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The relationship of redox potential to crustacea abundance at Bama beach of Baluran National Park, Situbondo, Indonesia

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ABSTRACT

Crustaceans are invertebrates that generally live at the bottom of the water. Organic matter on the substrate that is crustacean food undergoes the process of reduction and oxidation to become a simpler form. The purpose of this study is to find out the potential relationship of redox (reduction and oxidation reactions) to crustacean abundance. The research method used in this study is an observation method. Soil abundance and oxidation are measured based on transects at three stations. The results showed that there are 10 types of Crustaceans with a total of 1320 individuals, while in Mangrove there are 4 types with a total of 92. The highest redox potential (reduction and oxidation reaction) value is at Station 1 transek 1 (ST1. T1) which is 62.5 mV, with mud soil texture. while the lowest potential redox value is at Station 2 Transek 3 (ST2. T3) 40.6 mV, with mud soil texture. the conclusion of this study is that redox potential affects crustacean abundance by 99.5 %.

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1. Introduction

Mangrove forest ecosystems are one of the ecosystems that have high productivity compared to other ecosystems with high decomposition of organic materials. this makes it a very important ecological link to the lives of living creatures in the surrounding waters. Organic matter makes mangrove forest as a source of food and care for various biota such as fish, shrimp and crabs. Fish and shrimp production in marine waters depends heavily on the production of litter produced by mangrove forests (Anneboina and Kumar, 2017).

Crustaceans are exotic animals (water) found in seawater and freshwater. Crustaceans are known to be approximately 26,000 species, the most commonly known are shrimp and crab. Crustaceans have a hard skin (shell) caused by the presence of calcium carbonate deposits in the cuticle. Crustacean body consists of two parts namely the head of the chest that is fused (sefalotoraks) and abdomen or abdomen. Crustaceans are suspended (filter feeders) and are very dominant in sandy and muddy substrates. Ecologically, crustaceans serve as a counterbalance in the food chain. Crustaceans as a detrivor to decomplyse organic ingredients. Important organic ingredients such as cholesterol made by prokaryotes must be decomposed by crustaceans in order to be utilized by higher consumers (Thomas et al. 2012).

One method to look at the decomposition process of organic materials in the water is to look at the reduction or oxidation zone. Furthermore, to see the activity of reduction and oxidation in the water can be done with potential measurements of redox. The potential for redox is a potential amount of electricity that can indicate the decomposition process of organic matter in the water takes place in a state of reduction or oxidation Adianto (2018).

Bama Beach is one of the beaches that has mangrove vegetation around the beach. Based on information from Baluran National Park officials, that research on the potential for redox in mangrove vegetation is very limited, especially research on its redox potential. Based on the background, it is necessary to conduct potential redox research at Bama Beach so that it can be known the potential of its redox, water quality, and abundance of crustaceans

2. Material and methods

The research was conducted in mangrove vegetation of Bama Beach Baluran National Park Situbondo Regency, Fisheries Laboratory of Muhammadiyah University malang and Soil Laboratory of Universitas Brawijaya Malang. The tools used in the study were GPS, shovel, timba, sub plot (1 m × 1 m), rafia rope, refractometer, thermometer, DO meter, camera, and roller meter. Materials used in plastic bag research.

Sediment sampling begins with the installation of transects at each station with a size of 10 m × 10 m, then the sediment is taken using a shovel as much as 1–1.5 kg put in plastic and put in a box which is then taken to the Soil Laboratory of Universitas Brawijaya Malang for further examination of Potential Redox, Organic Carbon, and Organic Materials. Crustacean retrieval by means of sub transect installer with size 1 m × 1 m as much as 3 sub transects, then crustaceans on the surface of the substrate are taken by hand picking and crustaceans found in the hole are taken by digging the hole using a shovel. Crustaceans are then inserted into plastic bags according to the station and sub transeknya to be later identified and calculated in number.

Data retrieval is done 2 times with a distance of one month from the first data retrieval. In one station in the contents of three transects with a size of 10 × 10 m, and on each transect is given a sub transect of 3 pieces each measuring 1 × 1 m. The distance between the 10m transects is seen in Figure 1.

