The Habitat of Yellow Mouth Turban *Turbo Chrysostomus*, Linnaeus, 1758

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**ABSTRACT.** In general, yellow mouth turban snail *Turbo chrysostomus* L. 1758 was found in intertidal and coral reef area. This animal is active at night (nocturnal) and settles the coral reef-flats area to do its activity as substrate. In doing its activity, yellow mouth turban snail can be found in the depth of 50 cm until 4 m of tidal area. The adult yellow mouth turban snails are found in great number at intertidal area’s border and at coastal area of coral reef-flats. Methodology that was used in this study is visual analysis (descriptive method), and divided into two parameters which were observed, i.e. abiotic and biotic. Abiotic components that were measured are: Oxygen (ppm), pH, Water Temperature (°C), Salinity (ppm), Ammonia (mg/L), Nitrate (mg/L), Nitrite (mg/L), and Calcium Carbonat (mg/L). Whereas, biotic components that were measured are: substrates, seaweeds, other organisms, and epilithon. The observation’s result of yellow mouth turban snail’s environmental condition showed: abiotic condition of the waters consists of oxygen 3-5 ppm, seawater pH 7-8, seawater temperature 23-26°C, and the salinity of 32-33 ppm. The Habitat of yellow mouth turban snail settled the reef-flats area that is overgrown covered by seaweed Sargassum sp. as the place to do its activity.

1. Introduction

Mollusks are one of the potential marine biological resources in the waters of Indonesia. Some animal species have a high economic value and can be used either meat or shell [1, 2]. Latama [3] found that the shells of 59 species of mollusks (95%) of gastropod in South Sulawesi have commercial value. Krishnamurthy [4] adds that more than 30 species of mollusks from the Indian shell used for souvenirs. Utilization of a larger mollusks found in Thailand, which the mollusks are about 225 species, they are dominated by gastropods (174 species) and traded on the market (found in the souvenir market and a meat market) [5, 6].

The Yellow Turban snail (*Turbo chrysostomus*) is one of the most common types of marine gastropods found in tropical climates. This snail is known by international name as yellow-mouth turban or gold-mouth turban. Common names that are known by Indonesian people are Siput Bulan (Ambon), and Siput Mata Lembu (Pelabuhan Ratu and Pangandaran, West Jawa) [7].

The yellow turban snails are found in coastal waters in Indo-Pacific region including coastal waters of the Indian Ocean (Kenya, Seychelles, Chagos, Andaman and Nicobar islands), Southeast Asia (Malaysia, Indonesia, Thailand and the Philippines) and the Fijian Islands in the South sand [8]. This type of snail is also found in the coastal waters of the Ryukyu Islands, Japan [9], and in the waters of Northern Melanesia to southern New Caledonia [10, 11].

As well as batulaga snail (*Turbo marmoratus*), *Turbo chrysostomus* is one of the marine biological resources with the potential to be developed in Indonesia in the future. Utilization for the sake of national consumption is still relatively low because it has not been entrenched. In Indonesia, Ujung Genteng snails live in certain coastal waters, the waters of southern coast of Java, while in the waters of northern coast of Java island has been no information about the discovery of this type of snail.

2. Materials and Methods

This research was conducted in the waters of Ujung Genteng, Gulf of Pelabuhan Ratu, Sukabumi, West Java. Ujung Genteng located in the South of Java Island overlooking the Indian Ocean with position on 7°17'08" - 7°21'50" south latitude and 106°23'40 " - 106°24'10" East Longitude. This study
was conducted for one year, starting from January to December respectively. The tides in the waters of Ujung Genteng have the range from one to two meters that occurred during the rainy season, and one to two meters occurred at dry season. The environmental conditions influence the physiological activity of gastropod snail in nature in order to survive. Thus, it can inhibit or otherwise stimulate the reproduction activity. Some parameters of water conditions’ snail in situ are measured using the method or apparatus as follows:

Table 1. The observed environmental aspects, the use of methods / tools and the place of observation

| No. | The Observed Variables     | The Use of Method / Tools         | Place of Observation |
|-----|-----------------------------|----------------------------------|----------------------|
| Abiotic Components |
| 1   | Oxygen (ppm)                | Winkler/Titration                | In-situ              |
| 2   | pH                          | pH meter                         | In-situ              |
| 3   | Water Temperature (°C)      | Thermometer                      | In-situ              |
| 4   | Salinity (ppm)              | Refractometer                    | In-situ              |
| 5   | Ammonia (mg/L)              | Phenate/Spectrometer             | In-situ/Lab.         |
| 6   | Nitrate (mg/L)              | Brusin Sulfat/Spectrometer       | In-situ/Lab.         |
| 7   | Nitrite (mg/L)              | Sulfanilik/Spectrometer          | In-situ/Lab.         |
| 8   | Calcium Carbonate (mg/L)    | Permanganometri/Titration        | In-situ/Lab.         |
| Biotic Components |
| 8   | Substrate                   | Visual                           | In-situ              |
| 9   | Algae                       | Visual                           | In-situ              |
| 10  | Other Organisms             | Visual                           | In-situ              |

Some parameters cannot be measured directly in situ. In fact, the measurements were done at The Laboratory of Oceanic Biology, Department of Fisheries Resource Management (MSP), Faculty of Marine Sciences and Fisheries (FIKP) IPB.

