2 salinity 30,2 -32,2 ppt, temperature 28,6-29,6°C, the visibility 100%. The number of species, the number of found gastropods, the abundance, the maximum shell size of found gastropods showed decreasing from year to year; while routine collecting by the visitor and marine organisms shell collector, and disturbance by the fisherman activities were occured. This indication showed a tendency of gastropods extinction.

Keywords: decreasing, disturbance, extinction, gastropods, intertidal

INTRODUCTION

Gastropods is the most common or the largest class (75%) of living molluscs, which includes snail and slugs (Lerman, 1986; Fish and Fish, 1989), the most success among other classes of molluscs (Barnes *in* Manik, 2013), but gastropods at intertidal zone of Teluk Nipah waters Pesisir Selatan Regency West Sumatera Province is being disturbed by the human activities; event any of them disappeared from their habitat. This Information got from villager which live around the research location.

There are three main causes when a species disappeared from its habitat, that is anthropogenic impacts, ecological disturbance, and genetical disturbance. All of that is being occured at intertidal zone of the Teluk Nipah waters. Gastropods are usually active exploited by the visitor and by marine organisms shell collector in the tour destination area. Fishermen activities is other reason which supposed as causes that disappearance. Fishermen activities will influence the growth rate of gastropods, and so it will impact the genetic of gastropods, agree with Tanjung (2012) said that if the speeding up of organism exploitation is higher than the speeding up of its population growth rate, it will cause that organism will destroy in not so long time; therefore, the observation about the existence of the gastropods and also the human activities around its habitat should be done in order to know the indications of its extinction.

The investigation about extinction of fishes are documented during in the past 100 years in North America (Miller et al., 2011), whereas investigation about extinction of marine gastropods is not documented yet; therefore, documentation about some indicators of gastropods extinction have to be started as an effort to keep sustainable marine resources.

MATERIALS AND METHODS

Five kinds of information were needed in order to explain the indication of gastropods extinction, that is its species number, its population number and abundance, its maximum size of collected shell from year to year, water quality, and frequency of human disturbance.

To know its species number, its population number and abundance, and maximum size of shell, sampling of gastropods was carried out from three stations at the intertidal zone of the Teluk Nipah waters, The Pesisir Selatan Regency, The West Sumatera Province in five years. Observation on fishermen, marine organisms shell collector, and beach visitor activities was done too. Sampling and observation were done every Mart yearly from 2008 to Mart 2012 (**Figure 1**). Observed stations was fixed base on the purposive sampling technik (Tanjung, 2013). Station 1 is characterized by main tour activities, station 2 is placed at the fisherman activities and canal, and station 3 is fixed at more natural condition area. Each station was taken ten plots 50 x 50



To get information about the habitat quality, measurement of water qualities (DO₂, pH, salinity, temperature, visibility) was done in the field directly, while the substrate analysis (fraction) was done in the laboratory. Dissolved oxygen (DO₂) was measured with DO meter, salinity was measured with Handheld-refractometer, pH Indikator was used to measure pH, Thermometer was used for temperature, and Secchi Disk is used for visibility.

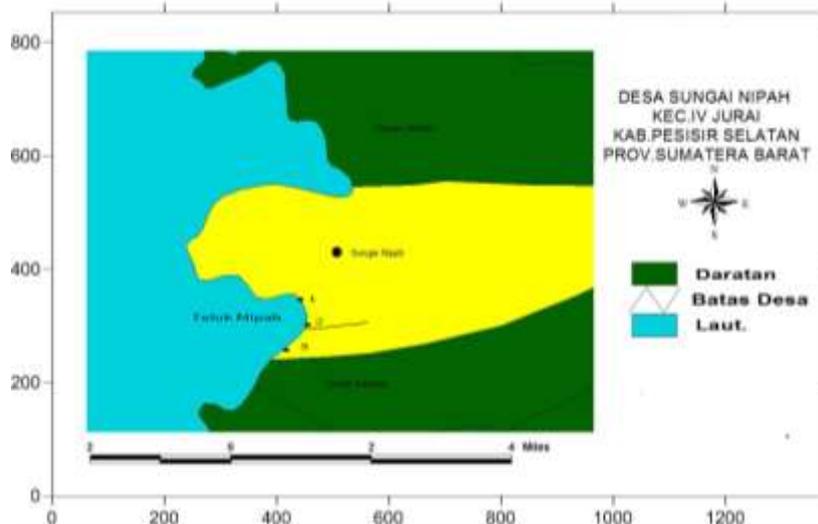


Figure 1. The map of sampling location (Source: Afrimansyah, 2013)

The samples of gastropods and substrate were taken at the time when the lowest tide occurred, and measuring the water quality was done at the time when the highest tide occurred. The sediment in each plot was dug for 50 x 50 x 10 cm for gastropod sampling, and the collected sediment was put into a macrozoobenthos sieve. The wet sediment sieving was done in the field directly, and then the found gastropods were put into a plastic bag and preserved with 10% formalin. The sample was identified based on Carpenter and Niem (1998), Robert et al. (1982), and Dharma (1988). The 50-gram sample of substrate was analyzed in the laboratory based on Rifardi (2008) and Buchanan (1984).

