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NUTRIENT PROFILE AND MANGROVE VEGETATION COMPOSITION IN THE COASTAL WATERS OF INDRAMAYU

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ABSTRACT

Indramayu is a regencyin West Java with a coastline length of ± 114 km bordering the Java Sea and has a mangrove forest covering an area of 4060.5 ha. A small part (27,58 ha) of this mangrove forest is located Karangsong Village, Indramayu regency. Karangsong Indramayu mangrove forest has 4 types of mangroves namely *Avicennia marina, Rhizophora stylosa, Avicennia alba, Rhizophora mucronata*, where *A. marina* and *R. stylosa* dominated the are. The purpose of this study was to obtain the profile of nutrients in the coastal waters of Indramayu, identify the composition of mangrove vegetation, and to analyze the relationship between nutrients and mangrove vegetation composition in the coastal waters of Indramayu. The method used in this study was a survey approach method, quantitative approach, and data gained were analyzed descriptively. The results showed that apart from dissolved oxygen, the temperature, salinity, and pH in the waters of Karangsong Indramayu were classified to follow the characteristics of mangrove growth. The substrates at the research site silty loam and silty clay loam. Nutrient content was in the range of 0.211 mg/L – 0.252 mg/L(nitrate), 0.135 mg/L – 0.277 mg/L (nitrites), 0.51 mg/L - 0.74 mg/L (ammonia), and 0.109 mg/L – 0.140 mg/L (phosphate). The relationship between mangrove composition and nutrient profiles was directly proportional, where less nutrient content showed a decrease in mangrove growth.

Keywords: Nutrients, Mangroves, Concentration, Composition, Substrates

INTRODUCTION

Indonesia is an archipelago with more than 81,000 km length of coastline ,more than 17,508 islands, and an area of sea about 3.1m km2. According to Constitution of The Republic of Indonesia No. 27 of 2007, coastal areas are transitional areas between land and marine ecosystems that are affected by changes in land and sea. This is in line with Nontji (1993) that coastal areas are areas of the encounter between land and sea, landwards include parts of land that are still influenced by marine properties such as tides, sea breezes, and salt intrusions, while towards the sea include parts of the sea that are still affected by natural processes that exist on lands such as sedimentation and freshwater flow and areas affected by human activities on land. Seeing the potential of coastal areas is a promising region with a lot of resources that can be utilized in many ways, one of which is through tourism, especially marine tourism.

Indramayu is one of the regencies in West Java that has a coastal area with a coastline length of ± 114 km bordering the Java Sea and has a mangrove forest area with an area of 4060.5 ha. One of the villages in Indramayu Regency that has a mangrove ecosystem (27,58 ha) is Karangsong Village, Indramayu District, Indramayu Regency (Indramayu Regency Fisheries and Marine Service, 2016). Geographically, Indramayu Regency is in the position of 107^0 51' – 108^0 32' BT and 06^0 13' – 06^0 40' LS, with an area of approximately 209,942 ha, with a beach length of ± 147 Km that stretches along the north coast of the Java Sea between

Cirebon and Subang Regencies. Since 1999 mangrove conditions in Indramayu Regency continued to experience a fairly significant decrease of 45.34%, this can be seen with a high level of seawater intrusion and abrasion in this area. OISCA(2004) stated that the area of Indramayu beach affected by abrasion (±2,153.12 ha) spread across 7 sub-districts and 28 villages, while the area affected by seawater intrusion along 17 km from the beach. Given the importance of mangrove forests as part of coastal ecosystems with biological and physical functions, it is necessary to have good management so that mangrove ecosystems can have optimal and sustainable functions in the coastal waters of Indramayu.

Nutrients in mangrove ecosystem consist of inorganic and organics. Important inorganic nutrients are N (often limited), P, K, Mg, and Na. Inorganic nutrient sources are rain, surface flow, sediment, seawater, and degraded organic matter. Organic nutrients are derived from biogenic materials degraded by microbes. Mangrove ecosystem nutrients are produced by the ecosystem itself (autochthonous), as well as from the surrounding river or sea (allochthonous). Sediment nutrients are in three forms, namely dissolved in the sedimentary pore water, adsorption on the surface of the sediment, and found in the lattice structure of sediment grains.