3. Results and Discussion

The results of water quality analysis (chemical water components) during the study in one year observation are presented in Table 2. Sampling for water quality analysis conducted between three to two days before the full moon is complete. The results of abiotic component showed that the levels of dissolved oxygen in the snail habitat of Turban snail is around 3 to 5 ppm, while the pH of sea water is ranged from 7 to 8. Similarly, the salinity of sea water is around 32 to 33 ppm. The content of ammonia in the waters of Ujung Genteng is recorded with the lowest value of 0.031 mg/L and the highest around 0.951 mg/L. Nitrate which is also one of the important components in the water body, the lowest is in 0.092 mg/L and the highest is in 0.676 mg/L. Nitrite content in seawater, the lowest is recorded in 0.001 mg/L and the highest is in 0.029 mg/L respectively. Deposits of calcium carbonate in which this component is indispensable to the process of growth, the lowest value is recorded in 145.88 mg/L and the highest is in 182.48 mg/L.

The results analysis of biological situation in the waters of Ujung Genteng, Sukabumi was presented in Table 2. The substrates which are preferable by snail at Ujung Genteng are fragments of rock, dead coral flats which are covered by some types of seaweed, and coarse sand that only a small fraction in the region reef flats that were carried away by the waves of the sea water. The monitoring results on the ground were taken during the inactive time of snail at the day in which the snail chose the protected or hiding area into rock to hide or rest.

At night or at sunset, the Yellow Mouth Turban shellfish came near the bank for feeding or doing other activities such as looking for a partner at the time to spawn. However, such substrates are generally covered by some types of seaweed. In addition, it is suspected that the condition of the substrate is to avoid currents or waves of sea water at high tide, so, it will help the snail to avoid the blows of sea currents or waves that can cause death or damage to the shell.
Table 2. The results of environmental conditions at sampling sites

| Abiotic Components | No. | The Observed Variables | Result |
|--------------------|-----|------------------------|--------|
|                    | 1   | Oxygen (ppm)           | 3 – 5  |
|                    | 2   | pH                     | 7 – 8  |
|                    | 3   | Water Temperature (°C) | 23 – 26|
|                    | 4   | Salinity (ppm)         | 32 – 33|
|                    | 5   | Ammonia (mg/L)         | 0.031 – 0.951 |
|                    | 6   | Nitrate (mg/L)         | 0.092 – 0.656 |
|                    | 7   | Nitrite (mg/L)         | 0.001 – 0.029 |
|                    | 8   | Calcium Carbonate (mg/L)| 145.88 - 182.48 |

| Biotic Components | No. | Diet | |
|-------------------|-----|------|--------|
|                    | 9   | Substrate | Rubble; Death Coral reef; Rough sands |
|                    | 10  | Seaweeds | Green Algae: Boergesenia; Bornetella; Caulerpa; Chaetomorpha; Codium; Halimeda; Neomeris; Udotea; Ulva |
|                    |     |        | Brown Algae: Dictyopteris; Hormophysa; Padina; Sargassum; Turbinaria |
|                    |     |        | Red Algae: Acanthophora; Amansia; Amphiroa; Corralina; Galaxaura; Gracilaria; Halymenia; Hypnea; Laurencia |
|                    | 11  | Other Organism | Nematoda; Oligochaeta; Polichaeta; Diptera; Crustacea; Gastropoda |
|                    | 12  | Epilithon | Tebellariaceae; Nitzschiaeaceae; Naviculaceae; Oscillatoria; Prasiolaceae; Ankisbodesmus; Chaetophora; Ulotrichaceae; Cymboloporidae; Schizomeridaceae; Nematoda; Nauplius |

