Community structure of conches (*Strombus* spp) in seagrass bed of Haria, Central Maluku, Indonesia

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Abstract. The coastal community especially women and children in Maluku usually utilize marine organisms when low tide or locally known as *bameti*. The gear use in this activity is simple such as spear, knife, and digger, or even by using bare hand. One of the target marine organisms is the conch (*Strombus* spp) that lives in the coastal area on a seagrass bed. This research was conducted to study the community structure of *Strombus* spp in Haria coastal waters, Central Maluku, Indonesia in February 2020. The sample was collected by using a transect linear quadrate with the size of quadrate is 1x1m². As many as 297 individuals of *Strombus* spp were collected during the study which consists of five species namely *S. labiatus*, *S. mutabilis*, *S. urceus*, *S. gibberulus*, and *S. luhuanus*. *S. labiatus* has the highest density and occurrence frequency while the lowest belongs to *S. luhuanus*. Based on ecological indexes, *Strombus* spp in the area have high diversity and high evenness with low dominance.

1. Introduction

Haria is a village located in the western part of Saparua City on Lease Islands, Central Maluku, Maluku Province Eastern Indonesia. The coastal waters of Haria village are typical tropical waters because they have several important ecosystems including mangrove ecosystems, seagrass ecosystems, and coral reef ecosystems which greatly support the survival of various marine biota. One of that marine biota is *Strombus* spp or locally called *bia lalamong* because their habitat generally in the seagrass area. *Bia* refers to a shell (mollusks) while *lalamong* means seagrass.

*Strombus* spp. is a type of sea snail belonging to the animal of the Mollusca phylum, class Gastropoda, family Strombidae, usually found in colonies and are generally abundant in areas where these gastropods are found. These gastropods live in shallow waters and are associated with the bottom of the waters, where the substrates are reef flats, sand, mud, and seagrass beds [1]. *Strombus* spp is an important gastropod economically and ecologically. Their meat is used as a source of protein and has good market value while their shell can be used for ornament [2, 3]. Ecologically, the occurrence of *Strombus* spp can be used as a bio-indicator for seagrass productivity [4]. Furthermore, some researchers show that the shell of *Strombus* spp can absorb heavy metal [5, 6].

According to [1], the Strombidae family is very abundant in almost all coastal waters of the Lease Islands including Saparua Island, and it is widely used by coastal communities in the Maluku region as a source of animal protein especially when fish are rare. Coastal communities in Maluku including in Haria village
generally looking for marine resources especially sedentary species such as mollusks and echinoderms when low tide. This activity which is locally called *bameti* usually is done by women and children using simple gears such as spear, knife, digger, or even bare hand. Even though *bameti* is done traditionally, intensive and continuous utilization of sedentary marine organisms such as *Strombus* spp could affect their sustainability.

Information on *Strombus* spp. in Maluku especially in Saparua Island is still lacking. The latest information on *Strombus* on the island is in 2011 as reported by [1], therefore, current information on this marine resource is needed. This research was conducted to study species composition, occurrence, density and abundance as well as to analyze the ecological index of *Strombus* spp. in the coastal waters of Haria, Saparua Island of Maluku Province.

2. Materials and Method

2.1. Location and date of study
This research was carried out at Haria coastal waters, Saparua Island, Central Maluku, the Province of Maluku, Eastern Indonesia (Figure 1) in February 2020.

![Figure 1](image-url)

*Figure 1.* Map showing sampling site (red circle)

2.2. Data collection
Sample of *Strombus* spp was collected by using the line transect method [7] which is positioned vertically on the coastline. As many as 42 quadrates, size 1x1 m² were placed in four transect lines in which the distance between transects is 100 m while the distance between quadrates is 5 m. Sample of *Strombus* spp collected...
was put in the plastic bag and labeled based on the quadrates they are found and preserved in 4% formaldehyde then brought to the laboratory. Specimen of *Strombus* spp was identified to the species level based on standard literature [8, 9, 10].

3.3. Data analysis
Density and abundance of *Strombus* spp were analyzed using the following formula [11]:

\[
\text{Density (ind/m}^2\text{)} = \frac{\text{number of individual}}{\text{sampling area}}
\]

\[
\text{Abundance (ind.)} = \text{Density} \times \text{study area}
\]

Ecological indices were analyzed based on standard reference as cited in [12].

3. Results and Discussion

3.1. Description of study sites
Haria village is located in Saparua Island, Central Maluku Regency, Maluku Province. Coastal waters in the area have three tropical ecosystems namely mangroves, seagrass, and coral reef which are used by marine organisms as their habitat.

The coastal water of Haria has sand, mud, and mix sand-mud substrates. The average temperature, salinity, and pH during the research are 28.83°C, 32.58 psu, and 7.0, respectively. Seagrass in the coastal waters of Haria consists of three species namely *Thalassia hemprichii*, *Enhalus acoroides*, and *Halodule pinifolia*. The combination of substrate, good hydrological parameters, and seagrass bed make coastal waters of Haria has a variety of sedentary marine organisms such as echinoderms and molluscs including *Strombus* spp.

