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Coastal Ecosystem Changes: Analysis of Snail Population after Mangrove Planting in the First Year

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ABSTRACT: One of the main indicators for assessing the effectiveness of mangrove planting in coastal ecosystem rehabilitation is monitoring the population of fauna that depend on their habitat, one of which is snails. This study analyzes the changes in snail population in coastal areas after mangrove planting in the first year. Specifically, this study will compare the snail population in areas where mangroves were planted with areas where mangroves were not planted as an effort to understand the initial impact of mangrove planting on the snail community.

Using a comparative approach, this study was conducted on the beach of Tongo Village, Bone Pantai District, Bone Bolango Regency, Gorontalo Province. The research results show a significant difference in the presence of snail populations in areas where mangroves were planted compared to areas without mangroves. Additionally, the areas with mangroves also showed the presence of crabs as another species besides snails. This emphasizes the importance of mangroves as a supporting ecosystem for biodiversity in coastal areas.

KEYWORDS: Mangrove, Snail, Coastal Area, Ecosystem, Conservation

INTRODUCTION

Based on the Indonesian National Mangrove Map (PNM) released by the Ministry of Environment and Forestry (KLHK) in 2021, Indonesia's total mangrove ecosystem covers an area of 3,364,076 hectares, or 20.37% of the world's total mangrove area. Out of the total mangrove area in Indonesia, which is 3,364,076 hectares, it is divided into three classes: dense mangrove, medium mangrove, and sparse mangrove. In Indonesia, dense mangrove covers 3,121,239 hectares (92.78%), medium mangrove covers 188,363 hectares (5.60%), and sparse mangrove covers 54,474 hectares (1.62%).

The dense mangrove class is a type of forest (a typical vegetation community) that grows in tidal areas (primarily in sheltered coasts, lagoons, and river estuaries) that are inundated at high tide and free from inundation at low tide, with a vegetation community that is salt-tolerant and a canopy cover percentage of >70%. On the other hand, the medium mangrove class is a type of forest (a typical vegetation community) that grows in tidal areas (primarily in sheltered coasts, lagoons, and river estuaries) that are inundated at high tide and free from inundation at low tide, with a vegetation community that is salt-tolerant and a canopy cover percentage of 30–70%. The sparse mangrove class is a type of forest (a typical vegetation community) that grows in tidal areas (primarily in sheltered coasts, lagoons, and river estuaries) that are inundated at high tide and free from inundation at low tide, with a vegetation community that is salt-tolerant and a canopy cover percentage of <30%. The government's focus in mangrove rehabilitation is on areas with sparse canopy cover. The division of roles in rehabilitating sparse mangrove areas is carried out according to the duties, main tasks, and functions of the relevant ministries and agencies.

Mangroves are a unique ecosystem capable of thriving in high-salinity environments and areas frequently inundated by seawater. Additionally, mangroves are important vegetation that protects coastlines from erosion and provides habitat for various organisms. This ecosystem functions as a natural barrier against shoreline erosion, strong winds, and large waves. Mangrove planting has been recognized as an effective method for rehabilitating degraded coastal areas. Furthermore, mangroves play a crucial role in soil nutrient cycles and provide habitat for various types of flora and fauna. One group of fauna commonly found in mangrove habitats is snails. The planting of mangrove seedlings as an environmental rehabilitation effort can influence the presence of snails through various ecological mechanisms.

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Snails are benthic organisms sensitive to environmental changes and play an important role in the food chain of coastal ecosystems. Additionally, one of the key indicators for assessing the effectiveness of mangrove planting in coastal ecosystem rehabilitation is monitoring the populations of fauna dependent on habitats such as snails.

This study aims to determine changes in snail populations in coastal areas following mangrove planting in the first year. Specifically, this research will compare snail populations in mangrove-planted areas with those in areas without mangrove planting in an effort to understand the initial impact of mangrove planting on snail communities.

SUBJECTS AND METHODS

The research was conducted at the beach of Tongo Village, Bone Pantai Subdistrict, Bone Bolango Regency, Gorontalo Province. This location was chosen due to an ongoing mangrove seedling planting program that has been active for one year. The primary subject of the study is the population of snails found in the intertidal zone of the Tongo Village coastline. The observed snails will include various species commonly found in mangrove habitats, such as *Cerithidea obtusa*, *Terebralia palustris*, and *Telescopium telescopium*.

This study uses a comparative research design with two main locations: a coastline where mangrove seedlings were planted one year prior, and a similar coastal area where no mangrove seedlings were planted. This is done to compare the condition of snails at the two locations.

The research area is divided into several plots measuring 5x5 meters. These plots are randomly selected within both the mangrove-planted area and the non-mangrove-planted area. In each plot, the number and species of snails are counted using line transect and quadrat methods. A line transect is drawn along the plot at 1-meter intervals, and at each interval point, a 1x1-meter quadrat is used to identify the presence of snail species.