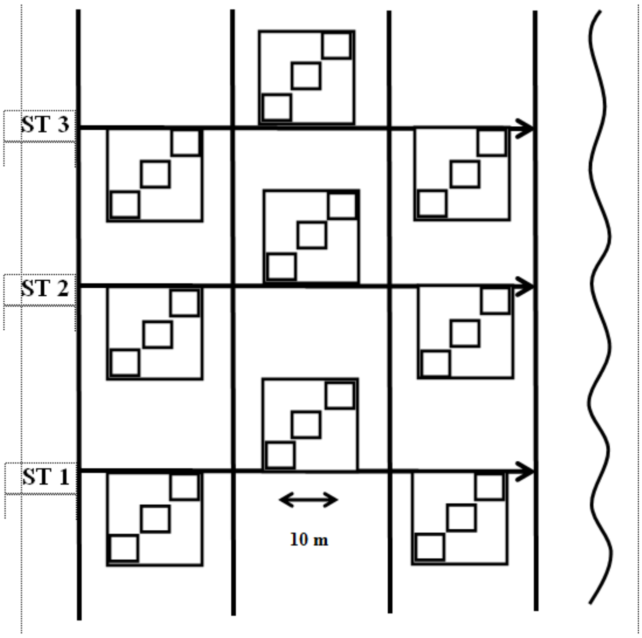
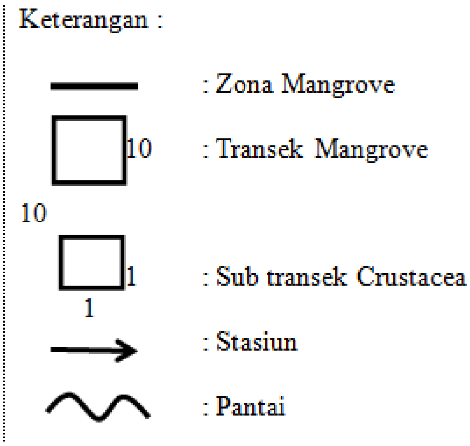


Figure 1. Transek and Sub transek laying models



Environmental parameter measurements include Temperature, Salinity, pH, DO, and TOM. For Temperature, Salinity, pH, and DO are checked 2 times a day morning and evening. As for TOM is done in the Fisheries Laboratory of Muhammadiyah University by titration $KMnO_4$.

2.1. Abundance of Crustaceans

Calculation of Crustacean Abundance using the formula:

$$N = \frac{\sum n}{A}$$

N : Abundance (ind/ha)
∑:Number of Individuals
A : The area of the pick up area.

2.2 *Diversity Index (H́akak)*

For processing of diversity used the formula Shanon Wiener (1989) in Darojah (2005), namely:

$$H' = \sum_{i=1}^{s} (\mathrm{pi})\,(log2\,pi)$$

H' : Diversity index value
pi : Proportion of the number of individual species i (ni) to the total of individuals (N) : (ni/N)
N : Total number of individuals of all species
S : Number of types

The value of the diversity index (Shanon-Wiener) has several categories according to Hardjosuwarno (1990) in Darojah (2005), divided into four criteria based on the conditions of divensitas fauna bentik with a range of:
H' >30 : Very high diversity
H' 1.6-3.0 : High diversity
H' 1.0-1.5 : Medium diversity
H'<1 : Low diversity

2.3 *Domination Index (D)*

The 'Simpson' dominance index method is used to determine the number of certain species that dominate certain habitats of Wediningsih (2005) in Septiyadi (2011), with the formula:

$$D = \Sigma\,(\mathrm{pi})^2 = \left[\frac{\Sigma \quad ni^2}{N}\right]$$

D : Simpson domination index
Pi : Proportion of species i in the community
ni : Number of individual species i
N : Total number of individuals.

Domination Index between 0-1
D = 0, means there are no species that dominate other species or community structures in a stable state.
D = 1, means that there are species that dominate other species or labil community structures, due to ecological pressures.

