The study of *Spirobranchus* (christmas worms) based on substrate in Lamteung waters of Pulo Aceh, Aceh Besar District

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Abstract. The objective of this paper is to analyze the number of *Spirobranchus* (Christmas worms) based on body color in the waters of Lamteung, Pulo Aceh District, Aceh Besar District, Aceh Province and to examine the substrate dominated by individual *Spirobranchus* in Lamteung waters of Pulo Aceh, Aceh Besar District, Aceh Province. The research activity was carried out in December 2018. The research area was determined by purposive sampling. Areas with Christmas worms were divided into three stations based on the substrate, namely station 1 with a massive coral substrate, station 2 with branched coral substrate, and station 3 with a substrate other than the two. Data were collected by documenting individuals based on color, coral substrate, and coral species occupied by *Spirobranchus*. The presence of *Spirobranchus* and its body color were analyzed descriptively. The results obtained were number of *Spirobranchus* based on body color found in Lamteung waters which occupied a Coral Massive were 13 individuals and occupied the Acropora Digitate were one individu. The dominance index obtained on the Coral Massive substrat e was 0.86 and on the Acropora digitate substrate was 0.01. The conclusions obtained that *Spirobranchus* based on body color which occupies more individuals on the Coral Massive substrate, when compared to Acropora digitate substrate. Coral Massive substrate type has a high degree of dominance compared to Acropora digitate substrate.

1. Introduction

Pulo Aceh District as one of the sub-districts in Aceh Besar Regency is a collection of various small islands and there are two islands inhabited by residents, having various flora and fauna in them [1] and [2] state that a small island is an island that has an area of less than 1000 km² or 100,000 hectares, with a population living in this area of less than 100,000 people. According to [3] small islands located in Pulo Aceh District, Aceh Besar Regency, include Nasi Island, Beras Island, Teunom Island, Sidom Island, Skull Island, and two of the islands are inhabited by residents.
Pulo Aceh District is located in the West Coast area of Aceh Besar Regency, surrounded by the waters of the Indian Ocean. In Aceh Island District, there are various famous water areas, including Lampuyang Waters, Teunom Waters, and Meulingge Waters in the Breuh Island area, Lamteung Waters, Demit Waters, Dedap Waters in the Nasi Island area [3]. The existence of waters in the Aceh Island District area is a habitat for aquatic biota, especially those that are attached to the bottom of the waters. One of the basic marine biota found in the waters of Aceh Island is *Spirobranchus*, which inhabits the bottom of the waters in various sub-extracts.

* Spirobranchus *is a genus of worms, which belongs to the Phylum Annelida, Class Polychaeta, Order Sabeillida, and Family: Serpulidae [4]. The body of *Spirobranchus* has a shape like a Christmas tree, which has setae that surrounds the outside of its body from the mouth to the basal part of its body, so that *Spirobranchus* is known by the name of the Christmas Worms [5]; [6].

Based on the body characteristics of each *Spirobranchus*, the experts put *Spirobranchus* into several species. [7] states that *Spirobranchus* has species including *Spirobranchus triqueter*, *Spirobranchus cariniferus*, *Spirobranchus lamarceki*, *Spirobranchus kraussi*, *Spirobranchus giganteus*, and *Spirobranchus porites*. This species of *Spirobranchus* lives on the bottom substrate of marine waters including on coral substrates and on coral reef substrates.

Lamteung waters area there are various aquatic biota, one of which is *Spirobranchus* (Christmas worm). *Spirobranchus* found in Lamteung waters has various body colors, which occupy various substrates found on the bottom of the water. The body colors of *Spirobranchus* found in this area include white, red, yellow, black and blue.

There are various species of *Spirobranchus* that are at the bottom of the waters of Lamteung, it is necessary to have a systematic and planned study. This is done because so far there has been no clear documented data and no researchers have conducted research on *Spirobranchus* in the waters of Lamteung Pulo Aceh. This requires a systematic and planned study, so that clear information can be obtained about *Spirobranchus* in the waters of Lamteung, Aceh Island District, Aceh Besar District. This study aims to (1) analyze the number of *Spirobranchus* based on body color in the waters of Lamteung, Pulo Aceh District, Aceh Besar District, Aceh Province, and (2) examine the substrate dominated by individual *Spirobranchus* (Christmas worms) in Lamteung waters, Pulo Aceh District, Aceh Regency. Besar Aceh Province.

2. Method

Research on *Spirobranchus* was carried out in the waters of Lamteung, Aceh Island District, Aceh Besar District. The Lamteung area is located in the waters of Nasi Island, the area of the Ferry Ferry Port for the Nasi Island People heading to Banda Aceh City or vice versa. *Spirobranchus* data collection was carried out in March and in November 2018.