RESULTS

There were 15 species found in the intertidal zone of the Teluk Nipah waters in March 2008: *Conus coronatus* (Gmelin 1791), *Cypraea* sp., *Oliva oliva*, *Murex tribulus*, *Pythia* sp., *Polinices* sp., *Natica* sp., *Neverita* sp., *Rhinoclavis sinensis* (Gmelin, 1791), *Strombus* sp., *Nerita chameleon* (Linnaeus, 1758), *Monodonta labio*, *Terebra* sp., *Nerita picea* (Recluz, 1841), and *Nerita polita*. There were 13 species found in 2009: *Conus coronatus* (Gmelin 1791), *Cypraea* sp., *Oliva oliva*, *Murex tribulus*, *Polinices* sp., *Natica* sp., *Neverita* sp., *Rhinoclavis sinensis*, *Nerita chameleon* (Linnaeus, 1758), *Monodonta labio*, *Terebra* sp., *Nerita picea* (Recluz, 1841), *Nerita polita*. There were 12 species found in 2010: *Conus coronatus* (Gmelin 1791), *Cypraea* sp., *Oliva oliva*, *Murex tribulus*, *Polinices* sp., *Natica* sp., *Neverita* sp., *Rhinoclavis sinensis* (Gmelin 1791), *Nerita chameleon*, *Monodonta labio*, *Nerita picea* (Recluz, 1841), *Nerita polita*. There were 11 species found in March 2012: *Conus coronatus* (Gmelin 1791), *Cypraea* sp., *Oliva oliva*, *Murex tribulus*, *Polinices* sp., *Natica* sp., *Neverita* sp., *Rhinoclavis sinensis* (Gmelin 1791), *Strombus* sp., *Nerita chameleon* (Linnaeus, 1758), *Monodonta labio*, *Nerita picea* (Recluz, 1841). These data showed a decreasing number of species found from the observed location from year to year. Two species, *Pythia* sp. and *Strombus* sp. (Linnaeus, 1758) disappeared from their habitat in 2009. *Terebra* sp. was lost from its habitat in 2010, and *Nerita polita* was lost too in 2011 (Table 1).

The number of individuals of each species was also decreasing from year to year, except *Neverita* sp. which had a little increase in 2011 (10 individuals) and then decreased again in 2012 (7 individuals), while *Polinices* sp. increased in 2009 (14 individuals) and 2011 (15 individuals) and then decreased again (11 individuals) in 2012 (Table 1).



Table 1. Number of individu each species and Number of Species in 2008-2012

Species	Sampling Time				
	2008	2009	2010	2011	2012
	----- (individu) -----				
<i>Conus coronatus</i> (Gmelin 1791)	22	21	19	16	15
<i>Cyprae</i> sp	18	16	15	13	8
<i>Oliva oliva</i>	16	14	6	5	5
<i>Murex tribulus</i>	34	32	29	20	14
<i>Pythia</i> sp (Linneaus, 1758)	14	-	-	-	-
<i>Polinices</i> sp	13	14	13	15	11
<i>Natica</i> sp	8	9	8	2	2
<i>Neverita</i> sp	9	8	7	10	7
<i>Rhinoclavis sinensis</i> (Gmelin, 1791)	7	6	4	4	3
<i>Strombus</i> sp	12	-	-	-	-
<i>Nerita chameleon</i>	15	14	12	5	4
<i>Monodonta labio</i>	12	11	10	12	10
<i>Terebra</i> sp	3	1	-	-	-
<i>Nerita picea</i> (Recluz, 1841)	14	12	11	10	3
<i>Nerita polita</i>	8	6	5	-	-
Number of individu	208	164	139	112	82
Species Number	15	13	12	11	11

The average abundance of gastropods at intertidal zone in Mart 2008 was 27.73 individu per m², 21.87 individu per m² in mart 2009, 18.53 individu per m² in Mart 2010, 17,60 individu per m² in Mart 2011), and 10.93 individu per m² in Mart 2012 (Table 2). This facts showed the decreasing abundance from station to station and decreasing too from year to year were occurred in this area. The average abundance of station 3 was the highest abundance (20.8 individu per meter square), followed by station 1 (18.4 individu per meter square), and station 2 as the lowest abundance (17.2 individu per meter square), See Tabel 2.