RESULTS

Tongo Village Beach is located in Bone Pantai Subdistrict, Bone Bolango Regency, Gorontalo Province, Indonesia. The area has a tropical climate with two main seasons: the rainy season and the dry season. The average annual temperature ranges from 25°C to 30°C, with high humidity levels.

The water quality around Tongo Village Beach is generally good, although the impact of human activities such as fishing can affect water fertility and clarity. Additionally, the beach has a muddy and sandy substrate rich in organic material, providing ideal conditions for mangrove and invertebrate life, such as snails.

According to research, the snails found at Tongo Village Beach, Bone Pantai Subdistrict, include *Terebralia palustris*:

Picture 1. Snails-Telebralia palustris

Kingdom	Animalia
Phylum	Mollusca
Class	Gastropoda
Subclass	Caenogastropoda
Order	Littorinimorpha
Family	Potamididae
Genus	Terebralia
Species	Terebralia palustris

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Terebralia palustris is one of the snail species commonly found in mangrove ecosystems. They have a robust, spiral shell with a surface that is often textured and rough. These snails typically live in the intertidal zone, frequently found on mangrove roots and in muddy substrates. This is as stated by Annandale in Sewell, It occurs usually in association with mangrove swamps. Some aspects of its biology have been studied by a number of workers (Sewell 1924, Annandale 1924, RAO 1938). In addition, the mud dwelling gastropod *Terebralia palustris* is widely distributed in the Indo-Pacific region from East Africa to India, Malaysia, Indonesia, the Philippines, and North Australia (BENTHEM JUTTING 1956).

These snails play an important ecological role in their habitat, helping to recycle organic matter and being part of the food chain. They feed on detritus and other organic material found in the mangrove environment, and they themselves become prey for various predators such as crabs and shorebirds.

Picture 2. Snail found around mangroves

- **Snails**

THE MANGROVE-PLANTED AREA	THE NON-MANGROVE-PLANTED AREA
The research shows that there is a fairly dense population of snails	In the area without mangrove planting, the number of snails tends to be low.

In the mangrove-planted area, a snail population was found. This may be due to the increased habitat complexity provided by the growing and developing mangrove roots. On the other hand, in the area without mangrove planting, snails were found, but not as many as in the mangrove-planted area. The further from the planted area, the fewer snails were encountered along the coastline. This may indicate that without mangrove planting, the habitat does not undergo significant improvement and may continue to degrade.

Species Composition

THE MANGROVE-PLANTED AREA	THE NON-MANGROVE-PLANTED AREA
In addition to snails, there is a population of crabs	There are some snails, but no crabs were found

Picture 3. Several crab burrows around the mangroves

This study also shows that mangrove seedling planting can increase the population and diversity of fauna, in addition to snails, along the coastline. Mangroves provide a complex and stable habitat that supports crab populations. The growing mangrove roots create effective shelters from predators and strong water currents, as well as provide an abundant food source from the detritus produced by the mangroves.

CONCLUSIONS

This study aims to understand the changes in the snail population in the coastal area of Tongo Village after mangrove planting in the first year. Based on the research conducted in two areas, one with mangroves and one without, the conclusions are as follows:

1. There is a significant difference in the presence of snail populations in the mangrove-planted area compared to the non-mangrove area. The area that has been planted with mangroves for one year provides a good habitat and additional food sources contributing to the growth of the snail population. This indicates that mangrove planting has a positive impact on faunal forms, particularly snails.
2. Areas with mangroves also show the presence of crabs as another species besides snails. This highlights the importance of mangroves as an ecosystem supporting biodiversity in coastal areas.

Overall, the results of this study indicate that mangrove planting has a significant impact on the rehabilitation of coastal ecosystems. In addition to increasing snail populations, mangroves also support the presence of other species such as crabs, which are an important part of the food chain in coastal ecosystems. Mangroves not only function as coastal protection but also as a support for coastal biodiversity. These findings provide a strong empirical basis to support mangrove rehabilitation initiatives in efforts to restore degraded coastal ecosystems.

SUGGESTIONS

Based on the results, here are some suggestions for future research:

1. A long-term study to monitor changes in snail and crab populations over several years after mangrove planting. This will provide a more comprehensive understanding of the dynamics of coastal ecosystem populations as mangrove forests develop.
2. Further research is needed to explore the interactions between snails and crabs in the mangrove ecosystem. Understanding the relationship between these two species, whether as competitors, predators, or in terms of habitat resource use.
3. Besides mangroves, other environmental factors such as water quality, substrate type, and temperature may also affect snail and crab populations. Further studies examining the impact of these factors will help identify optimal conditions for population growth and sustainability in coastal ecosystems

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