The area of Lamteung waters as the research location was determined by purposive sampling, which established this area as a research area with due regard to the existence of *Spirobranchus*. This water area is combed with attention to the substrate used as habitat for *Spirobranchus*, and the area is designated as an observation location. The area traced as a habitat for *Spirobranchus* consists of corals that are Massive Corals (solid surface like a ball, must surface, solid) and corals that are *Acropora digitae* (coral with tight branches like fingers).

If the area has Massive Coral Substrate occupied by *Spirobranchus*, then this area is designated as Location 1. If it is found that the substrate used by *Spirobranchus* is Acropora Digitae, this area is designated as Location 2. Meanwhile, if *Spirobranchus* is found using a substrate other than both types as their habitat, then the area is used as Location 3.

Each area was explored and then the existence of *Spirobranchus* was noticed. Each *Spirobranchus* found on each substrate was observed for body morphological color, number of individuals, and environmental conditions. All *Spirobranchus* found on each substrate were documented using the Nikon Coolpix W300 Waterproof Camera.

Data analysis on the number of individual *Spirobranchus* of each substrate was analyzed descriptively. Meanwhile, the substrate dominated by *Spirobranchus* individuals based on the color
found in Lamteung Waters, Aceh Island District, Aceh Besar District, was analyzed by the modified Dominance Index formula and the formulation:

\[
C = \sum_{i=1}^{s} p_i^2
\]

\(C\) = dominance with a range of values = 0-1, \(n_i\) = number of individuals by color, \(N\) = total individuals by color. If \(C = 0.00-0.50\) means the level of individual dominance is low, if \(C = 0.50-0.75\) it means that the individual dominance level is moderate, and if \(C = 0.75-1.00\) means the level of individual dominance is high [8].

3. Result and Discussion

3.1. Spirobranchus based on the color of the substrate in Lamteung Water

Spirobranchus that lives in the bottom of the waters of Lamteung, Aceh Island District, Aceh Besar District, Aceh Province, is shown in Table 1. In Lamteung waters, Pulo Aceh District, two substrates were found for Spirobranchus habitat, namely Coral Mesive Substrate and Acropora Digitate Substrate (Table 1). Coral Mesive is inhabited by 13 individuals from Spirobranchus, which have various colors, while the Acropora Digitate substrate is inhabited by one species, namely Acropora palifera. [9] states that Spirobranchus is included in the Polychaeta Class of the Serpulidae family which has a shape like a Christmas tree, lives on corals or corals that are associated between the two. Meanwhile, [10] found Spirobranchus giganteus, a member of the Genus Spirobranchus in Atlantic waters, using live coral in colonies.

Table 1. Spirobranchus in Lamteung Waters, Aceh Island District

| No | Subtract type for shell | Coral Species As Habitat | Spirobranchus colored |
|----|-------------------------|--------------------------|-----------------------|
| 1  | Coral Massive           | Coeleroseries mayeri     | Red                   |
|    |                         |                          | Orange                |
|    |                         |                          | Dark Orange           |
|    |                         |                          | Yellow                |
|    |                         |                          | Blue                  |
|    |                         |                          | Yellowish Maroon      |
| 2  | Acropora Digitate       | Gardineroseras planulata | Whitish Black         |
|    |                         |                          | Whitish Orange        |
|    |                         |                          | Whitish Blue          |
| 3  | other (rock, wood)      | Acropora palifera        | Pink                  |
|    |                         |                          | No Spirobranchus was found. |

The results of the research conducted, obtained various body colors from Spirobranchus in the Lamteung Waters, Pulo Aceh District, shown in figure 1. The body color of Spirobranchus in the waters of Lamteung, Pulo Aceh District, Aceh Besar District, starts from white, red to maroon, black and white, and orange white to black orange (Figure 1). The depiction of body color in Figure 1 is the color of each individual Spirobranchus, which is owned by each individual of Spirobranchus in the waters of Lamteung Pulo Aceh, Aceh Besar District. [7] states that many species of Spirobranchus are found in various seas and oceans with varying body colors, including in the waters of the Pacific Ocean and the Red Sea, found Spirobranchus aloni, S. corniculatus, S. gaymardi, S. cruciger, who live in the Genus Millepora, Porites, and Genus Acropora. The waters of the Indian Ocean contain S. gardineri, Australian waters, Andaman, New Caledonia, there are S. tetraceros and S. tricornis, and in Brazilian waters there is S. giganteus.
[11] states that there are several colors of *Spirobranchus*, especially the colors found in *Spirobranchus giganteus* with body colors including blue, red, and white. Meanwhile, [5] states that *Spirobranchus giganteus* has body colors including maroon, orange, blue, yellow, and white.