According to Fachrul et al (2005) nutrients are substances that have an important role in preserving life because they are used by phytoplankton as a source of food, for example, phosphates and nitrates which are indicators to evaluate the quality and fertility rate of water. Phosphorus in water and sediment is in the form of dissolved phosphate compounds and unrefined phosphates. Dissolved phosphates consist of organic phosphates (phosphoric sugar, nucleoprotein, phosphoprotein) and inorganic phosphates (orthophosphate and polyphosphate). Nitrates are the main form of nitrogen in natural waters and are the main nutrients useful for plant and algae growth. This compound is produced from the perfect oxidation process of nitrogen compounds in the waters. Nitrification is the process of oxidizing ammonia into nitrites and nitrates by organisms. This process is important in the nitrogen cycle (Effendi, 2003).

MATERIALS AND METHODS

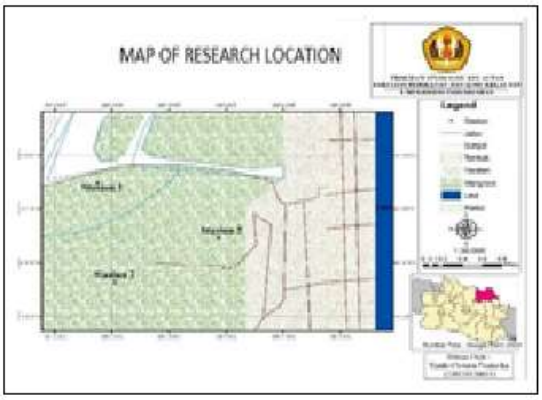

Figure 1. Research Station in Karangsong Mangrove Forest

This research was conducted in Karangsong Coastal Waters, Indramayu, in October 2020, where the research stationss were chosen randomly. Nutrient sample analysis was conducted at PPSDAL Padjadjaran University in November 2020, and mangrove vegetation analysis was conducted at KTNT Laboratory Faculty of Agriculture Padjadjaran University in November 2020. The methods used in this study were a survey approach and quantitative approach. Data gained were analysed descriptively. The survey method which was previously conducted as a preliminary survey coveredthe entire mangrove forest were conducted at three research stations to study the structure of mangrove vegetation,and water quality. Furthermore, substrates were sampled to find out the nutrient concentration (Nitrate, Nitrite, Phosphate, Ammonium).

To find the correlation between nutrients and the composition of mangrove vegetation to be observed. Data from the concentration of four nutrients of this study will then be tested using the Anova Test. The results of the analysis are then discussed descriptively. The determination of the station based on the type of mangrove and the difference in the structure of mangrove vegetation is determined by three research stations each - each station made 3 observation plots along the transect line.

Sampling

Research stations were determined directly at site. Line transect method was used to determine the community structure of the mangrove forest. Transect line (50m) was drawn from the reference point that was the outer mangrove facing direct motion of the shoreline. A plot (20 x 20 m) was used to calculate and identify the type of mangrove tree life form), a smaller plot (10 m x 10 m) was used to calculate and identify the type of mangrove life form), and another smaller plot (5 m x 5 m) was used to calculate and identify the type of mangrove stakes life form) (Figure 2)

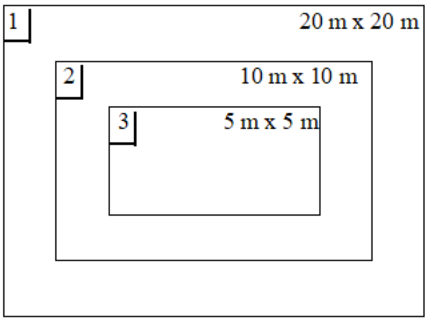

Figure 2. Design of vegetation observations in the field Description:

1: Plot for tree observation $(20m \times 20m)$
2: Plot for pole observation $(10m \times 10m)$
3: for stake observation $(5m \times 5m)$

Individual plants were categorized as tree, pole and stake with trunk circumference > 62.8cm, 15.7cm - 31.4cm, and <15.7cm, respectively. (Prihadi et al., 2018). while at the level of seedlings only noted the type and number of stands, and the parameters recorded are the name of the plant type, the diameter of the trunk, the number of types and the number of plots of the discovery of a plant type (frequency). Data retrieval transect line is drawn from the reference point that is the outer mangrove tree with the direction perpendicular to the shoreline. The length of the transect line is drawn along 50 m. On each path are made observation tiles according to their growth rate (Figure 2).

