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Abstract. Mangrove Avicennia Marina has important role in wave reduction. The purpose of this research were: (1) To know wave energy ratio in Indah Kapuk Beach and East Lampung Regency, Indonesia. (2) To know the influence of Avicennia Marina mangrove's respiratory roots on wave energy reduction. Measurement of wave in Indah Kapuk Beach used SBE26, in East Lampung used SBE26 and RBRDUO TD. Parameters were the structure of mangrove vegetation and wave energy reduction. The wave observed in Indah Kapuk Beach tends to be smaller than in East Lampung, so the influence of respiratory root in reducing wave in Indah Kapuk Beach was less visible while the influence of respiratory root in East Lampung was more clearly seen. The muffled wave in the Indah Kapuk Beach research was less visible due to the presence of inhibitors obstructing the incoming waves, while the reduced wave was more clearly measured in the study in East Lampung because without an inhibitors of wave coming.

Keywords: East Lampung, Indah Kapuk Beach, Lampung Mangrove Center, Mangrove Avicennia Marina, Wave Reduction

1. Introduction

Development of science on mangrove research was growing rapidly. Starting from the morphology of the mangrove species itself, the vegetation structure, the influence on the living biota in it, the influence on the balance of the coastal areas, and its effect on wave reduction.

Abrasion or erosion of the coastline is one of the aspects of coastal ecology damage caused by sea water waves. The damage occurred because the waves directly hit the shoreline without any obstacles. The diminishing size of Indonesia's land area is one of the consequences of the sea waves that are in the coastline[1]. The waves were caused by the wind and flux and reflux waves that formed due to the attraction between the sun, the moon and the earth. The magnitude of the wave energy is influenced by the circumstances surrounding it and will affect the condition of the coastline. According to Pratikto et al. (1997), waves that reach the coast tend to surround the headland, and concentrate its energy on the side and sides of the cape[2]. Extra defense was indispensable for coastal areas that have areas that jut out to sea. While in the bay area, the coastline was longer than the headland, wave energy tends to be scattered along the coastline. The bay area was still safe from the waves but the cape region may get a

huge wave of energy and disrupt the existence of mangrove ecosystems. Mangrove Avicennia Marina plays an important role against wave reduction because when compared with other types of mangroves, Mangrove Avicennia Marina was a vegetation volunteer with the leading position[3].

Flows, waves and flux and reflux were important aspects of aquatic dynamics that affect coastal and marine change. Simply flow can be interpreted as the distribution of water mass from one region to another[4]. Waves generated energy to form beaches, generated currents and sediment mobilization in a direction perpendicular to and along the coast and cause forces acting on coastal buildings. Therefore a natural wave reducing object is needed which can be the best solution to protect coastal area and reduced abrasion level of the area.

The waves reduction research by Sonneratia sp mangrove type ever done by Mazda in 2006 in Japan[5], besides Mazda did research wave reduction with modeling system using Avicennia Marina mangrove type. The results of both studies have different wave reducing characteristics[6]. Research on wave reduction by Avicennia Marina mangroves has also been conducted at Indah Kapuk Beach, Jakarta in 2014 by Herison with mangrove thickness ranging from 0-30 m, it turns out the results obtained were not significant. Large wave studies are required[7]. Finally, conducted further research using the same object, namely Avicennia Marina mangrove that has been implemented by Herison in East Lampung District with a thickness of 0-50 m.

Indah Kapuk beach area, Jakarta has a small wave characteristics. This is due to its geographical location located in the bay of Jakarta. The formation of Jakarta Bay is strongly influenced by the influence of the process of the formation of delta and interdelta deposits together. The unique shape of the Jakarta bay is caused by the difference in the speed of the deposition process of sedimentary materials carried by rivers flowing into the bay of Jakarta[8].

The research in East Lampung Regency was carried out around Lampung Mangrove Center (LMC) belonging to University of Lampung in 2017 with the characteristic of big wave. The amount of waves and wind caused by coastal waters affected by the Indian Ocean. This is characterized by the blowing of monsoon winds and high rainfall. The wind blows from the south in May to September, and from the opposite direction occurs in November to March. Large waves occur in June to November with wave heights reaching 0.5-1 m[9].

The purpose of this research were: (1) To know wave and wave energy ratio in Indah Kapuk Beach and East Lampung, (2) To know the influence of Avicennia Marina mangrove's respiratory roots on wave energy reduction

2. Materials And Method

2.1. Research Location

The first research was conducted at Pantai Indah Kapuk, Jakarta, located on the northern coast of Java Island and geographically located between 6o05`- 6o10`S and between 106o43`-106o48`E. In the northern boundary Java Sea, the southern border with PT. Mandara Permai, eastern by the Angke River and settlements and the west by the Kamal River[10]. The distance from the basecamp to the survey location was not that far away so the research accommodation becomes more efficient.

The next research was conducted in Marga Sari Village, Labuhan Maringgai district, East Lampung Regency which is located at Lampung Mangrove Center (LMC) with coordinates 5°31'43.81"S - 105°49'20.21" E. This location was quite far from the basecamp, it taken some time to get through the estuary of the river to reach the location.

2.2. Materials

Research at Indah Kapuk Beach, Jakarta used SBE 26 in front and back of mangrove. Then in East Lampung used SBE 26 is placed in front of mangroves and RBRDUO TD[11] placed behind the mangrove[12].

Figure 1. RBRDUO TD (left), SBE 26 (right)

2.3. Procedures

2.3.1. Data collection of mangrove vegetation. In the data collection of mangrove vegetation, the parameters measured include thickness, density and extent of seedlings, large trees, poles, stakes, and core trees, and respiratory roots. In research at Indah Kapuk beach to measure these parameters using quadratic transect method and spot-check method[13], while in research conducted in East Lampung all parameters were measured by the same method, that was quadratic transect method and method spot-check, but specifically for respiratory roots, Herison used the Sondani method. Sondani method is used in measuring the number of respiratory root by area. The method was done by drawing a parallel coastline with a width of 20 m and a length of 50 m, then above the line placed a square of 1 x 1 m size of 5 pieces for one pattern[14].

