Production and Decomposition Rate of Litter *Rhizophora mucronata*

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During a month, a bag was taken from each station after 7th, 14th, 21st and 28th day. This observational method based on the previous study reveals that the decomposed process occurs from 7 to 15 days (Sa'ban, 2013). However, total decomposition each lea is different from
one another. Within 60 days, it shows that no litterfall has been completely decomposed 100%, it even can take a year to be decomposed perfectly. The remaining litterfall in the bag is cleaned and dried on the oven at 80ºC for 48 hours or until their weight is stable (Mahmudi et al., 2011).

3. Data Analysis

3.1 Litterfall Production Rate

The mangrove litterfall that falls into litter bag is loaded in the plastic bag, separated based on leaf, twig, flower-fruit, and measured their weight. The result is calculated by gram/m2/week units. After
drying at 80°C for 48 hours in the oven to reach the constant weight, it will be taken as litterfall production (Fitriyani, 2016).

3.2 Littering Decomposition Rate Analysis

Identifying decomposition rate in this study is to analyze the reduction of litterfall weight in the litter bag. Its loss is calculated by comparing the original weight to residual decomposition. Decomposition rate is then measured by formula that used by Hardianto (2012); Andrianto et al (2015):

□ − □□
□ = □

R = Decomposition rate
(g/day)
T = Observation time
(day)
Wo = Dried weight of initial

productivity in each observation station is presented in the □ollowing □igure 3.

The production o□ litter□all in all observational stations indicates that lea□ is the most contributed component o□ Rhizophora mucronata compared to other. Littering production presented in the □ollowing Table 2.
The average littering production in each observational station □or each littering component, can be seen as □ollowing the □igure 4.

4.2 Littering Decomposition Rate

The result o□ observational littering decomposition rate □or 28 days in each station reveals that none o□ litter□alls have

station reveals that none o□ litter□alls have been completely decomposed in all stations. The dried weight o□ mangrove litter□all that decomposed □or 28 days shown in the □ollowing Figure 3. Decomposition o□ litter□all Rhizopora mucronata, during the study □or 28 days can be seen in the □ollowing Table 3 and Figure 4
In□luential □actors toward productivity and decomposition rate o□ Rhizopora mucronata litter□all
Based on the result o□ observational
ield shows that In□luential □actors toward productivity and decomposition rate o□ Rhizopora mucronata litter□all consist o□ salinity, pH, temperature, wind velocity, and Rhizopora mucronata density.
The measurement results can be seen
in the □ollowing table. The density o□ mangrove, Rhizopora mucronata, in Tongke-tongke village shows di□ferent results. Observational station III is the

Tongke-tongke village shows di□ferent results. Observational station III is the highest density which the density value is
97 trees per 100 m2, while station III is the lowest density with 60 trees per 100 m2. Additionally, the station II and I show 82 trees per 100 m2 and 79 trees per 100 m2 respectively.

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Litterall productivity or 28 days in each observational station shows dierent

results. Station III is the highest production at 92,8 g/m2/28 days or 23,2 g/m2/week, ollowed by station I at 89,1 g/m2/28 days or 22,3 g/m2/week, while station II and IV are at 78 g/m2/28 days or
19,5 g/m2/week and 64,1 g/m/28 days or
16 g/m2/week respectively.
The dierence o production o mangrove Rhizopora mucronata litterall due to various actors, based on observational results reveal that there are diverse densities in which station III is the highest density while station IV is the lowest density. According to Aida et al. (2014) stated that the density o mangrove vegetation eected the litterall production, the denser the trees, the higher littering production. Another study Andrianto (2015) noticed the station that had the densest vegetation produced highest. However, dierent results are shown in station I and II where the density
is 79 trees per 100 m2 and production is
89,1 g/m2/28 days or 22,3 g/m2/week even though it has less density but is able to produce more compared to station II, 82 trees per 100 m2 and production 78 g/m2/28 days, which is denser but produces less. These occurs because there are other actors. In addition to density eect, other actors such as diverse temperature, salinity, pH, and wind velocity contribute to dierent results.
In this study shows that dierent temperature leads to diverse results in which station I is higher (31oC) than station II (30oC) but can produce more litterall. This inding is encouraged by Riyanto (2013) stated that temperature eects the amount o litterall production because in the lower temperature in order to reduce transpiration rate, the vegetation naturally aborts its leaves to survive. According to Panjaitan et al (2014) the appropriate temperature or the lie and
litterall productivity in the tropical region

is approximately 26-32 °C. Based on the observation shows that the temperature in the ield study is 26-32 °C which is livable or growing mangrove.
Salinity monitoring in observational
ield shows ranging rom 26 ‰ to 28 ‰ which station III and IV have less salinity than station I and II. Less salinity in station III and IV is caused by water intrusion rom Baringeng River. In station III, Having 27 ‰ salinity, produces more litterall than station I and II. Although station I and II have similar salinity 28 ‰, they produce dierent amount o litterall. This is because station I has higher temperature than station II has. Bengen