Mangrove ecosystem vegetation found in research stations were counted for their density and analyzed as follows: Density (ind/ha) = (Number of individuals of a species) / (Area of all plots). These results were then used to categorized the types of damaged mangrove (Based on the Decree of the Minister of Environment of Indonesia, number 201, year 2004 (Table 1).

Table 1. Standard Criteria for Mangrove Damage

Criteria		Closure (%)	Density (ind/ha)
Good	Solid	≥75	≥1500
	Medium	≥50 < 75	≥1000 <1500
Damaged	Rare	<50	<1000

Source: Decree of the Minister of Environment Number 201, year 2004

Habitat characteristics of Karangsong mangrove ecosystem were determined by measuring the quality of water and substrate in the study area. The data on the physical and chemical parameters of the waters were carried out and taken to the PPSDAL Padjadjaran University Laboratory for further analysis. The observation of substrate type was carried out at the KTNT Laboratory of the Faculty of Agriculture, Padjadjaran University.

Data Analysis

Data analysis were conducted descriptively.. Descriptive analysis is used to find out a problem by describing the condition of the subject and research object based on visible facts (Nawawi. H, 1983). Data analysis was carried out on the composition of mangrove vegetation in Indramayu mangrove ecosystem. A laboratory test was carried out to determine the nutrient content of the sediment pore water. Concerning mangrove condition and composition structure, a t-test and a correlation test were conducted. For the dominance, low dominance when $0 < D \leq 0.5$; moderately dominance when $0.5 < D \leq 0.75$; and highly dominance when $0.75 < D \leq 1.00$. For the Density of mangrove, to determine the level of diversity of a species using the Shannon-Wiener index formula (H '). If the value of H 'was high (H'> 3), then the diversity of an ecosystem can be categorized as stable because it is composed of many species

RESULTS AND DISCUSSION

In conducting the research, temperature measurements at each station were carried out during the day and the results from observations in temperature measurement in this study showed that the range of values was not much different, which means that the temperature at each station tends to be homogeneous. The suitable temperature for mangroves is 28°C - 32°C as stated in Attachment III of the Minister of Environment and Forestry Decree 51 of 2004, concerning Sea Water Quality Standards for Marine Biota.

Geographically, Indramayu Regency is located within 107 ° 52 '- 108 ° 36' East Longitude and 6 ° 15 '- 6 ° 40' south latitude. Indramayu Karangsong Beach is abundant with mangrove trees, both natural vegetation and the results of reforestation. In this research, it can be identified that the mangroves in the Karangsong mangrove forest consist of four species namely *Avicennia alba, Avicennia marina, Rhizophora stylosa, Rhizophora mucronata*. Measurement and observation of water quality and substrate were carried out at each research station. Species of mangroves found at station 1 were *A. alba, A. marina, R. stylosa, R. mucronata*. In station 2, there were *A. marina and R. Stylosa* and only one species found at station 3, namely *A. marina.*

Table 2. Results of Water Quality and Substrate Measurement

Water Parameters	Station		
	1	2	3
Temperature (°C)	30	29	29
Salinity (‰)	34	25	30
DO (mg/L)	1.6	2.8	4.5
pH	8.47	7.71	8.01
Substrate Type	Silty Loam	Silty Loam	Silty Clay Loam

Measurements and observations of water quality and substrate were carried out at each research station with three replications for each station and each parameter. Temperature at all stations showed a range of values 29 - 30ºC (Table2) This is in line with DKP (2008) that in general. the temperature in each station were relatively the same. And could still support the life of the mangrove ecosystem. and were still under the life boundaries of the mangrove ecosystem.

Temperature

The water temperature at the study sites ranged from 29°C to 30°C. The lowest water temperature was at station 2 (29°C) and the highest water temperature was at station 1. Temperature at station 2 and 3 had the lowest value because the intensity of sunlight received by the water surface was low. while the temperature at station 1 haa the highest due to the ntensity of sunlight received by the water surface was high. Water salinity in all stations were different The highest salinity (34 ppt) was found at station 1 and the lowest (29 ppt) was at station 3The low salinity at the research location was due to the low intensity of sunlight received by the water surface so that the salinity at the research location is lower than the other stations. The salinity conditions at each station have various salinity values that make mangroves in the research

Salinity

location grow well. According to Nontji (1993). salinity is influenced by several factors including water circulation patterns. evaporation. rainfall. and river flow. Based on the salinity observations obtained at the research location. the salinity values at station 1 to station 3 were still supportive for mangrove survival as stated by the Decree of the Minister of Environment Number. 51 of 2004.