Tabel 2. The abundance of gastropods at Sampling Station

Sampling Station	Abundance (individu)					
	2008	2009	2010	2011	2012	Averages
1	27.2	21.6	18.4	13.6	11.2	18.4
2	24.8	20.8	17.6	13.6	9.2	17.2
3	31.2	23.2	19.6	17.6	12.4	20.8
Averages	27.73	21.87	18.53	17.6	10.93	-

Base on the analysis of 50 gram the substrate which took from each plot, it could be told that the intertidal of the Teluk Nipah consist of sand.

The activities of fishermen to hanging down in the afternoon and to start sailing their fishing boats in the morning were routine everyday, almost 8–12 fishing boats per day did their activities every day (Tabel 3). Almost every visitor will collect everything marine organism which found in the intertidal zone. If they did not get enough in number and satisfaction collection they will walk along the coast of intertidal zone from station 1 to station 2, and the last station 3. Different with the collector of marine organism shell for accessories material, they hunt weekly until they got enought in number.

Tabel 3. Disturbance of Fishermen activities

Sampling Station	Frequency of Hanging down and start to sail (boat)				
	2008	2009	2010	2011	2012
1	0	1	0	0	0
2	11-12	11-12	8-10	8-12	8-10
3	0	0	1	1	0
Range	11-12	11-12	8-10	8-12	8-10

It was got from the measuring of waters quality: the dissolve oxygen more than 5,6 mg/l¹, pH was 7,0 – 7,2, salinity 30,2 -32,2 ppt, water tempaure was 28,6 – 29,8⁰C, and the visibility 100% (Tabel 4).



Tabel 4. Waters Quality at Research Location 2008-2012

Sampling Time	DO ₂ (mg l ⁻¹)	pH	Salinity (ppt)	Temperature (°C)	Visibility (%)
2008	5,7-5,9	7,0-7,2	30,2-30,4	28,9-29,4	100
2009	5,7-5,8	7,1-7,2	30,4-30,6	28,6-29,4	100
2010	5,7-6,0	7,0-7,2	31,0-31,4	29,0-29,6	100
2011	5,7-5,9	7,1-7,2	31,2-32,2	29,0-29,6	100
2012	5,7-6,0	7,0-7,2	31,8-32,2	28,6-29,2	100
Range	5,7-6,0	7,0-7,2	30,2-32,2	29,0-29,6	100

There were not species of gastropod's samples which have the highest size reach the maximum size (base on Carpenter and Niem, 1998). All of them is smaller than the maximum size and It was almost decreasing from year to year (Tabel 5).

Table 5. Size of Found Shell and Maximum Size Shell of each Species (Carpenter and Niem, 1998) in 2008-2012

Species	The shell Size					
	2008	2009	2010	2011	2012	Maximum Size
	----- cm -----					
<i>Conus coronatus</i> (Gmelin 1791)	3,4- 3,8	3,2-3,6	2,4-3,2	0,6-1,6	0,8-1,1	4,0
<i>Cyprae</i> sp	8,6-10,6	6,6-8,2	6,0-9,2	3,8-6,6	2,2-4,5	10,5
<i>Oliva oliva</i>	3,6- 2,8	1,6-2,4	1,2-2,0	1,8-2,2	1,0-2,0	4,0
<i>Murex tribulus</i>	8,8-9,2	8,1-8,8	6,9-8,7	7,2-8,6	8,2-8,6	10,5
<i>Pythia</i> sp (Linneaus, 1758)	2,8-3,1	-	-	-	-	3,5
<i>Polinices</i> sp	3,4-4,4	3,1-4,2	4,0-4,2	3,2-3,6	2,2-3,2	5,0-6,0
<i>Natica</i> sp	2,3-3,3	2,2-3,2	2,9-3,0	2,8-3,2	2,8-3,6	4,0-8,5
<i>Neverita</i> sp	1,2-2,1	2,2-2,8	2,1-2,6	2,2-2,7	1,2-2,5	4,0-6,5
<i>Rhinoclavis sinensis</i> (Gmelin, 1791)	2,3-3,4	3,2-4,6	3,6-3,9	2,4-4,2	1,2-2,2	7,0
<i>Strombus</i> sp	1,2	-	-	-	-	5,0- 10,0
<i>Nerita chameleon</i>	3,2	2,8-3,0	1,4-2,8	1,2-2,4	1,0-1,2	4,0
<i>Monodonta labio</i>	2,0-2,9	2,2-2,6	2,4-2,6	2,0-2,4	1,0-2,0	4,0
<i>Terebra</i> sp	5,6-9,8	6,7-8,8	3,6-4,0	-	-	13,0-27,5
<i>Nerita picea</i> (Recluz, 1841)	3,2-4,2	2,8-3,2	2,8-3,0	2,2-2,8	0,8-1,1	4,0
<i>Nerita polita</i>	2,3-3,5	2,8-3,2	2,6-2,8	0,6-0,8	-	4,0