2.4 *Uniformity Index (E)*

The uniformity index can be known by comparing diversity with the maximum value of Werdiningsih (2005) in Septiyadi (2011), which is stated as follows:

H’

$$E = \frac{}{H'\ max}$$

H'max : Maximum value H'= Log2S = 3.3219 Log S.
E : Uniformity Index
H' : Diversity Index
S : Number of types

Index values range from 0-1
E - 0 : Uniformity between species is low, meaning the wealth that each species has is very much different.
E= 1 : Uniformity between species is relatively evenly distributed or the number of individuals of each species is relatively the same.

2.5 Data Analysis

The data obtained will be analyzed using correlation analysis methods, regression analysis and T tests of SPSS 26.0 and MS Excel 2013 programs.

3. Results and Discussion

3.1 Type and Abundance (N) Crustaceans

The results obtained are calculated using Excel, found on Station I 57 types, Station II 42 types, and Station III 38 types, seen in Table 1.

Table 1. Type Name and Abundance Calculation

Nama Jenis	Stasiun		
	1	2	3
Uca lactea perplexa	14	4	4
Hemigrpsus sanguineus	13	-	-
Cardisoma armatum	10	14	-
Hemigrapsus takanoi	-	6	8
Hemigrapsus penicillatus	6	7	6
Callinectes sapidus	-	6	-
Cylograpsus lavauxi	5	-	5
Neolimera pubescens	-	-	5
Ocypode cordimanus	3	-	-
Uca annulipes	6	5	10
Total	57	42	38

Based on the table above Abundance (Table.1) the highest is at station 1 which is 57 types while the lowest is in staisun 3 which is found 38 types. Crustacean abundance is influenced by environmental factors, and is also influenced by tidal currents, and is also influenced by the crustacean mating season. Usually during the mating season, in September – November crustaceans overflow until they rise to land. This is reinforced by a statement from the Klompmaker (2010) which states that, the spread and abundance of a type of organism causes the formation of a diversity of types in a habitat. One of the factors that affects the composition is the migration and stability of the environment.

The statement was also supported by Reise (2012), among all environmental parameters, tidal currents are one of the main factors controlling species, distribution and abundance of many organisms including Crustaceans. Crustaceans living in the equator to subtropical areas can do spawning throughout the year, but in general there are two peaks of the mass period, namely around September to November 2019 and March to May 2020.

3.2 Uniformity Index (H'), Domination Index (C), and Uniformity Index (E) on Crustaceans

The result obtained through excel calculation of Diversity Index (H') in staisun 1 is 1.83, at station 2 is 1.44, and at station 3 is 1.74. The Domination Index (C) at station 1 is 0.17, at station 2 is 0.20, and at station 3 is 0.18. and the Uniformity Index (E) at staisun 1 is 0.79, at station 2 is 0.62 and at station 3 is 0.75 seen in Table 2.

Table 2. Diversity Index (H'), Domination Index (C), and Uniformity Index (E) calculation data on Crustaceans

Stasiun	H’	C	E
1	1,83	0,17	0,79
2	1,44	0,20	0,62
3	1,74	0,18	0,75

Based on the table above (Tabel.2) the result of the diversity calculation (H') which is the highest diversity is at station 1 which is 1.83, while the lowest is at station 2 which is 1.44, from this explanation stated that the diversity on bama beach is high, which means the condition of crustacean community is in stable condition. Another factor is environmental conditions that are able to support the continuity of the process of living of organisms well. This is reinforced by Khedhri et al (2016) argues that analysis of the composition of benthik macrofaunal has become one of the indicators to assess the quality status of an environment.

The statement was also supported by, high H' value indicates a complex community and there is a high type of interaction as well. Within the community there will be kind of interactions involving energy transfer, predation, competition, and the division of ecological niches. The concept of diversity can be used to measure a community's ability to keep itself stable (community stability), despite its interference. Olsen et al. (2018) states that the H' index is in fairly stable condition, ecosystem conditions are fairly balanced and under moderate ecological pressure.
Based on the table above (Tabel. 2) in the calculation of The Domination Index (C) which is the highest dominance index value is at staisun 2 which is 0.20, while the lowest is at station 1 which is 0.17 from the explanation can be stated that the community structure is stable and no type dominates. The presence of diverse species indicates that communities in the waters are stable. Hail is reinforced by Kurten et al. (2011) The high uniformity index values indicate the crustacean community is in stable condition. Low dominance values indicate no species dominates against other species. The presence of diverse species indicates that communities in the waters are stable. The waters provide suitable habitat and abundant feed so as to support the life of various types of crustaceans.

