The correlation of the density of seagrass with the abundance of *Ophioderma longicauda* (Ophiuroidea class) in the Littoral Zone Cikabodasan Beach

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**Abstract.** Seagrass is a group of flowering plants found along the coast. Seagrasses become one of the habitats of the Ophiuroidea group. The study was conducted at Cikabodasan Beach, Garut. The aim is to determine the correlation of seagrass density with abundance of Ophiuroidea. The research method used is descriptive correlational. Samples were taken as much as 30% of the length of the Cikabodasan beach. The sampling technique was done by purposive sampling where 9 line transects were installed with 90 squared transects measuring 1 x 1 m² in 3 stations. From the results of the study obtained an average density of two species (*Thalassia hemprichii*, *Cymodocea rotundata*) of 346.23 individuals / m². This density is included in very tight criteria. While the abundance of *Ophioderma longicauda* (3.33 individuals / m²) is included in the less category. From the results of statistical calculations with the Pearson correlation test shows the correlation coefficient of 0.834. These results indicate that there is a significant correlation between seagrass density and *Ophioderma longicauda* abundance.

1. **Introduction**

Nature reserve according to LAW No.5 1990 is the nature reserve where the state of nature has plants and animals that are typical, so the ecosystem needs to be protected so that development can take place naturally. Cikabodasan Beach included in the Sancang Sea Nature Reserve Jawa Barat [1], however on the Cikabodasan Beach there are settlements of citizens who work as fishermen, so the result of their daily activities can cause disruption of the ecosystem and water pollution. Some of the beaches in the Sancang Sea Nature Reserve is particularly seagrass damage visible on the coast a lot of seagrass that is already dead brownish color due to rot and pile up mixed with garbage of both organic or inorganic. Seagrass is the only group of flowering plants recorded in the marine environment [2,3]. Seagrass serve as habitat for young fish because it can provide a source of abundant food [4,5]. The functions and benefit of seagrass beds in shallow water ecosystems are as primary producers, bottom waters stabilizers, sediment reduction and nutrient recycling [6-8]. But some other sources also mention that seagrasses can be used as bio indicators [9], helping to stabilize the metabolic system to respond to climate change [10], provider of carbon stocks [11].

One of the biota that lives in the seagrass beds is the phylum Echinodermata, Ophiuroidea class (Snaking star). These animals eat microorganisms and organic matter that decompose in the bottom of the mud. As for other animals such as demersal fish, crabs and starfish, snaking stars are a food source.
Animals included in the Echinoderms phylum can be used as ocean bio indicators because of their sensitivity to changes in water conditions [12].

Many of the marine Biota living in the littoral zone, including the seagrass and the animals of the Ophiuroidea class. Littoral zone (tidal zones) is a stretch of beach located between the sandstone water high tide full moon (Highest HighWater Spring tides, HHWS) towards the mainland and paras lowest water of the tide full moon (Lowest Low Water Spring tides, LLWS) toward of the sea with a depth of 0-200 m.

Seagrass is a habitat for a wide variety of organisms one of which is the Ophiuroidea class. The balance of the ecosystem on the Cikabodasan beach can be disturbed by the activities there so that it can have an impact on other biota that life there.

Based on the problem background above, the purpose of this research was to determine “The Correlation of the Density of the Seagrass with of the Abundance of Ophioderma longicauda in The Littoral Zone Cikabodasan Beach”.

2. Methods
The Research was conducted in April - May 2019 at Cikabodasan Beach, Sancang Sea Nature Reserve. Research data collection was carried out by the method of line transect and quadratic transect. The sampling place is divided into three stations. Each station has three line transects 100 m to the middle of the littoral zone. At each transect line of the plug 10 pairs of quadratic transects are sized 1x1 m² with a distance between squares of 10 m. The distance between stations is 92m, while the distance between the lines transect is 46 m. Measured data include seagrass density and abundance of Ophioderma longicauda.

![Image of transect deployment](image)

**Figure 1.** Sketch of the deployment of the transect climatic factor measurements include water temperature, light intensity, pH, humidity and wind.

3. Results and discussion

3.1. Seagrass density
Seagrass found consisted of two species, namely *Thalassia hemprichii* and *Cymodoceae rotundata*. Comparison of the number of stands and seagrass density values of *Thalassia hemprichii* species can be seen in the figure below.
The number of stands and density of *Thalassia hemprichii* in each transect line is different. The highest number of stands and density is at station two, line transect three, namely 10278 stands with density 1027.8 Ind / m² while the lowest number of stands and density is at station three, line transect one is 1293 stands with a density value of 129.3 ind / m². Once averaged, the number of individuals and *Thalassia hemprichii* density of all stations is 509.78 with a density of 509.67 ind / m² which is categorized as very tight.

Another seagrass species found is *Cymodocea rotundata*. Comparison of the number of stands and the density value of *Cymodocea rotundata* seagrass found can be seen in the figure below.

The highest density value is found at station three, transect line three, 3173 stands with density value of 317.3 ind / m², while the number of stands and the lowest *Cymodocea rotundata* density values are at station one, transect line three, 700 stands with density values 70.0 ind / m². After averaging, the number of individuals and the density of *Cymodocea rotundata* from all stations is 1828.22 with a density of 1828.82 ind / m² which belongs to the very tight category. The average density of *Thalassia hemprichii* and *Cymodocea rotundata* is 346.23 which is in the very tight category.

