Analysis of the distribution pattern of Kaboa (*Aegiceras corniculatum*) in Cipalawah Beach

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Abstract. Kaboa (*Aegiceras corniculatum*) is a plant that lives around mangroves where the distribution pattern varies. Variations in the distribution are spread out or clustered. The study was conducted at Cipalawah beach in Garut Regency, with the aim of finding out the distribution pattern of kaboa (*Aegiceras corniculatum*). The research method uses descriptive methods. The plot line method with multilevel plots is used to obtain research data. Research data obtained from each location taken by the quadratic method. Where each data obtained from variations in plant diameter. Data on diameter of tree plants (10 cm) was obtained from plots of 10 x 10 m size. Data on diameter of sapling plants (2-10 cm) was obtained from plots with a size of 5 x 5 m. Data on seedling diameter (10 cm) was obtained from a plot of 1x 1 m size. The results showed that the distribution pattern of kaboa (*Aegiceras corniculatum*) was clustered.

1. Introduction

Mangrove plants are plants that are along the beach or estuary and is influenced by the tide, which inundated during high tide and free from puddles at low tide [1]. Mangroves have role of coastal protection from waves, wind, and prevent shoreline erosion [2]. The plants act as a barrier and alluvial material catcher as well as a hiding place and breeding of fish, crabs, shrimp, Mollusca and nesting place of hundreds of bird species [3-5].

Mangrove plant species can be differentiated into true mangrove (core) and mangrove follow-up (false). Is true mangrove mangrove can only live in a receding environment. While mangrove tides mangrove apparent is able to live outside the mangrove environment or indirectly affected by the tide. The factors that control the distribution of mangrove forests is the availability of suitable habitat for each species of mangrove and tide. The tidal movements are known to play a role in seed dispersal, seed growing power, but less contribute to the life of the tree grown [6]. High tides in coastal areas related to tofografi coastal mangrove forests will greatly affect the occurrence zonase) mangrove [7,8].

Garut has Sancang Region Nature Reserves and Marine Reserves Sancang. This forest has an area of 2,157 ha with a sea area of about 1,150 ha [9]. In this Nature Reserve are typical of mangrove plants are Kaboa (*Aegiceras corniculatum*). These plants are plants that live and thrive in Cipalawah Beach. Kaboa live on rocky substrate type, sandy and muddy. Kaboa (*Aegiceras corniculatum*) including true mangrove species. Kaboa plants rarely survive at the site or other area because of these plants require areas suitable for their survival. With the Kaboa it will prevent abrasion.

The research began in June 2019 at Cipalawah Beach, Sancang Sea Nature Reserve Area, Cibalong District, Garut Regency. The research method used is a descriptive method that is describing the state
of Kaboa (*Aegiceras corniculatum*) which is seen from the pattern of distribution, density and abundance. Data was obtained using the plot method with multilevel plots that were systematically distributed. From each location taken using the 10 m x 10 m quadratic method for trees > 10 cm in diameter. In each of these plots a smaller plot size of 5 m x 5 m is made. In the plot data were collected about 2-10 cm diameter saplings. As for seedling levels < 2 cm in diameter, data were collected from each 1 x 1 m plot placed in a 5 x 5 m plot [10].

2. Methods
This research began in June 2019 located on the Beach Cipalawah, The Sea Sancang Nature Reserve, Cibodas Sub district, Garut Regency. The research method used is descriptive method that is describing the state of the Kaboa (*Aegiceras corniculatum*) is seen from the distribution pattern, density and abundance. Data obtained using the method of line tile to the plot of the multilevel distributed systematically. From each location were taken by using the method of least squares measuring 10 m x 10 m for trees with diameter > 10 cm. On each plot is created plot is small with a size of 5 m x 5 m. In the plot it collected data about the children of the trees (saplings) with diameter of 2-10 cm. As for the levels seeding diameter < 2 cm, data were collected from each plot measuring 1 x 1 m were placed in a plot size of 5 x 5 m.

![Figure 1. Plot design.](image)

Data obtained in the field were analyzed by calculating the values of density, abundance and distribution patterns.