The value of the dominant index ranges from 0-1. The value of D=0 of the community structure is stable and no type dominates, and the value of D=1 of the community structure is in a state of dising and there is a dominating type. Based on the table above (Table.2) it is obtained that the Uniformity Index (E) which is the highest uniformity index value is at station 1 which is 0.79 while the lowest is at station 2 which is 0.62, from the explanation can be stated that the uniformity between species is stable, meaning that the three stations have better quality. The value of uniformity describes the ecological balance in a community, the higher the value of uniformity then the better the quality of the environment. This is strengthened by the statement of Amalia et al., (2017) which states that the Uniformity Index can lead to an even spread of biota types. The criteria for uniformity index values are: low uniformity and depressed communities (E<0.5), moderate uniformity and stable communities (0.51<E<0.75), high uniformity and stable communities (E>0.76).

3.3 Mangrove Type Composition

In the study, 6 types of mangrove species were found from 3 observation stations. The types of mangroves found in the study are *Rhizopora stylosa* Griff, *Rhizopora appiculata*, *Rhizopora mucronata* Lam, *Heritiera littoralis* Dryand, *Excoecaria agollocha*, and *Sonneratia caseolaris*. Based on the description there are 3 zonings namely R. stylosa, is seaward zone, zone *R apiculata* which is the middle zone, and landward zone dominated by *Heritiera littoralis*, *Excoecaria agollocha*, and Sonneratia caseolaris. This is reinforced by Mughofar et al (2018) which states that mangrove forest zoning consists of three parts including zoning close to the sea, zoning between sea and land, zoning close to land, but in addition to the location of mangrove zoning division is also based on the constituent plants. Mangrove forest zoning is heavily influenced by substrates, salinity and tides. Muddy substrates are excellent for rhizopora mucronata, while Rhizopora stylosa grows well on sandy substrates.

3.4 Type Density Calculation Data (Di), Relative Density (RDi), Type Frequency (Fi), Relative Frequency (RFi), Type Closure (Ci), Relative Close (RCi), and Mangrove Essential Value Index (INP)

Results obtained through Excel's calculation of station 1 of the Important Value Index (INP) of 219%, on station 2 of the Important Value Index (INP) of 219%, and on station 3 of the Important Value Index (INP) of 215% are seen in table 3.

Table 3. Calculation of Type Density (Di), Relative Density (RDi), Type Frequency (Fi), Relative Frequency (RFi), Type Closure (Ci), Relative Close (RCi), and Mangrove Essential Value Index (INP)

Nama Jenis	Stasiun 1						
	Di	RDi	Fi	RFi	Ci	RCi	INP
Rhizophora stylosa G	0.05	0.23	1.67	0.23	1.54	0.01	0.46
Rhizopora mucronata L	0.1	0.45	3.33	0.45	32.17	0.11	1.02
Heritiera littoralis D	0.04	0.18	1.33	0.18	8.04	0.03	0.39
Excoecaria agallocha L.	0.03	0.14	1.00	0.14	15.09	0.05	0.33
Total	0.22	100 %	7.33	100 %	57.66	19 %	219 %
Nama Jenis	Stasiun 2						
	Di	RDi	Fi	RFi	Ci	RCi	INP
Rhizophora stylosa G	0.06	0.40	2.00	0.40	2.27	0.01	0.81
Rhizopora appiculata	0.05	0.33	1.67	0.33	22.90	0.08	0.74
Excoecaria agallocha L.	0.02	0.13	0.67	0.13	19.64	0.07	0.33
Sonneratia caseolaris	0.02	0.13	0.67	0.13	12.57	0.04	0.31
Total	0.15	100 %	5.00	100 %	57.37	19 %	219 %
Nama Jenis	Stasiun 3						