(2004), stated that one of mangrove ecosystem identities consisted of normal salinity (2-22 ‰) and salty salinity (38 ‰), so all stations have high salinity. Regarding to salinity, leaves play an important role in mangrove adaptation against high level of salinity by storing the salt in their particular cells (Fitriyani,
2016). Another finding by Zamroni and
Rohyani (2008) shown that leaves had high contribution to the litterfall decomposition due to adaptation pattern to reduce the water loss in highly salty environment.
Wind velocity monitoring in each
station reveal that wind velocity rate is low where station I and III have higher wind velocity than station II and IV have. This is because the station I and III directly face the open ocean, but its category level is still low between 0, 9 m/s and 0, 7 m/s. While station II and IV located in onshore which receive less wind. Therefore, the production of litterfall in station II and IV is fewer than station I and III, supported by Zamroni and Rohyani finding (2008) stated that there was a positive correlation between production of litterfall and wind velocity,

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the aster wind velocity, the more production.
Observational result shows that the
largest production o mangrove litterall is leaves coming rom Rhizopora mucronata. According to Yulma (2012) said that it caused by all season o mangrove in dry season with high temperature. Moreover, leaves contribute more on production o litterall than any other organs because compared to twig and branch, biologically they are ormed quickly and aborted easily by wind. Additionally, Gunarto (2004) stated that mangrove ecosystem was a main ood chain that played signiicant role in ood web as producer in marine ecosystem. This ecosystem provided adequate ood and shelter or various marine species such as ish, crab, shell, and shrimp. Meanwhile, Kawaroe & Mujizat (2001) said that mangrove contributed signiicantly to the juvenile ishes. As a result, i mangrove underwent degradation either quality or quantity, it would drive negative impact or marine creatures especially ish as a main source o ood.

5.2 Decomposition rate o Rhizopora mucronata litterall

Mangrove leaves that all in the ground need long time to be decomposed depending on several actors. Based on the observational result reveals that the decomposed process in station IV is the slowest among other stations. It can be seen rom the mass o dried leaves beore was 10 g, but ater decomposing, the mass all into 2, 4 g. The composition rate in station I 76%, station II 44%, station III
56% and station IV 39% show that during study, 28 days, none o litterall has been completely decomposed.
The highest decomposition rate in all
stations occurs in the second week, 15

days, which encouraged by Sa'ban (2013) stated that mostly mangrove litteralls had decomposed rom 7 to 15 days. This was due to organic material and soluble organic material loss or the presence o microorganism. In addition to Yulma (2012) said that the highest ungal cellulitis enzyme more likely happened in the beginning o decomposition, but ater
14 days decomposition rate declined. Similarly, Ulqodry (2018) ound that the average o decomposition rate in the irst
14 days ranging rom 0.563-0.601 g/day
while Lestarina (2011), obtaining an average decomposition rate in the irst 14 days was 0.415-0.420 g/ day. According to Yulma (2012) it ws caused by decreasing organic

materials and nitrogen contents in the rest o the leaves.
The dierent amount o decompositions in each station is dependent on several actors.
The results o measurements in the study sites reveals that the average o water temperature is
28-29 ºC. It shows that the decomposition
rate in every station is quite high while all stations reached 1.3 g/week or 13% per week.
Section I that has water temperature at 29oC is the highest
decomposition rate reaching 76% in 28 days, ollowed by section III in the second place at 56% in 28 days.
Manan (1978) stated that the humid
and high temperatures region throughout the year led to the decomposition o mangrove litterall rapidly, so that the process o orming topsoil was ollowed by the mineralization process. The optimum temperature or bacteria was at
27 - 36 ºC which was the best condition or decomposing mangrove litterall as i mangrove leaves were their basic metabolism.
pH monitoring in the ield shows that all station have 7 pH except station IV 6 pH because it is located in Baringeng

River. This inding supported by Annas (2014) said that water pH played signiicant role to maintain the decomposed process o Rhizopora mucronata litterall.
Litterall decomposition rate was well known as the litterall loss rate due to the removal o litter components by physical conditions such as tidal currents (Personal,
1998). In the waters, the decomposition process assisted by the physical mechanism such as the movement o tidal currents and inundation by sea in which the tidal stream in the study area occurs in the morning then at night new receding. The decomposition o litterall can also be caused by the erosion o the wave movement. Wet and humid environment led to decomposition process aster (Manan, 1978). In ield, the largest exposed to the tidal currents is station I and III. Thus, it also aects the high decomposition rate. Furthermore, station II still inluenced by tidal water puddles, and also receded. However, although station IV is not inluenced by the tidal, it is always submerged by river water. This is because station IV is located in Baringeng River.

6. Conclusion

6.1 The observational result in Tongke- tongke, mangrove ecosystem, East Sinjai obtained the average productivity o Rhizopora mucronata litterall is 2.89
g/m2/day or 10.55 tons/ha/year with the
largest contributor rom the lea litter then ollowed by the organ o twigs and also the lowers while the ruits are not ound. The highest production o mangrove litterall in station III, with an average at
3.18 g/m2/day, and the lowest production
ound in station IV point, with an average o 2.29 g/m2/day.