Dissolved Oxygen (DO)

DO values at station 1 to station 3 were 1.6 – 4.5 mg/L and were below the minimum threshold. The highest DO (4.5 mg/L) was at station 3. and the lowest DO (1.6 mg/L) wasat station 1. Dissolved oxygen content is needed in the waters for the survival of organisms in the waters. Prihadi (2018) stated that the solubility of oxygen has a negative correlation to water temperature and salinity. Oxygen solubility decreases with increasing temperature and salinity.When DO measurements were taken in the morning. the results obtained were lower even the DO was at a minimum. Effendi (2003) stated that DO levels in waters were influenced by aeration. photosynthesis. respiration. and oxidation of organic matter. There is a relationship between oxygen levels and temperature. where the higher the temperature. the less oxygen solubility.

pH

The pH value at the research location ranged from 7.71 – 8.47. The highest pH value (8.74) was at station 1. while the lowest value (7.71) was at station 2. The low pH value was due to various natural factors. The results of measuring the degree of acidity show that the difference was not that big so that the pH in the study location could be classified as homogeneous and there was no. large pH changes because the research station were not too far away and were still in one area. Nybakken (1993) stated that in general. the pH of seawater is stable due to the carbonate cycle in seawater. In this research. the pH at each station was still following the quality standards in the Minister of Environment Decreo.No. 51. year 2004.

Substrate

Substrates are one factors that can limit the growth and distribution of mangrove plants because differences in soil physical and chemical characteristics will cause differences in mangrove zoning. Kusmana (2005) stated that mangroves grow on mud soils and various types of mangroves can grow on sandy. coral. gravel. and even peat soils. The results of the substrate at the research location show that station 1 and 2 had Silty Loam substrate type. and station 3 had a Silty Clay Loam type.

Table 3. Results of the Substrate Sample Analysis of the Research Location

Location	% sand	% clay	% silt	Criteria
Station 1	13	21	66	Silty Loam
Station 2	17	24	59	Silty Loam
Station 3	53	22	25	Silty Clay Loam

Visually. the substrate at the study site was classified as sandy. but after analyzing the substrate texture at each research station based on 3 fractions. namely sand. clay. and dust. the clay texture content was greater than the percentage value of clay and sand. Aksornkoe (1993) stated that differences in soil physical and chemical characteristics will cause differences in mangrove zoning. This is evidenced by the abundance of *A. marina and R. mucronata* species found. The substrate conditions in the form of fine sand and muddy are very good for this mangrove species and develop well in the research location.

Kitamura et al. (1997) stated that *A. marina* thrives in muddy areas and is very tolerant of high salinity. *A. marina* can grow well in salinity that is close to fresh up to 90 ‰ because *A. marina* has a fairly high tolerance limit for waters with extreme conditions such as high salinity. muddy substrate conditions. and with its root system. namely pneumatophores.

Mangrove Density

The density of mangrove species at each level of trees. poles. and stakes was calculated by the number of individual mangroves found divided by the area observed. Results showed that the dominating species at the research station was *Rhizophora stylosa*. This was because mangrove Rhizophora spp. Were able to adapt to all types of substrates. in which the types of substrates found in the study site are clay loam and silty clay loam substrate types. Rhizophora spp. generally can grow well on muddy substrates and can live in sandy mud substrates.

The overall tree. pole and stake density were 350 ind/ha. 110 ind/ha. and 11 ind/ha. respectively. At station 1. mangrove data collection was near the river. with the highest tree density. *Rhizophora stylosa* (184 ind/ha). and the lowest tree density (1 ind/ha) was *Rhizophora mucronata*.

