



MACROFAUNA RECOVERY IN PEAT ONE YEAR AFTER FIRE

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ABSTRACT

Macrofauna data on post-fire peat soils have been documented in many literatures, but assessments of soil macrofauna recovery in peatlands after one and a half years after fires are scarce. The aim of this study was to evaluate the recovery of soil macrofauna in peatlands after one and a half years after fires. This research was conducted on peat land in PT.SSS Kuala Panduk Teluk Meranti District, Pelalawan Regency. This research was conducted by survey method. Determination of the location using the purposive sampling method, especially on peatlands after one and a half years after the fire and unburned peatlands. Based on peatland cover, 6 samples were taken, and 6 samples were taken from unburned peatland. Determination of the sampling point using a systematic method. Macrofauna observations included number of families, number of individuals, population density, and diversity index. The study of macrofauna recovery was carried out by t-test on macrofauna data on peatland fires and unburned peatlands. The results shown in peatlands after a year and a half of fires are macrofauna recovery.

Keywords: Recovery, Macrofauna, Peat Fire

INTRODUCTION

In peat soils, the role of soil biota, including macrofauna, is more important than in mineral soils. The active role of soil macrofauna in decomposing organic matter can maintain and restore soil productivity with the support of surrounding environmental factors (Wulandari et al 2005). The presence and activity of soil macrofauna play a role in providing nutrients through the decomposition of organic matter.

In the last decade, peatlands have experienced frequent fires. This has an impact on the damage to soil biota. Over

time there was a gradual recovery of vegetation and microclimate. The results of research by Sugiarto et al, (2017) showed that peatlands 1 week after burning were still in a damaged condition and at 4 months there had been improvement. The results of the research by Kurniawan, Nelvia & Wawan, (2020) showed that on peatlands one and a half years after the fire, the number of families, population density and macrofauna diversity index were not statistically different from unburned land. However, these macrofauna parameters on peatlands one year after burning are still lower than on unburned

Rachman *et al*, land (Gesriantuti, Trantiati, & Badrun, 2016). This means that there has not been a complete recovery of macrofauna. However, the condition of the vegetation after one year of fire experienced a significant improvement. This improvement in vegetation conditions will support the development of soil macrofauna. Thus it is necessary to retest in a year and a half after burning will occur restoration of soil macrofauna is complete or not. To test the hypothesis, this research was conducted. The purpose of this study was to evaluate the macrofauna recovery of peat soil one and a half years after burning.

MATERIALS AND METHODS

This study on the restoration of macrofauna on peatlands one and a half years after burning was carried out in the work area of PT. SSS Kuala Panduk Gardens, Kuala Panduk Village, Teluk Meranti District, Pelalawan Regency, Riau Province. Initial vegetation is peat land that has been human intervention. In this case, the thickness of peat and macrofauna is relatively different. Soil analysis was carried out at the Soil Laboratory of the Faculty of Agriculture, Riau University, Bina Widya Campus Km 12.5 Simpang Baru Panam, Pekanbaru. The research was conducted by survey method. Determination of the location using the purposive sampling method, namely on peatlands one and a half years after burning and peatlands that are not burned. Based on the area of burnt land, 6 samples were taken and on unburned peatland were also taken 6 samples with a depth of 3-4 m each. Determination of the sampling point using a systematic method. Macrofauna parameters observed included number of families, number of individuals, population density and diversity. Assessment of macrofauna recovery was carried out by testing the macrofauna observation

parameter data on burned and unburned land.

RESULTS AND DISCUSSION

a. Soil Properties

Soil properties affect living things in the soil. Soil properties that affect living things in the soil are the physical and chemical properties of the soil. Some of the physical properties of the soil on burnt and unburned peatlands in the study area are presented in Table 1.