The Yellow Mouth Turban liked reef flats area that covered by seaweed *Sargassum sp*. In which as feeding ground, because the snail is the herbivorous animal with marked by the teeth scrape for the seaweed with the radulas. From the field of observation, are obtained nine species of green seaweed which is always found during the observation, but its abundance during the dry season in contrast to the rainy season. The green seaweed in the dry season is more abundant than in the rainy season, while the brown and red seaweed in the dry season are less than in the rainy season. All observations were made only in the area of coral reef in accordance with specimen collection which was only done in the area of coral reef-flat from the slope areas toward the beach that was grown by the three types of seaweed. At the slopes to the depths of the sea, there is no supporting information regarding the state of the vegetation. When collecting specimens of yellow tubinid snail done in the field, a few specimens were caught still eating the fresh of thalus seaweed *Sargassum sp*. [12, 13]. Being in the laboratory (in the aquarium), the yellow mouth turban snail grazing the talus of *Sargassum*, but prefers diatomaceous attached to the aquarium. Asano [14] and Soekendarsi et al. [15] have examined the content of the stomach which contains the Topshell snail of *Trochus niloticus*. Similarly, [13] and [16], examining the content of the stomach which contains the Topshell snail of *Trochus niloticus* and batulaga snail had the same result that the kind of food Topshell and also some kinds of yellow – silver snails were algae within namely Cyanophyta, Phaeophyta, Rhodophyta and Chlorophyta and some types of foraminifera, sand and detritus.
In the habitat’s substrate of yellow mouth turban snail, it was acquired several other animal species that live together with the snail that is from the Nematoda Class; Oligochaeta; Polychaeta; Diptera; Crustaceans; and other gastropods, and other gastropod species here are Turbo argyrostoma inhabiting or overlapping the same area with yellow mouth turban snail. Allegedly, some kinds of crustacean are predators of yellow mouth turban snail, whereas the animals of the class Polychaeta and Diptera, thought to be one of the yellow mouth turban’s food that are ingested when grazing for feeding time.

During the study, we have been analyzed 12 types epilithon which attached to the Sargassum sp. So, presumably some kind epilithon are ingested by snails when grazing the tallus of Sargassum. There are several types of epilithon which are the food that commonly eaten by several species of gastropods during the juvenile phase and phase veliger, such as; Nitzschia; Navicula; and Oscillatoria [17].

There are some environmental factors that may limit the activity of the Sub-Class Prosobranchia on habitat [6, 18, 19], namely:

- Oxygen content and temperature of the water, not a limiting factor that is essential for the activity of the sub-class snail Prosobranchia. These snails require dissolved oxygen in the water for at least 5 mg /L or more, and only a few types of these which still survive with dissolved oxygen content lower than 2 mg /L.
- pH, generally ranging from 6.7 - 9.0. However, snails are particularly fond of waters having a pH in the range of 7.0 - 8.4. When the pH is lower than this range, shell growth can be disrupted to damage the snail shell
- Calcium carbonate, alkalinity conditions will be good when the content of calcium carbonate in the water is in the range of 200 - 600 mg /L. While the calcium carbonate that is lower than 200 mg /L can cause the stress of snail.

Protho [20] in his book entitled 'Ambient Quality Criteria for Ammonia water', states that some species of mollusks that live in the sea-water have enough power for good environmental tolerance of the content of ammonia is 3.08 - 19.10 mg/L; pH: 7 - 8; water temperature is around 24 - 25°C and salinity is around 31 - 33 ppm. The content of ammonia which are dissolved in seawater are directly related to salinity, temperature and pH, whereas the dissolved nitrite that can be tolerated by the snail is between 1.3 - 3.5 mg/L. As well as nitrate dissolved is between 0.37 to 2.30 mg/L. In addition, according to [20,19], if the content of ammonia waters is between 0.005 – 0.01 mg/L, on sea urchin Lytechinus Pictus, fertilization process will not occur.

Ujung Genteng waters is an area of coral reef with a fairly high tides and ocean currents are quite strong. The content of ammonia measured here is around 0.031-0.881 mg /L. (So it does not matter if the content of ammonia increased significantly) the increased content of ammonia in addition affected by salinity, pH and temperature, are also influenced by the detritus decay that occurs in the bottom waters at any time which can be washed away by the flow of seawater from the coast towards the sea. Thus, we can say that the process of ammonia formation will be different in an area where flooded by the open area (washing the substrate by a current).

Yi and Lee [21], which examines Topshell snail Trochus niloticus get the result that the temperature is one of the factors to sustain the life of Topshell, especially in oxygen consumption. 31°C temperature is the optimum temperature for activity and growth. This is in accordance with the opinion of Heslinga [22], that the difference in temperature also affect the growth of Topshell, mainly related to the abundance and quality of natural food. Topshell snail tolerates to temperature 28 - 34°C and changes in the salinity of 31 – 37 ppm.

As well as Yellow mouth Turban snail, Hatta [23] examined the existence of conch Topshell Trochus niloticus where the conch Topshell commonly found on the substrate rocks and sandy stone and the conch Topshell that found in the rocks have a weight higher than Topshell living in sandy rock areas. This is in accordance with the opinion of Schuster [18] and Islay [24] that the calcium carbonate is very influential on the growth of several species of gastropods. It was also known that the substrate of rocks which is overgrown covered by seaweed is the food of the family snails and slugs Turbinidae Trochidae and also other herbivores.
4. Conclusion
The habitat of Yellow Mouth Turban snail in their activities have dissolved oxygen 3 – 5 ppm, seawater pH 7 – 8, sea water temperatures 23 – 26°C, and the salinity of 32 – 33 ppm, with its substrate in the form of reef flats covered overgrown with seaweed Sargassum sp. near the edge of the slope of the area directly opposite the sea.

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