Table 4. Results of mangrove species density at the research location

Growth Rate	Diversity Index (H')	Info.
Tree	0.760468802	Low
Poles	0.887235197	Low
Stakes	0.860851391	Low

The highest mangrove pole density at station 1 was *R. stylosa* at 49 ind/ha and the lowest tree density was *R. mucronata* at 1 ind/ha. The highest mangrove species density at stake level was *R. stylosa* at 29 ind/ha and the lowest tree species density at station 1 was *A. alba* at 1 ind/ha.

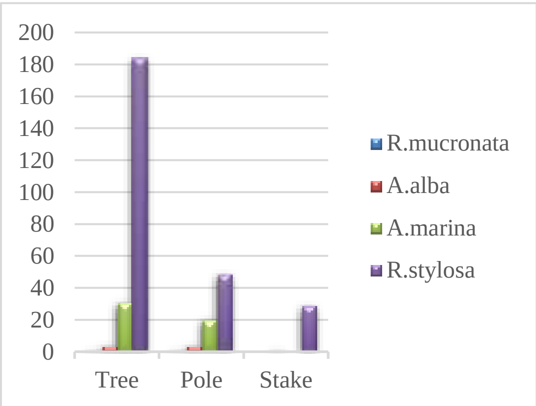

Figure 3. Mangrove (tree. pole and stake) density in Station 1

At station 1. four species of mangrove were found. namely *R. mucronata*. *R. stylosa*. *A. marina*. *A. alba*. The number 0 in the table indicated that no mangrove species were found at a certain level on the research transect. This was due to the low ability to regenerate. The low regeneration ability at the stake level until the tree level at the research location was caused by various factors are plastic waste and death.. station 1 is near to the river. so that mangroves has an impact. causing mangrove die and reduce the number of stands at the stake level. At station 2. the highest tree species density (31 ind/ha) was *R. stylosa* and the lowest (5 ind/ha) was *A.marina* The highest mangrove pole density (17 ind/ha) was *R. stylosa* and there was no mangrove pole found. The highest mangrove stake density (5 ind/ha) was *R. stylosa* at and the lowest (1 ind/ha) was *A. marina*.

In station 2. there were 2 species of mangroves found. namely *R. stylosa* and *A.marina*. The smaller number of species found was probably due to the low ability to regenerate.

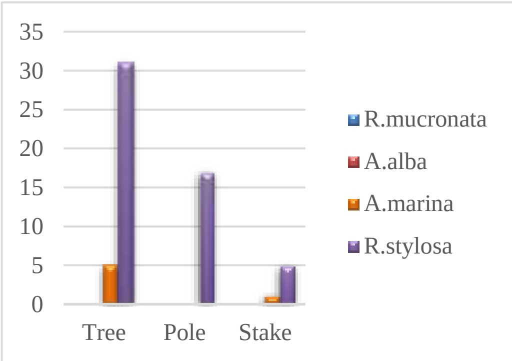

Figure 4. Mangrove (tree. pole and stake) density in Station 2

The low regeneration ability at the stake level until the tree level at the research location was caused by various factors are plastic waste and death.stadion 2 is far to the coast. so at low tide stasion 2 isn't too immersed in seawater and so that mangroves die and reduce the number of stands at the stake level.

At station 3. there was only *A. marina* found in the area. Mangrove tree density was 94 ind/ha. whereas mangrove poles and stakes were 23 ind/ha and 9 in/ha. respectively (Figure 5)

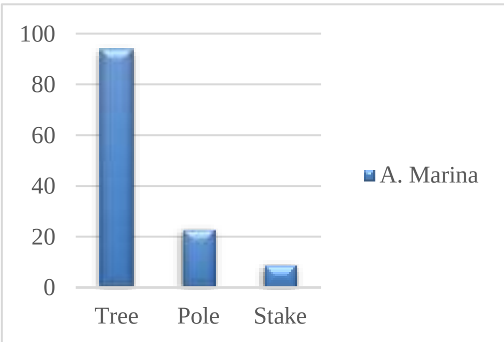

Figure 5. Mangrove (tree. pole and stake) density in Station 3

Station 3 was located close to Karangsong beach. so there were no other mangrove species besides *A. marina*. The value at the sampling level was small due to low regeneration capability. The low regeneration ability at the stake level until the tree level at the research location was caused by various factors are plastic waste and death.. stadion 3 is near to the coast. and the sea water are receding when the researches do the research. so that mangroves die and reduce the number of stands at the stake level.