3.2. *The abundance of Ophioderma longicauda*

Comparison of the number of individuals and the value of abundance can be seen in the figure below.
Ophioderma longicauda found in each station is included in the lack category. The highest number of individuals and abundance values are at station two, line transect three, which is 10 individuals with an abundance of 10.0 ind / m². Whereas the lowest amount and value of abundance is found in one line transect at two station, 9 individuals with an abundance of 0.9 ind / m². After averaging the number of individuals and the abundance of Ophioderma longicauda is 33.33 with an abundance of 3.33 ind / m² which is still categorized as less.

3.3. Measurement of climatic factor

The data of environmental parameters measured can be seen in the table below:

| No | Measured Factors     | Station 1 | Station 2 | Station 3 |
|----|----------------------|-----------|-----------|-----------|
| 1  | Water temperature   | 26.87 °C  | 26.88 °C  | 22.03 °C  |
| 2  | Salinity            | 30.81     | 31.17     | 30.66     |
| 3  | Water brightness    | 15.41     | 19.83     | 14.93     |
| 4  | Humidity            | 76.94     | 77.38     | 74.66     |
| 5  | Light intensity     | 702.67 X 100 | 726.87 X 100 | 789.8 X 100 |
| 6  | Wind speed (km / h) | 4.37      | 4.18      | 2.37      |
| 7  | pH of Sea water     | 6.89      | 6.95      | 7.09      |

Based on Measurement results of environmental parameters at each station at Cikabodasan Beach, water temperature between 22.03 - 26.88°C, salinity between 30.66 - 31.17 ppt, water brightness between 14.93 - 19.83, humidity between 74, 66 -77.38%, light intensity between 702.67 x 100 - 789.8 x 100 lux, wind speed between 2.37 - 4.37 km / hour and pH of sea water between 6.89 - 7.09.

Wagey et al in Sari et al states that the difference in the number of stands and the density value of Thalassia hemprichii at each station (tight and very tight) is because seagrasses are fast-growing species that are able to colonize quickly even in disturbed areas [13]. Species of seagrass is generally found on substrates of sand, coral fragments and is also a substrate mixture of sand mud, soft mud and can survive in all types of substrate. In addition to substrate, salinity can also affect the level of density, as the increasing value of salinity in a body of water then the density of types will also increase, but will have an impact on the morphology of seagrasses with a reduced number of branches and leaf width [14]. Thalassia hemprichii found on the field there that has leaves that are shorter and have more leaves length and width. This is caused because the density of the seagrass itself, because the meeting a type in the substrate, then there will be competition to get the food in order to survive, so that these conditions will affect the growth and development of the seagrass [15].

Based on observations in figures 3 and 4, the density value of Cymodocea rotundata has a variety of density categories, ranging from sparse, rather tight, tight and very tight. Thayer in Alifah states...
this is because seagrass species are resistant to marginal conditions and at moderate levels of disturbance, as well as coastal substrate in the form of sand and low sedimentary rock make *Cymodocea rotundata* can body with lush [16].

The average density of *Thalassia hemprichii* and *Cymodocea rotundata* is 346.23 and including very tight criteria. It shows that both species have the same characteristics of being able to adapt easily to the environmental conditions at the research site.

3.4. Correlation of seagrass density with *Ophiderma longicauda* abundance

The first test carried out was Linearity Regression and the conclusion was that the regression was linear. Based on the linearity regression test results the data obtained are linear, so to find out the correlation coefficient Pearson correlation test is used with the results obtained are as below.

| Table 2. The results of Pearson correlation test between seagrass with *Ophiderma longicauda*. |
|-----------------------------------------------|-----------------------------------------------|
| **Ophiderma** | **Seagrass** | **Pearson correlation** | **Sig.(1-tailed)** | **N** |
| *O. longicauda* | 1,000 | .834 | 1,000 | 9 | 9 |
| *Seagrass* | .834 | 1,000 | .003 | 9 | 9 |

The magnitude of the correlation coefficient is 0.834 [17], this shows the form of a strong correlation between variables. Seagrass ecosystems are habitats for other biota, looking for food, foster areas and refuge areas for benthic organisms. The significance value of the correlation coefficient amounted 0.695 or 69%. This shows that 69% of *Ophiderma longicauda* abundance is determined by seagrass density. other factors that influence it by 31%. Living things, including biota that live in the sea, are very dependent on the state of their environment. Other factors that can influence it are environmental factors including water temperature [18], salinity, brightness, humidity, light intensity, wind speed and pH of sea water. Besides human activities such as swimming and fishing will affect marine life both seagrass or animals from the Ophiuroidea class.

4. Conclusion

- Seagrass density: The average value of the two species of *Thalassia hemprichii* and *Cymodocea rotundata* is 346,23 including the criteria very tightly.
- There is a significant correlation seagrass with Ophiuroidea Class species (*Ophiderma longicauda*) in the Littoral Zone at the Cikabodasan Beach, Sancang Sea Nature Reserve. The magnitude of the correlation coefficient obtained is 0,834, with a coefficient of determination of 69%.

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