This research was conducted by analyzing mangrove vegetation by combining two methods, namely transect method and quadrat method, then called quadratic transect method[15],[16]. The density of mangrove vegetation determines the wave reduction. Therefore, this study will investigate the relationship between factors affecting wave reduction through simulation techniques. Bathymetry factors, water depth, wave height, width / wave propagation spacing, and overall mangrove factors were interrelated factors that determine wave reduction[17].

2.3.2. Data collection of wave. Stages of data collection of the wave started from the survey location of the study, equipment preparation, direct measurement in the field, and analysis and compilation of data. Wave data retrieval was done until it got raw data (RAWDATA) ready to be analyzed.

Taken wave data at Indah Kapuk beach and East Lampung has stages that were not much different. It's just that the wave recordings at Indah Kapuk Beach were done for 12 hours[17], while the wave recordings in East Lampung were carried out for 6 hours

3. Result and Discussion

Based on the research that has been done in Indah Kapuk Beach and East Lampung, obtained a significant comparison seen from wave parameters and wave energy. The results obtained were of course influenced by several factors, because the measured parameters were the same, then the comparison between the two research were clearly visible.

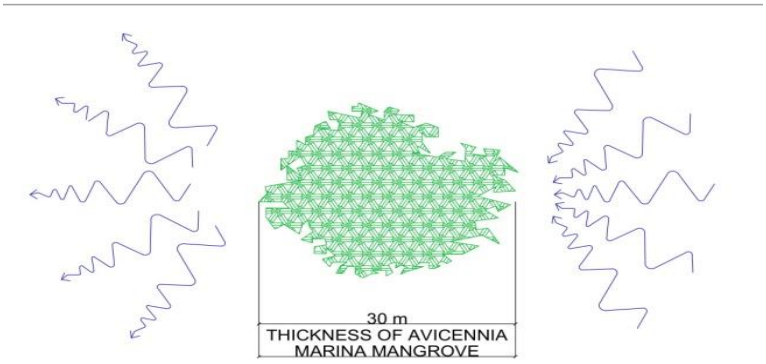

Figure 2. Ilustration of data collection at Indah Kapuk Beach

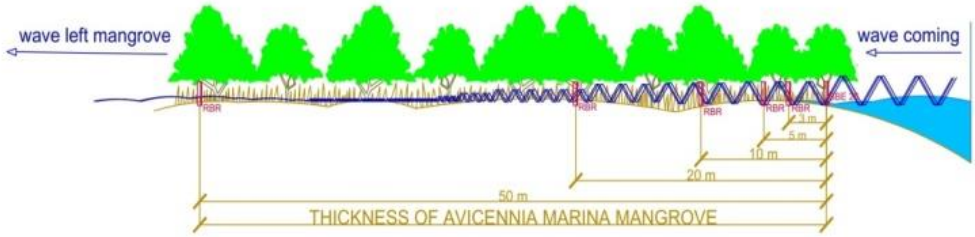

Figure 3. Ilustration of data collection at East Lampung

The research at Indah Kapuk Beach, Jakarta was conducted at a smaller distance than the research conducted in the surrounding Lampung Mangrove Center (LMC), East Lampung. Research in Pantai Indah Lampung was done at a distance of 0-30 m, while in East Lampung conducted at a distance of 0-50 m.

Based on the results of 12-hour wave recording, the wave that occurred in Indah Kapuk Beach tended to be small. Of course one of the factors that influence was the inhibitors of the wave so that the wave of sea water does not directly hit the shoreline. It made the influence of Avicennia Marina mangroves to be less visible in the process of wave reduction. Another case with research conducted in East Lampung, based on the results of recording for 6 hours of waves that occur tend to be large. The ability of wave reduction by Mangrove Avicennia Marina is clearly measured because there were no wave inhibitors that can affect the arrival of waves.

Many aspects can be reviewed to determine the ability of Mangrove Avicennia Marina in reducing the coming waves. The reducing aspects of Mangrove Avicennia Marina can be seen depending on the size of the coming waves. The respiratory roots was one aspect that can absorb the waves. When the waves are small, the calculation of the wave absorbing ability of the respiratory root is less visible. Vice versa, when the waves were large, the calculation of wave reducing ability seen from the respiratory roots will be clearly visible.

The size of the waves was also influenced by the condition of bathymetry. Taken bathymetry data aims to got profile information below the water surface. Bathymetry conditions showed an increase in depth along increases the distance from the coastal region[18].

The wave energy at Indah Kapuk Beach, Jakarta tends to be smaller than the energy generated by the waves in East Lampung. It was caused the deviation of large waves causes the energy to be small, while the wave energy will be greater if the smaller wave deviation. Of course the energy of this wave was influenced by its respiratory roots. When the energy of the incoming wave is small, then the movement of energy after through the respiratory roots, the resilience was not so great that the deviation of moving energy becomes small. When the energy was large, the energy reduced in the front, so there was a big energy difference between the energy in front with the energy that spread backward.

4. Conclusions

Based on the results obtained from these two studies, the following conclusions can be drawn: (1) The comparison of wave sizes in Indah Kapuk Beach and East Lampung showed a clear difference, the muffled wave in the PIK research was less visible due to the presence of inhibitors obstructing the incoming waves, while the reduced wave was more clearly measured in the study in East Lampung because without an inhibitors of wave coming. (2) The respiratory root density factor will be more effective in helping the wave reduction.

5. References

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