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Important Value Index (IVI)

The magnitude of the influence and role of a type of vegetation at a location was determined by the IVI (important value index) where the more vegetation found. the higher the frequency found. the larger the diameter of the stems will increase the value of the IVI. Important value index (IVI) had values ranging from 0 - 300 for the tree level. and 0 - 200 for the stake level. If fewer species of vegetation were found in a location. the greater the IVI value of the vegetation species.

Table 5. Important Value Index

Station	Amount	Pi (ni/N)	ln (pH)	IVI	H' -(IVI)
Station 1	324	0.63654	-0.4517	-0.2875	0.2875
Station 2	59	0.11591	-2.1549	-0.2498	0.2498
Station 3	126	0.24754	-1.3962	-0.3456	0.3456
Total	509	1	-4.0028	-0.8829	0.8829

Important value index at each research station. Station 3 had the highest important value index. where the mangrove species was only *A.marina*.Tthis was probably because *A. marina* is an endemic species that could adapt to its environmental conditions so that it can continue to survive. The smallest important value index was at station 2 because the location was not exposed to sunlight and many mangroves have fallen.

Mangrove Diversity

To determine the level of diversity of a species using the Shannon-Wiener index formula (H '). If the value of H 'was high (H'> 3). then the diversity of an ecosystem can be categorized as stable because it is composed of many species. The results of the Shannon-Wiener (H ') diversity index in all research stations. had a diversity index of H' <1 and showed low species diversity on a transect

Table 6. The accumulative diversity index at the research station

Mangrove Species	Density (ind/ha)		
	Trees	Poles	Stakes
Rhizophora stylosa	215	66	34
Avicennia alba	4	4	1
Rhizophora mucronata	1	1	0
Avicennia marina	130	43	10
Total	350	114	45

Mangrove Species Dominance

Dominance is a ratio between the number of individuals in a species with the total number of individuals in all species. To determine the level of dominance of a species in a community. the Simpson (D) dominance index was used. The results of the accumulative calculation of Simpson's dominance index (D) at all stations can be seen that the mangrove dominance index based on the growth rate with the tree to stake criteria.

Table 7. Research Station Dominance Index

Station	Species	D (pi*pi)	Info.
1	*R. mucronata*	0.00003810395	Low
	A.alba	0.000771605	Low
	A. marina	0.024777092	Low
	R.stylosa	0.653901844	Medium
Total		0.679488645	
2	*R.mucronata*	0	
	A.alba	0	
	A.marina	0.010341856	Low
	R.stylosa	0.806952025	High
Total		0.817293881	
3	*R.mucronata*	0	
	A.alba	0	
	A.marina	1	High
	R.stylosa	0	
Total		1	

Table 7 showed that station 2 had a high dominance index of *Rhizophora stylosa*. and at station 3 with *Avicennia marina*. Station 1 had a moderate dominance index (0.5 <D ≤ 0.75) with the mangrove species being *Rhizophora stylosa*. Whereas station 1 had a low dominance index (0 <D ≤ 0.5) with 3 mangrove species. namely *Rhizophora mucronata. Avicennia alba. and Avicennia marina*and at station 2 with mangrove type is *Avicennia marina*.

Nutrient Analysis

Organic material is an element that is included in the life process of organisms. According to Aksornkoae (1993). a nutrient is an important factor in the balance of the mangrove ecosystem. Nutrients are divided into inorganic nutrients and organic detritus. Inorganic nutrients consist of N. P. K. Mg. Ca. and Na. Nitrate and phosphorus are very stable inorganic nutrients. Organic detritus consists of two sources. from the waters themselves and from other ecosystems. The results of the research on nutrient content at each research station showed that the nutrient content found at each station was not too much different

Nitrate

Nitrate levels at each station in the study location varied and ranged from 0.211 to 0.252 mg/L. The lowest nitrate level at the study location was 0.211 mg/L and was found at station 2. and the highest nitrate level at the study location was 0.252 mg/L and was found at station 1. The nitrate level at station 3 was obtained at 0.226 mg/L. The high level of nitrate at station 1 may be due to the large supply of organic substances containing nitrate nutrients into the coastal waters being carried away by the current. This trend was also found by Hutagalung and Rozak (1997) and stated that the higher the nitrate content towards the coast. while for the vertical distribution the nitrate content was higher when the depth increases.