1. Density = \( \frac{m}{V} \) [7]
2. The abundance is calculated with the formula
   \[
   A = \frac{X}{n}
   \]
   Description:
   A= Abundance (individual/m2)
   \( X_i \)= Number of individuals (individuals) \( n_i \)=Area of the plot type to-I found (m2) [11]

3 Distribution Patterns
   Distribution patterns are calculated using a standardized Morisita index [12]:
   \[
   Id=n \frac{(\sum X_i^2 - \sum X_i)}{(\sum X_i)^2 - \sum X_i}
   \]
   Description:
   Id: Morisita Index.
   \( n \): Total number of plots.
   \( X_i \): The total number of individuals of an organism in a square \( (X1 + X2 +...) \)
   \( X_i^2 \): The total square of the number of individuals of an organism in the square \( (X12 + X22 +...) \)
3. Results and discussion

Table 1. Distribution patterns Kaboa (Aegiceras corniculatum).

| The name of the species | the growth rate of | number of individuals | Ip  | Distribution Patterns |
|-------------------------|--------------------|-----------------------|-----|-----------------------|
| Aegiceras corniculatum   | Seedling           | 189                   | 0,5 | Clustered             |
|                         | Stake              | 295                   | 0,5 | Clustered             |
|                         | Tree               | 38                    | 0,5 | Clustered             |

Table 2. Density and abundance Kaboa (Aegiceras corniculatum).

| The name of the species | Density | Abundance |
|-------------------------|---------|-----------|
| Aegiceras corniculatum   | 7436 individual/ha | 0,744 individual/m2 |

Table 3. Results of abiotic factor measurement.

| No | Abiotic Factors        | Cipalawah Beach |
|----|------------------------|-----------------|
|    |                        | The beginning   | The Middle     | The End of the |
| 1. | Wind Speed (km/h)      | 3,7 km/h        | 5,0 km/h       | 2,9 km/h       |
| 2. | Light intensity (lux)  | 633 x10 lux     | 310 x10 lux    | 233 x 10 lux   |
| 3. | Soil pH                | 5               | 4,5            | 5,2            |
| 4. | Temperature            | 25,5°C          | 25°C           | 27°C           |
| 5. | Salinity (ppt)         | 30,55 ppt       | 31 ppt         | 32 ppt         |

Based on Table 1, it can be seen that the distribution pattern of kaboa (Aegiceras corniculatum) on Cipalawah Beach analyzed based on growth rate is clustered. The Morista Index (Ip) value is 0.506 in the seedling phase, 0.503 in the sapling phase, 0.527 in the tree phase. Based on the Morista Index (Ip) value, it can be seen that each growth phase does not differ greatly and the distribution pattern is clustered. The calculation results are in accordance with observations in the field, namely (Aegiceras corniculatum growing in groups (Clustered). Environmental factors on the Cipalawah beach are suitable for growing and developing Kaboa, this can be seen from the density and abundance of these plants in accordance with those contained in table 2. Three main environmental parameters that determine the survival and growth of mangroves are salinity, fresh water supply, substrate stability, nutrient supply [13,14]. One of the environmental factors measured is salinity. Salinity obtained ranged between 30.55 - 32 ppt. This indicates that kaboa can live in high salinity. Aegiceras corniculatum has a high tolerance to varying salinity, soil and light [15,16]. Kaboa are tolerant of the high salinity because it can excrete salts through the leaves [17]. Different types of mangroves overcome salinity levels in different ways. Some
of them are selectively able to avoid the absorption of salt from the growing media, while some other types are able to secrete salt from special glands on the leaves [17,18].

Kaboa plant substrate (*Aegiceras corniculatum*) in the Sancang Sea Nature Reserve Area including rocky, muddy and sandy. This shows that kaboa (*Aegiceras corniculatum*) have characteristics that can be adapt to the three substrates. *Aegiceras corniculatum* grows in mangrove areas, on the edge of the sandy beach to the edge of the river and rocky substrates. In Cipalawah Beach, kaboa grows near the mainland. The type of substrate is the most dominating that is rocky and muddy.

4. Conclusion
The distribution pattern of kaboa (*Aegiceras corniculatum*) in Cipalawah Beach, Garut Regency which is analyzed based on the growth rate is clustered. The Morista Index (Ip) value is 0.506 in the seedling phase, 0.503 in the sapling phase, 0.527 in the tree phase.

The density of kaboa (*Aegiceras corniculatum*) at Cipalawah Beach in Garut Regency is very dense, with a density of 7436 individuals /m$^2$.

The abundance of kaboa (*Aegiceras corniculatum*) in Cipalawah Beach in Garut Regency is evenly distributed with an abundance of 0.744 individuals /m$^2$.

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