Table 1. Some of the Physical Properties of Soil on Burned and Unburned Land, as well as t Test Results

Parameters	Average		Different/ No different
	Burned	Not Burned	
Fill weight (BD) (g. cm ⁻³)	0,20	0,23	No different
Porosity (%)	86,75	85,32	No different
Available water content (%)	5,34	4,54	Different
Soil penetration (gF.cm ⁻²)	807.42	775.92	No different
Subsidence (cm)	4,48	-	-

Table 1. shows that the physical properties of soil density, porosity, and soil penetration between burned and unburned peatlands are not different. With the exception of the soil moisture content in burnt peat soil is higher than unburned peat because in unburned peat the organic matter is still intact.

When compared with research conducted by Qirom *et al.*,(2019), the same conclusion is obtained, namely there is no difference in soil physical properties, bulk

Rachman *et al*, density, porosity, and soil penetration, between burned and unburned peatlands.

b. Soil macrofauna

1) Number of Families and Number of Individuals of Soil Macrofauna

The results of the identification of the number of soil macrofauna families on burned and unburned land, as well as the results of the t test are presented in Table 2.

Table 2 shows that on burnt peat, the number of families ranged from 7 to 12 with an average of 9 + 1.8 while unburned peatland had a number of families ranging from 7 to 11 with an average of 9 + 1.4. The results of the t-test showed that on peat land 1.5 years after burning with unburned land, the number of families did not differ (Table 2). The number of soil macrofauna families is the same, this is because the microclimate conditions in burned and unburned land are not different. The microclimate conditions that were not different were caused by vegetation and the thickness of the litter on the two lands did not differ. Macro fauna that enters the soil or hides in the soil from increased temperature conditions due to fires will multiply (Sugiarto *et al*, 2017). Organic materials derived from various mixtures of plant materials, the decomposition process is relatively faster than coming from similar plants, the length of the decomposition process will maintain soil fauna to remain (Sutemi, 2005).

Table 2 Number of Macrofauna Families in Burned Land and Unburned Land. and t test result

Burnt Land		Unburned Land	
Observation Point	Number of Family (Total)	Observation Point	Number of Family (Total)
TB 01	9	NTB 01	9
TB 02	7	NTB 02	9
TB 03	12	NTB 03	10
TB 04	8	NTB 04	11
TB 05	10	NTB 05	7
TB 06	8	NTB 06	8
Average	9	Average	9
Std. Deviation	1.8	Std. Deviation	1.4
T Count		0	
T Table		2.22814	
Significance		Not Significant	

The results of observations and calculations of the number of individual macrofauna on burned and unburned peatlands are presented in Table 3.

Table 3 shows that the number of individuals on burnt land ranged from 51 to 107 with an average of 78.17 + 23.19, while on unburned land the number of individuals ranged from 45 to 110 with an average of 63.5 + 24.07. The results of the t-test showed that on peatland 1.5 years after burning with unburned land, the number of individuals did not differ (Table 3). The number of individual soil macrofauna did not differ due to the microclimate conditions which also did not differ in the two fields.

Table 3 Number of Macrofauna Individuals at Observation Points of Burned and Unburned Land, as well as t Test Results

Burnt Land		Unburned Land	
Observation Point	Number of Individuals (ind/m ²)	Observation Point	Number of Individuals (ind/m ²)
TB 01	51	NTB 01	54
TB 02	105	NTB 02	45
TB 03	107	NTB 03	49
TB 04	68	NTB 04	110
TB 05	77	NTB 05	55
TB 06	61	NTB 06	68
Average	78.17	Average	63.5
Std. Dev	23.19	Std. Dev	24.07
T Count		1.075	
T Table		2.22814	
Significance		Not Significant	

2) Soil Macrofauna Population Density

The results of the calculation of the population density of soil macrofauna on burned and unburned land are presented in Table 4.