![Color of the Spirobranchus body found in Lamteung Waters](image)

**Figure 1.** Color of the *Spirobranchus* body found in Lamteung Waters

### 3.2. Dominant Substrate as *Spirobranchus* Habitat in the waters of Lamteung, Aceh Island

The substrate dominates as a habitat inhabited by Sprirobranchus in the waters of Lamteung, Pulau Aceh District, Aceh Besar District, shown in Table 2. If we look at the results of the analysis of the dominance index and the level of dominance of the two substrates occupied by *Spirobranchus*, it shows that the dominance index ranges from 0.01 to 0.86. On the substrate that has a substrate type in the form of Coral mesive type, the dominance index is 0.86 which indicates that the dominance level of the Coral mesive type is high, while the substrate type is Acropora digitae coral with a dominance index of 0.01 which indicates a low level of dominance of the Acropora digital substrate. This is in accordance with the opinion of [8] which states that if the dominance index that is owned is between 0.00-0.50 it means the level of dominance is low, whereas if the dominance index that is owned ranges from 0.75-1.00 it means that the level of dominance is high.

Coral massive has the characteristics of a smooth and solid surface, and looks like a ball or boulder. This smooth and dense surface can be inhabited by various basic aquatic biota, especially those that are epibenthos and inbenthos, especially *Spirobranchus*. [5] states that there are species of *Spirobranchus (Spirobranchus giganteus)* that live attached to the surface of living coral, in salty tropical waters. One of the coral species as a living habitat for *Spirobranchus* in the litoral and Neritic zones is Acrophora sp. [12] stated that in the tidal area, various species of Coelentera were obtained, dominated by Acropora sp., Because this area has a sloping bottom with various environmental factors, especially substrate, pH, salinity and temperature suitable for life. [13] states that the species of Acropora dominate other species when compared to other genera in marine areas. [14] states that *Spirobranchus giganteus* as a species of *Spirobranchus*, lives on the surface of the Masive Corals that are still alive in the Marine Protected Area
(APL) in the Thousand Islands Region of Jakarta. Meanwhile [9] states that Spirobranchus opercula lives in association with corals with an open operculum, and takes advantage of algae found in corals.

The presence of Spirobranchus on a substrate, especially the Coral Massive substrate and Acropora Digitae, is strongly influenced by the availability of food in the region. This is in accordance with [15] opinion that the availability of substrate on a water bed can present biota of various waters in the bottom water area, because there is a source of food and a habitat for it. [16] states that waters that have litter or other nutrients will be utilized by marine biota, especially the benthos group, as a source of food for them.

Table 2 The substrate dominates as a habitat inhabited by Spirobranchus in the waters of Lamteung

| No | Subtract type for shell | Coral Species As Habitat | Spirobranchus colored | Number of Individu | Index Dominant | Dominance |
|----|-------------------------|--------------------------|-----------------------|--------------------|---------------|-----------|
| 1  | Coral Massive           | Coeleseries mayeri       | Red                   | 1                  |               |           |
|    |                         |                          | Orange                | 1                  |               |           |
|    |                         |                          | Dark Orange           | 1                  |               |           |
|    |                         |                          | Yellow                | 1                  |               |           |
|    |                         |                          | Blue                  | 1                  |               |           |
|    |                         |                          | Yellowish Maroon      | 1                  |               |           |
|    |                         |                          | Reddish Maroon        | 1                  |               |           |
|    |                         |                          | White                 | 1                  |               |           |
|    |                         |                          | Blackish white        | 1                  | 0.86          | High      |
|    |                         |                          | Whitish Black         | 1                  |               |           |
|    |                         |                          | Whitish Orange        | 1                  |               |           |
|    |                         |                          | Whitish Blue          | 2                  |               |           |
| 2  | Acropora Digitate       | Gardineroseris planulata | Pink                  | 1                  | 0.01          | Low       |
| 3  | other (rock, wood)      | Acropora palifera        | No Spirobranchus was found. |               |               |           |
|    |                         |                          |                       |                    |               |           |
|    | Total                   |                          |                       | 14                 |               |           |

4. Conclusion

Spirobranchus, based on body color, occupies the Coral Massive substrate more individuals, when compared to Spirobranchus which occupies Acropora digitate. Coral massive substrate type has a high level of dominance, when compared to the Acropora digitate substrate in the waters of Lamteung, Pulo Aceh, Aceh Besar District, Aceh Province.

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