	Di	RDi	Fi	RFi	Ci	RCi	INP
Rhizophora appiculata	0.07	0.39	2.33	0.39	3.46	0.01	0.79
Rhizopora mucronata L	0.05	0.28	1.67	0.28	19.64	0.07	0.62
Heritiera littoralis D	0.02	0.11	0.67	0.11	15.90	0.05	0.28
Excoecaria agallocha L.	0.04	0.22	1.33	0.22	7.07	0.02	0.47
Total	0.18	100 %	6.00	100 %	46.07	15 %	215 %

Based on the table above (Table.3) it can be concluded that the highest density of Mangrove types is *Rhizopora mucronata* Lam type at station 1, from the explanation can be stated that mangroves on bama beach are classified as dense. The high density of mangrove species indicates the number of tree stands in the area. *Rhizophora mucronata* Lam. has the highest mangrove density in all categories. This condition is caused because *Rhizophora mucronata* Lam type is a type of mangrove whose growth is tolerant to environmental conditions, especially against substrate conditions, as well as its wide spread of seeds. This is reinforced by Amalia et al. (2017), that *Rhizophora mucronata* is a type of mangrove plant that is tolerant of environmental conditions (such as substrates, tides, salinity and nutrient supply), can be widespread and can grow upright in various places.

Based on the table above (Table.3) it can be concluded that *R. mucronata* type at station 1 has the highest relative density due to the condition of substrates that generally contain organic matter is suitable for the growth of its kind, in addition this type is a pioneer plant or pioneer. This is in accordance with the Amalia et al. (2017), that the reliance of pioneer plant species on soil species is indicated by the genus Rhizophora which is a common feature for muddy soils mixed with organic matter.

Based on the table above (Table. 3) it can be concluded that the highest mangrove type frequency is in *R. mucronata* type at station 1, this is because the condition of the substrate is suitable for its growth, so that this type of mangrove spreads evenly at each observation station. In addition, *R. mucronata* is a type that has seeds that can germinate while still in its parent very supportive of the widespread process of other types. This is in accordance with the statement of Bengen (2003), that on mud and mushy soil overgrown by mangrove species *R. apiculata*, *R. mucronata*, *Lumnitzera littorea* with an even and wide spread, while in sandy coastal areas and large choppy mangrove vegetation growth is not optimal.

Bengen (2003) also argues that the special life cycle of mangrove species (*Rhizophora* sp) with seeds that can germinate while still in the parent plant strongly supports the extensive distribution process of this type in mangrove ecosystems. Based on the table above (Table.3) it can be concluded that the highest relative frequency is in *Rhizophora mucronata* Lam at station 1, this is because this type of mangrove acquires more nutrients compared to other types of mangroves. The high relative frequency value is caused by the unbalanced competition between mangrove species occupying the same habitat, thus being less competitive in obtaining nutrients.

Based on the table above (Table.3) it can be concluded that the highest type closure at stations 1,2 and 3 is *R. mucronata* Lam which is 0.11. Then for the highest relative closure at all stations is Rhyzopora type mucronata Lam. An important factor that affects the closing value of the type is the circle of tree trunks and basal areas in a data retrieval location (Bengen, 2003). Based on the table above (Table. 3) it can be concluded that the index of important values (INP) at station 1 is 219 %, while at station 2 is 219 % and at station 3 is 215 %. The important value index (INP) ranges from

0-300 indicating the representation of mangrove types that play a role in the ecosystem so that if the value index is important 300 means that a type of mangrove has an important role and influence for the mangrove community. When viewed from each station shows that the role of Rhizophora mucronata Lam in maintaining ecosystem survival is still quite high because R. mucronata has an important value index (INP) of other types of 1.02. This is in accordance with Bengen (2003) which states that the Important Value Index is used to look at mangrove growth in a community and from the analysis of vegetation conditions in mangrove communities.

The statement was also reinforced by Prasetyo (2007) explaining that mangrove areas that have high importance indicate that mangroves in the area are in good condition and have not changed, otherwise if this condition is reduced or turned into land due to sedimentation and damage due to human behavior, rehabilitation needs to be done in order to maintain ecosystem balance.