Table 4 shows that the total macrofauna population density on burned land ranges from 1712 – 816 indv/m² with an average of 1251 + 371.03, while on unburned land the total macrofauna population density ranges from 1760 – 720 indv/m² with an average of 1016 + 385.16 . The results of the t-test showed that on peatland 1.5 years after burning with unburned land, the total population density did not differ (Table 4).

Table 4. Total Macrofauna Population Density at Each Observation Point of Burned and Unburned Land, and T-Test Results

Burnt Land		Unburned Land	
Observation Point	Population Density (ind/m ²)	Observation Point	Population Density (ind/m ²)
TB 01	816	NTB 01	864
TB 02	1680	NTB 02	720
TB 03	1712	NTB 03	784
TB 04	1088	NTB 04	1760
TB 05	1232	NTB 05	880
TB 06	976	NTB 06	1088
Average	1251	Average	1016
Std. Dev	371.03	Std. Dev	385.16
T Count		1.075	
T table		2.22814	
Significance		Not Significant	

3) Macrofauna Diversity Index

The results of the calculation of the soil macrofauna diversity index on burned and unburned peatlands are presented in Table 5.

Table 5. Macrofauna diversity index values on burnt and unburned peatlands, as well as t test results

Burnt Land		Unburned Land	
Observation Point	H'	Observation Point	H'
TB 01	1.74	NTB 01	1.24
TB 02	1.12	NTB 02	2.04
TB 03	1.5	NTB 03	1.64
TB 04	1.22	NTB 04	1.52
TB 05	1.78	NTB 05	1.14
TB 06	1.27	NTB 06	1.11
Average	1.44	Average	1.45
Std. Deviation	0.27	Std. Deviation	0.36
T Count		0.54	
T Table		2.22814	
Significance		Not Significant	

On burnt peatland the diversity index value (H') of macrofauna ranged from 1.12 to 1.78 with an average value of 1.44 + 0.27, while on unburned land the diversity

Rachman *et al*, index value ranged from 1.11 to 2.04 with an average value of 1.45 ± 0.36 . The results of the t-test showed that the index value of soil macrofauna diversity on burned peatlands was not different compared to unburned peatlands (Table 5).

Peatlands are prone to degradation and on burnt peatlands there is damage to soil biota. On land that has been burned there is a gradual improvement in vegetation. This affects the soil cover and has an impact on improving the microclimate. The improvement of vegetation and microclimate has an effect on increasing the activity of soil biota. The results of research by Sugiarto, *et al.* (2017) showed that on peatlands four months after burning there was an increase in soil biota activity. Furthermore, on peatlands one year after burning according to Wawan *et al*, (2019) there was also an increase in soil macrofauna compared to four months after burning.

There was no significant change in the physical, chemical and biological properties of the soil on burnt peat and unburned peat after 1.5 years after burning. This result is similar to Wawan's (2016) study which stated that the peat land burned in the area of PT. JJP Pangkalan Panduk Gardens, Kuala Panduk Village, Teluk Meranti District, Pelalawan Regency, has the same physical, chemical and biological properties of soil as unburned peatlands within 1.5 years after burning.

Overall, the results showed that in one and a half years of burning peatland, the number of individuals, number of families, population density and soil macrofauna diversity index did not differ from that of unburned land.

4) Macrofauna Recovery Assessment

Referring to PP No. 4 of 2001 with the criteria for fauna damage if there is a change. The results of all macrofauna

parameters in this study were not different from unburned peatlands or no change occurred. Thus, it can be concluded that there was no damage to the macrofauna of the peat soil, or in other words, one and a half years after the burning of the peat soil macrofauna, there has been a complete recovery, this is in accordance with the opinion of Qirom, Yuwati, & Syaifuddin, (2021) that the peat burned have the ability to heal naturally.

CONCLUSION

There was no difference in the number of families, number of individuals, population density, and soil macrofauna diversity between peatlands one and a half years after burning and peatlands that were not burned. Thus, there has been complete restoration of soil macrofauna on peatlands one and a half years after burning.

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