Biodiversity of Holothurians in Morella coastal waters, Central Maluku, Indonesia

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Abstract. The Holothurian is one of the echinoderms which has well known as the sea cucumber. The coastal communities in Maluku often harvest the sea cucumber for their livelihoods both for consumed and sold them. Recently, the number of sea cucumber has been decreased due to anthropogenic and environmental degradation. Therefore, the data of bio-ecology of the resources are needed to manage the resources for its sustainability. The objective of the study was to analyze the biodiversity of holothurians. Data were collected by purposive random sampling. The research was carried out from October 2017 to October 2018. The results showed that there were five species of holothurians found during this study. The abundance of holothurians ranged from 18 to 173 individuals which the highest abundance was found in March 2018 whereas the lowest abundance was found in November 2017. The diversity of species differed each month. The study indicated that there were temporal changes in diversity. The diversity index (H') ranged from 0.733-1.346, meaning low species diversity. The evenness index showed that the abundance of each species had almost similar. So, that there were no predominance species. Nevertheless, three species have a high number or tend to be dominant later namely Bohadschia similis, Holothuria scabra and H. atra.

Key words: sea cucumber, diversity, echinoderm, holothurians

1. Introduction
Holothurians belong to phylum echinoderms which some species have commercial value. There are at least seven species respectively which categorized as economically important species namely pinkfish (Holothuria edulis), black teathfish (H. nobilis), sandfish (H. scabra), lolly fish (H. atra), prickly redfish (Thelonota ananas) and leopard fish (Bohadschia argus) [1]. In Maluku, the exploitation of holothurians is high especially for H. scabra, H. nobilis, H. edulis, H. atra, T. ananas and B. argus [1, 2].

The holothurians are widely distributed in Maluku such as in Southeast Maluku and Central Maluku. Some previous studies have shown that the current demand for holothurians is high, so the local people collect holothurians without paying attention to the size and species. So, it could be expected that the
number of holothurians would decrease in the next future. According to Yusron (2001) [3] and Malik (2013) [4], the density of holothurians in Morella was decreasing in many years.

The objective of the present study was to analyze the biodiversity of holothurians in the coastal waters of Morella, Central Maluku. It is expected that this study could be used as baseline data to manage sea cucumber resources in Maluku.

2. Materials and Methods
The research was carried out from October 2017 to October 2018 in coastal waters of Morella (Figure 1). Geographically, the study site is located at 3°32′45.5″ - 3°33′08.2″S and 128°11′36.9″ - 128°11′48.2″E. The characteristics of coastal waters of Morella was beach flat and consisted of a variety of substrates namely sandy, sandy-mud, reef flat and coral fragments.

Data were collected by purposive random sampling. All of the sea cucumber found were counted and collected. The specimen of sea cucumber was preserved in alcohol 70% for identification. Species were identified by using guideline following [5-6]. Data were analyzed using PRIMER 6 [7] and PAST [8] software.

3. Results and Discussion

3.1 Species composition.
A total of 805 individuals were found and belonged to three genera (Holothuria, Bohadschia, and Stichopus) and eight species. Those species were *H. atra*, *H. scabra*, *H. leucospilota*, *Holothuria* sp., *B. similis*, *B. marmorata*, *Stichopus variegatus* and *S. hermanii*. The species ofHolothurians found in Morella coastal waters was low compare to other studies. Study on species composition in Tanjung Pai Padaido, Papua [2] found 10 species of holothurians, while in Un Bay Southeast Maluku there were 11 species [9]. In addition, 18 species were found in Porto and Warialau villages, Central Maluku [10].

The abundance of holothurians ranged from 18 to 173 individuals with the highest abundance was found in March 2018 whereas the lowest abundance was found in November 2017. The highest abundance was represented by *H. scabra* followed by *B. similis*, *H. atra*, *H. leucospilota*, and *B. marmorata* whilst the other three species had the lowest abundance namely *S. variegatus*, *S. hermanii* and *Holothuria* sp. (Figure 2). The highest abundance of *H. scabra* was also found in Un Bay, Southeast Maluku [9].

Based on the economic value, the species could be divided into three categories i.e. highest, moderate and low economic values. The highest economic value was *H. scabra* whilst the low economic value was the other seven species.
3.2 Species diversity of Holothurians

The species diversity emphasizes the species richness and species equity. The more species found and equally abundance of each species, the more diversity. During the study, the diversity of species vary every month (Table 1). This was indicated by Shannon-Wiener Diversity Index (H'). The study also showed that there were temporal changes in diversity. According to Mason (1981) [11], species diversity could be classified into three categories namely low (H' < 1), moderate (1 ≥ H' ≤ 3) and high (H' > 3). The diversity index (H') ranged from 0.733-1.346 means low to moderate species diversity. Beside that this H' index could be used to assess water environmental quality. The higher H’ value indicates better water environmental quality.

The species diversity of sea cucumber was higher in coastal waters of Natuna [12] than that of this study. Some other studies also indicated that species diversity was very high [13, 14] compare to the present study.

| Month   | S  | N  | H'  | J'  | D  |
|---------|----|----|-----|-----|----|
| Oct-2017| 5  | 50 | 0.917 | 0.569 | 0.520 |
| Nov-2017| 3  | 18 | 0.868 | 0.789 | 0.418 |
| Dec-2017| 3  | 28 | 0.833 | 0.758 | 0.500 |
| Jan-2018| 3  | 23 | 1.061 | 0.966 | 0.328 |
| Feb-2018| 4  | 74 | 1.129 | 0.814 | 0.357 |
| Mar-2018| 4  | 173| 0.888 | 0.641 | 0.449 |
| Apr-2018| 4  | 120| 1.136 | 0.819 | 0.361 |
| May-2018| 4  | 125| 1.079 | 0.779 | 0.403 |
| Jun-2018| 3  | 42 | 1.077 | 0.980 | 0.332 |
| Jul-2018| 5  | 54 | 1.346 | 0.836 | 0.308 |
| Aug-2018| 4  | 36 | 0.808 | 0.583 | 0.330 |
| Sep-2018| 4  | 36 | 0.733 | 0.528 | 0.590 |
| Oct-2018| 3  | 26 | 0.865 | 0.788 | 0.473 |

Figure 2. Species abundance of Holothurians at coastal waters of Morela
The evenness index ($J'$) ranged from 0.569 to 0.980. This evenness index found in this study almost similar to the study by [12] for holothurian in Natuna and the study of Tuapattinaya et al. (2014) [15] in Tanjung Tiram, Inner Ambon Bay. The range of the evenness index was 0-1 [16]. If the value closes to 1 meaning all species have almost similar abundance. The analysis showed that the abundance of each species almost similar. Therefore, there was no predominance species. Nevertheless, three species have a high number or tend to be dominant later namely *B. similis*, *H. scabra*, and *H. atra*. These three species prefer sandy habitat in the seagrass bed.

The dominance index ($D'$) ranged from 0.308-0.590. The dominance index (D) could be divided into three categories specifically low ($D < 0.4$), moderate ($0.4 < D < 0.6$) and high ($D > 0.6$) [15, 17]. So, in coastal waters of Morella the sea cucumber community belonged to low and moderate value. The diversity indexes could be affected by the number of species, the number of individuals, the abundance of species and substrate variety [15, 18].

4. Conclusions

There were eight species of sea cucumber during the study which the high abundances were *H. scabra*, *B. similis*, and *H. atra*. The species diversity was low to moderate categories which three species could be dominance in time.

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