Table 8. Nutrient content at the research station

Station	Nutrient			
	NO_2 (mg/L)	NO_3 (mg/L)	NH_3 (mg/L)	PO_4 (mg/L)
Station 1	0.135	0.252	0.0074	0.109
Station 2	0.182	0.211	0.0051	0.125
Station 3	0.277	0.226	0.0055	0.140

Brotowidjoyo. et al.. (1995) stated that the normal nitrate content in marine waters is generally between 0.10-0.50 µM or equivalent to 0.001-0.007 mg/L. The Minister of KLH (2004) set a standard quality for nitrate compounds for marine biota of 0.008 mg/L. According to Chu *in* Wardoyo (1982) that the range of nitrate levels from 0.3 to 0.9 mg/L is sufficient for organism growth and> 3.5 mg/L can harm the waters. Meanwhile. Effendi *in* Simanjuntak (2012) stated that water nitrate levels> 0.2 mg/L can result in eutrophication which can stimulate rapid growth of phytoplankton (blooming).

Nitrite

The results of the analysis of nitrite levels for each research station had different range of values. The lowest measurement of nitrite level was at station 1. (0.135 mg/L) and the highest measurement (0.277 mg/L) was at station 3. The nitrite level at station 2 was obtained at 0.182 mg/L. the increase in nitrite levels is closely related to the organic matter in this zone (whether it contains nitrogen or not). Among them. the decomposition of organic matter by microorganisms requires large amounts of oxygen. The oxygen comes from free oxygen (O2). but if the oxygen is not enough then the oxygen is taken from nitrate compounds which in turn into nitrite compounds (Hutagalung and Razak. 1997).

Ammonia

Results showed that the levels of ammonia (NH3) in the study locations had different ranges of values. The highest measurement of NH3 0.74 mg/L was at station 1. . and the lowest (0.51 mg/L) was at station 2.. For NH3 levels at station 3. it was obtained 0.55 mg/L. Increasing this ammonia compound. will increase the growth and density of phytoplankton. The high density of phytoplankton causes a population explosion event (blooming). which was followed by mass death (die-off) of phytoplankton. Population explosion events and the mass death of phytoplankton will worsen water quality.

Phosphate

Phosphate levels at each station in the study location varied and ranged from 0.109 mg/L - 0.140 mg/L. The lowest phosphate concentration (0.109 mg/L) was found at station 1. and the highest (0.140 mg/L) was found at station 3. Phosphate concentration at station 2 was 0.125 mg/L. The low levels of phosphate at the study site may be due to the lack of supply of organic substances from the land spreading into waters containing phosphate nutrients. Besides that. low levels of phosphate in the surface layer may also be caused by intensive phytoplankton activity. The high level of surface phosphate at the location near the coast is probably due to currents and turbulence of the water mass which results in the lifting of the high phosphate content from the bottom to the surface layer.

According to Joshimura *in* Wardoyo (1982). the fertility level of fairly fertile waters based on phosphate levels ranged from 0.0021 to 0.050 mg/L and fertile waters ranged from 0.051 to 0.100 mg/L. According to Ilahude and Liasaputra(1980). phosphate levels in the surface layer in the world's most fertile waters were close to 0.6 µM or equivalent to 0.019 mg/L. where as according to EPA(2002). phosphate levels were classified as high in marine waters when > 3.10 µM or equivalent to > 0.096 mg/L. Ketchum (1969) determined a phosphate value of 2.8 µM or equivalent to 0.087 mg/L as the upper limit for uncontaminated water and the Ministry of Environment (2004) set a standard quality standard for phosphate compounds for marine biota of 0.015. mg/L.

CONCLUSION

There are four types of mangroves found in Mangrove Karangsong, namely; *Avicennia Marina, Rhizophora stylosa, Avicennia alba, Rhizophora mucronata*. Of the four types of mangroves, *Avicennia marina* and *Rhizophora stylosa* are the dominant species. Subtrat Manggrove Karangsong are generally dusty loam and sandy loam while nitrate, nitrite, ammonia and posfat concentrations are respectively in the range of 0.211mg/L-0.252mg/L; 0.135mg/L- 0.277mg/L; 0.51mg/L-0.74mg/L; and 0.109mg/L- 0.140 mg/L.

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