Table 4. Range of water quality values during research

Parameter	Kisaran Kualitas Air	Kisaran Optimal (Bengen, 2003)
Oksigen Terlarut (ppm)	6.72–7.91	≥ 3
pH	8.00–8.15	8–9.2
Suhu (˚C)	31.5–31.8	25–33
Salinitas (ppt)	33–34	≤ 35
TOM	10–12.64	≥ 10

Water quality is checked while periodic dissolved oxygen ranges from 6.72–7.91 ppm, the high dissolved oxygen can be affected by temperature. The higher the DO content in a water, the more qualified the waters are and vice versa. According to Rahayu et al. (2017) crustacean research in other Indonesian waters the optimal temperature range for Crustaceans is 28–30 °C, optimum salinity ranges from 23–32 ppt and optimum pH is 7.4–8.5. Based on these statements, temperature, salinity, pH, oxygen at each research station can still be tolerated by Crustaceans for their survival. Soil Analysis Data Research 1 and Research 2.

Table 5. Calculation of Soil Analysis Research 1 and Research 2

Code	Redox (mV)	C. Organic (%)	Organic Matter (%)	Soil Texture
ST1.T1	62.5	6.44	11.2	Mud
ST1.T2	54.8	5.66	10.1	Mud
ST1.T3	45.4	2.03	3.51	Mud
ST2.T1	57.1	5.39	9.32	Sandy Mud
ST2.T2	52.2	4.03	6.97	Sandy Mud
ST2.T3	40.6	2.14	3.71	Sandy Mud
ST3.T1	53.8	6.76	2.69	Sandy
ST3.T2	52.5	7.35	2.72	Sandy
ST3.T3	44.5	1.82	3.10	Sandy

In the table above (Table.5) it is explained that the potential for redox that has a high value is at Station 1 Transek 1 (ST1. T1) which is 62.5 mV, the texture of mud soil, while the potential redox that has a low value is at Station 2 Transek 3 (ST2. T3) 40.6 mV, Sandy Mud soil texture. Based on the table above (Table.5) the potential value of redox indicates a moderate reduction reaction i.e. Fe^{3+} reduced organic compounds are reduced. This is reinforced by Kim et al. (2019) which states that the reaction of redox occurs on almost all lands. Usually, oxidation reactions are related to gooddrainase soil conditions, while the reduction process is related to poordrainase soil conditions or when there is excess water. Soil redox conditions affect the stability of iron and manganese compounds. Eh value is the most important character in the evaluation of the status of elements in the soil. Based on the relationship between soil properties and plant growth, redox status is classed into four categories: oxidation, weak reduction, moderate reduction, and strong reduction. Can be seen in the following table:

Table 6. Land redox status gradation

Redox	Range Eh (mV)	Reaction
Oxidation	> 400	O_2 more, material in oxidation
Low Reduction	400-200	O_2 ,NO_3- dan Mn^{4+} reducted
Mid Reduction	00 – (-100)	Fe^{3+} reducted in organic matter
Reduction	< (-100)	CO_2 dan H^+ reducted

Based on the table above (Table.6) it is obtained that the high organic material is at Station 1 Transek 1 (ST1. Q1) which is 11.14%, sand soil texture while the lowest is at Station 3 Transek 1 (ST3. T1) which is 2.69 sand soil texture. The content of organic matter in the research area is included in the low classification, which is in the range of 11-2%. Organic matter is a very influential limiting factor in plants. Organic matter is a supply of growing substances for plants. This is reinforced by the statement of Tyson (2010), the criteria of organic material sediment is very high: >35, high : 17 – 35, medium : 7 - 17, low : 3.5 – 7, very low < 3,5.

The statement was also reinforced by Hakim et al. (2016) suggesting the role of soil organic ingredients is very important for plants, organic ingredients contain a number of growing substances and vitamins. At any given time organic matter can stimulate the growth of plants and micro-bodies. Soil organic matter is also important influence on soil characteristics both physically, chemically, and biologically.