DISCUSSION

It was occurred decreasing of species number which live in intertidal zone of the Teluk Nipah waters from 2008 to 2012. This case is supposed due to the anthropogenic impacts: Every day fishermen do their activity in station 2, the visitor come to this area for picnic especially in station 1, and the overhunting of marine organism shell collector. The activities like hanging down and to start sailing from land to the sea and back to the land again will cause instability on substrate of the beach floor. This case will influence coastal organism which live there, and so that place was not fit for organism. Agree with (Chiba and Roy, 2013) said that the anthropogenic impacts have led to widespread extinctions of species on oceanic islands. It can be seen from Tabel 1, It is shown by two species *Pithya* sp and *Strombus* sp disappeared from their habitat in 2009, and so *Terebra* sp. and *Nerita polita* did after that. The activities of the collector and visitor will cause the ecological and the genetical disturbance.

Waters of the Teluk Nipah has temperatur 28,6 – 29,6 °C. This temperture is normal temperature for intertidal zone life, as said by Nontji (1993) that temperature of sea surface Nusantara is 28 -30°C. Dissolved oxygen content in the waters of the Teluk Nipah was more than enough. Agree with Nybakken (1988) said that dissolved oxygen is not limiting factor, pH is not important for organisme at intertidal zone, and salinitas is important factor for intertidal life (Nybakken, 1988). Hylleberg and Vestergaard (1984) said that salinity is a mayor factor of species number for marine molluscs. Temperature has important role, salinitas is important and mayor factors in coastal life, dissolved oxigen is very needed for living of gastropods, but the decreasing of species number of gastropods at intertidal zone of Teluk Nipah waters is not related to quality of water and substrate, because both quality of water and quality of substrate were not different relatifely from year to year, event were not different either from station to station, and it those were



It is reasonable to say that human activities influenced the existence of gastropods at intertidal zone. It can be seen from the value of gastropods abundance at each station, where station 2 had the lowest average abundance (17.20 individu per meter square) of gastropods among the others due to the highest level of disturbance occurred here (Tabel 2).

At station 2, activity of fishermen was higher than the other two stations, about 8 – 12 boat activities every day, while at station 1 and station 3 were almost nothing activities (Tabel 3). Station 1 is the station which characterized by the place for picnic or marine tour, whereas the station 3 was characterized by the place more natural aspect because nothing activity there. The highest average abundance of gastropods at station 3 was 20.8 individu per meter square (Tabel 2). It showed that the station which has no so much disturbances will has the highest abundance when compared with the station with much disturbances.

Not only the fishermen activities responsible for coastal organism disappearance from its habitat, but also the habits of beach visitor and the collector of marine organism shell will cause that case. The effects of human activities did not affected directly in short time, but the effects will destroy the habitat in long time. The disturbance of habitat will reduce and isolate the space for gastropods life. This statement agreed by Hogan (2010), said that the most important causal anthropogenic impact are habitat destruction, overexploitation, pollution and the introduction of alien species to an environment. More detail He said that habitat destruction is the greatest contributor to the extinction of many species; moreover, impacts to biota from habitat fragmentation is a critical mechanism of driving species to extinction. According to Nybakken (1988) that the decreasing of average size of fishes is an indication of overfishing.

The species loss from its habitat is the species which unable to adapt on situation and condition changes. The species is able to adapt on the changes of their environment will survive, but habitat is not fit for them. It can be proved from the number and the maximum size. The number of species decrease from year to year and also the maximum size of found species decrease too (Tabel 1 and Tabel 5). It is agree with Chiba and Roy (2013) explained that body size itself is a well-recognized correlation of extinction.

CONCLUSION

There are three things which show that gastropods extinction will occurred at zona intertidal of the Teluk Nipah waters, if situation and condition of gastropods habitat without treatment with new policy from Government: (1) the decreasing of species number from year to year, (2) the decreasing of found gastropods number and abundance from year to year, and (3) smaller maximum size found species in research location was than should be. All of that could be called as the indication of Gastropods extinction at intertidal zone of Teluk Nipah waters.

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