3.2. Species composition and occurrence of *Strombus* spp
Five species of *Strombus* were found namely *Strombus gibberulus*, *S. labiatus*, *S. luhuanus*, *S. mutabilis*, and *S. urceus* during the research at seagrass bed in the coastal waters of Haria, Saparua Island (Figure 2).

*Figure 2.* Species composition of *Strombus* spp in Haria coastal waters

There is a small variation in species composition of *Strombus* in the coastal waters of some villages in Saparua Island [1]. In the previous report in 2011, there were 7 species of *Strombus* on those coastal waters of Saparua Island i.e. 5 species found in this study and two other species namely *S. aurisdiane* and *S. lentiginosus* [1]. The number of species of *Strombus* found in this study is lower than those species reported in 2011 in the coastal waters of Sirsahony (7 species), Wayalo, Porto, and Saparua city (6 species) [1].
the coastal waters of Haria, there were 6 species of *Strombus* in 2011 [1], however, only 5 species are found in the present study in which 1 species could not be found namely *S. lentiginosus*.

As mentioned in the method, samples of *Strombus* spp were collected in the 42 quadrates along the transect line. *S. labiatus* was collected at 32 quadrates while *S. luhuanus* was collected at 7 quadrates only (Figure 3). This figure indicates that *S. labiatus* has a higher occurrence than other species of *Strombus* with the less occurrence belongs to *S. luhuanus*.

![Figure 3. Occurrence of Strombus spp in Haria coastal waters](image)

3.3. *Density and abundance of Strombus* spp

As a whole, there are 297 individuals of *Strombus* spp collected during the research in the coastal waters of Haria. More than 50% of those individuals belong to *S. labiatus* while *S. luhuanus* only has less than 5%. Thus, *S. labiatus* has the highest density and abundance whilst the lowest belongs to *S. luhuanus* (Figure 4).

![Figure 4. Density and abundance of Strombus spp in Haria coastal waters](image)

There is a significant difference between the result of the present study and the previous one on *Strombus* spp. In the present study, *S. labiatus* has the highest density and abundance while in the previous study this species was the lowest one in the coastal waters of Haria [1]. On the contrary, in 2011 *S. luhuanus* was the
predominant species in the coastal waters of Saparua Island which consists of 54% of total individuals collected and at Haria coastal waters this species was the third in terms of density and abundance species [1]. However, in the present study S. luhuanus has the lowest density and abundance among 5 species of Strombus collected at Haria coastal waters. There is no clear reason for this phenomenon, but it seems that high exploitation of S. luhuanus that trigger population decreasing as shown by plenty of empty shell of this species which is scattered along the coast of Haria village.

3.4. Diversity of Strombus spp
The diversity of Strombus spp in this study was analyzed by using ecological indices of Shannon-Wiener, Simpson and, Pielou. The calculated values of the Shannon-Wiener diversity index (H'), Pielou evenness index (E), and Simpson dominance index (D) are 1.28, 0.80, and 0.34, respectively.

Shannon-Wiener diversity index which is affected by the number of species and their individual distribution is useful and widely used to classify the diversity of marine organism community in a certain area [11, 12]. Based on this index, the diversity of a certain community can be classified as low (H'<1), moderate (1<H'<3), and high (H'>3) [13]. Thus, it can be concluded that the community of Strombus spp in Haria coastal waters has moderate diversity.

The Evenness index has a value ranging from 0 to 1 and its maximum value (E=1) is achieved when every species in the community has an equal number of individuals [14]. This index can be used to justify whether a community is in a stable condition (E ≥ 0.6) or in unsteady condition (E < 0.6) [15]. The calculated value of the Evenness index in this study, E=0.80 means that the community of Strombus in this area is in stable or steady condition. This result indicates that the environmental condition in Haria coastal waters is still in good condition and supports the community of Strombus.

Similar to the evenness index, the value of the Simpson dominance index is ranging from 0 – 1. However, its minimum value (D=0) occurs when there is an equal number of individuals among the member of the community [14]. Based on this value, dominance can be categorized into 3 namely low (D < 0.4), moderate (0.4 < D < 0.6) and high (D > 0.6) [16]. The calculated value of the Simpson dominance index in this study is 0.34 and this value E < 0.4 indicates low dominance in the Strombus community. The result of this study which is based on ecological indices of Shannon-Wiener, Simpson, and Pielou is similar to the previous study in several sites in Saparua Island including Haria coastal waters [1].

4. Conclusion and Recommendation
4.1. Conclusion
Based on the results, it can be concluded that the genus Strombus at seagrass bed of the coastal waters of Haria consists of five species namely Strombus gibberulus, S. labiatus, S. luhuanus, S. mutabilis, and S. urceus. S. labiatus has the highest density and abundance while the lowest belongs to S. luhuanus. Strombus spp has moderate diversity, high evenness, and low dominance.

4.2. Recommendation
Intensive utilization of Strombus spp during bameti especially during corona virus pandemic nowadays can affect their sustainability particularly for the population of S. luhuanus. Maluku is well known for traditional management called Sasi. Unfortunately, this practice is not implemented in Haria village for bameti activity. Size limitation and partial closed area or season could be recommended to implement in this activity.
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