According to Garcia et al. (2015) mud sediment has a higher content of organic matter than sand sediment. High organic material in mud sediments comes from nutrients derived from rivers and the result of decay of bird droppings, and other animals, both at the top and in the water. Based on the table above (Table.5) it is obtained that the high organic C is at Station 3 Transek 2 (ST3. T2) 7.35 %, sand soil texture and the lowest is Station 3 Transek 3 (ST3. T3) 1.82 %, sand soil texture. Presentase C organic mangrove sediment on bama beach is flutuative up and down. Organic levels in the soil including sediment are highly sensitive to a number of factors, including climate, tofography, soil and plant management, as well as other anthropogenic conditions. The high factor of organic C is also caused by the diameter of the tree because it has a high cellulose content. This is reinforced by Widiatmaka et al. (2014) stating that organic levels in the soil including sediment are highly sensitive to a number of factors, including climate, tofography, soil and plant management, as well as other anthropogenic conditions.

The statement was also reinforced by Shibata et al. (2013), a 50 % wood composed by cellulose. Cellulose is the main component of a sturdy wall that envelops plant cells and consists of long chain linear sugar molecules composed by carbon, so the higher the cellulose, the higher the carbon content will be. The larger the diameter of the tree is thought to have the potential of cellulose and other wood-building substances will be greater. The height of carbon in the trunk is closely related to the higher biomass of the trunk part when compared to other parts of the tree. This factor leads to a larger diameter class whose carbon content is greater.

3.5 Redox's Potential Relationship with crustacean abundance

In (Figure.2) there is a squared determination coefficient (R2) used to determine the amount of influence of independent variables on dependent variables expressed in the percentage seen in figure 2

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.998[a]	.995	.990	.18503

a. Predictors: (Constant), Potensial_Redoks

b. Dependent Variable: Kelimpahan_Crustacea

Figure 2. Calculation results of determination coefficient

Based on the image above (Figure.2) it is explained that R2 = 0.995, is then used in percent form so that it becomes 0.995 x 100% = 99.5%. Thus the potential value of redox (as an independent variable) of 99.5% affects the amount of crustacean abundance. Simple linear regression test results show that Y constitutes an abundance of Crustaceans, and X is a Potential Redox

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.132	1	7.132	208.333	.044[b]
	Residual	.034	1	.034		
	Total	7.167	2			

a. Dependent Variable: Kelimpahan_Crustacea

b. Predictors: (Constant), Potensial_Redoks

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	13.817	2.844		4.859	.129
	Potensial_Redoks	.796	.055	.998	14.434	.044

a. Dependent Variable: Kelimpahan_Crustacea

Figure 3. Simple linear regression analysis results

In the output coefficient table (Figure.3) the calculation results above can be made regression equation Y= 13,187 + 0.796X, where Y= Amount of crustacean abundance and X= Potential redox value. The equation shows that the X regression coefficient of 0.796 states that each addition of 1 potential redox value will increase the amount of Crustacean abundance by 0.796. A constant of 13,187 states that if the variable potential value of redox does not exist then the amount of crustacean abundance is 13,187. The sig value of the redox potential is 0.044, because the sig value of the potential redox value = 0.044 < 0.05 then H0 is rejected and H1 is accepted. It can be concluded that the regression coefficient X(B) has a significant effect on variable Y.

Based on the above data, it can be concluded that the potential redox has a relationship to crustacean abundance. Crustacean abundance is influenced by habitat suitability, availability and abundance of feed, environmental conditions and the number of predators. This is reinforced by the statement of Anneboina and kumar (2017). Crustasea community in mangrove area is very diverse and stable. Crustaceans also have limiting environmental factors in supporting their lives, such as temperature, salinity, pH, substrate type and organic matter contained in substrates. Changes in the quality of aquatic ecosystems and substrates will affect the abundance and diversity of Crustaceans and other biota.

4. Conclusion.

The highest abundance (N) is at station 2 which is 478, while at the lowest station is station 1 which is 385. Crustacean abundance is influenced by habitat suitability, availability and abundance of feed, environmental conditions and the number of predators. Potential redox that has a high value is at Station 1 Transek 1 (ST1. T1) which is 62.5 mV, the texture of mud soil, while the potential redox that has a low value is at Station 2 Transek 3 (ST2. T3) 40.6 mV, Sandy Mud soil texture. The potential value of redox indicates a moderate reduction reaction i.e. Fe^{3+} reduced organic compounds are reduced. . Based on the data that has been analyzed obtained that potential redox has a relationship to the abundance of Crustaceans. Potential redox affects crustacean abundance by 99.5 %.

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