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Community structure of algae epiphytic in different leaf litter of mangroves

Riche Hariyati, Sri Widodo Agung Suedy, and Rully Rahadian

*Department of Biology, Faculty of Science and Mathematics, Diponegoro University
Jl. Prof. H. Soedarto, SH., Tembalang Semarang 50275 Indonesia*

ABSTRACT

Mangrove is a plant that has the morphological and physiological adaptations to habitats which influenced by a tide. This plant can grow and develop in an environment of high salinity and its soil conditions are less stable and aerobic. Litter mangrove is the main source for the availability of detritus and is the largest component constituent of a food web in a mangrove ecosystem environment. Algae epiphytic microalgae is a group that lives attached to the plant, including the mangrove litter. The study aims to assess the abundance and diversity of epiphytic algae on different types of mangrove leaf litter. The observed mangroves leaf litter were *Avicennia alba*, *Sonneratia sp.* and *Rhizophora sp.* Epiphytic algae were brushed on mangrove leaf litter covering an area of 6.25 cm² and diluted with distilled water. Samples were observed under a microscope with a magnification of 400 x. Water quality parameters were measured in situ and the organic ingredients, total N and P were analyzed. The results showed that epiphytic algae on each type of mangrove leaf litter were not different. *Rhizophora sp.* is the most abundant and the richest species compared with other types of litter that are equal to 622 individuals / cm² and 26 species of epiphytic algae. While the abundance of *Avicennia alba* and *Sonneratia sp.* were 459 ind/cm² and 321 ind /cm², in the coastal mangrove areas of Morodemak was found 28 species of epiphytic algae. The common epiphytic algae species found in all types of mangrove litter were *Cymbella sp.*, *Coscinodiscus sp.*, and *Synedra ulna*. In general, the group of Bacillariophyta (diatoms) is the dominant species in some mangrove leaf.

Keywords: Community, Algae epiphytic, Mangrove

I. INTRODUCTION

Mangrove forests have a fairly extensive role, among others, as a collector of sediment and soil formation, as the natural habitat of a wide variety of fauna as well as the breeding and foraging or nesting of some aquatic organisms. Besides, physically as a stabilizer and a bastion of coastal areas of the pounding waves, wind and even retaining abrasion or flooding. One role of mangrove forests is a matter of principle supply chain processes related to regional food estuaries and coastal waters. Mangrove leaf litter is the main source for the availability of detritus which is the largest component of food web constituent in the mangrove environment. Leaves are generally the largest component of litter. Mangrove litter will be utilized by the microorganisms and then decomposed into organic materials simpler. This component eventually becomes a food source for a wide variety of aquatic organism, for example, mollusks, shrimp, fish, crabs, and other marine organisms.

Epiphytic algae are algae attached to the substrate both on the plant roots, stems or leaves. Algae can be categorized as epiphytic algae which serve as food for larval animals. One characteristic of epiphytic algae is the base

*Corresponding author

E-mail addresses: riche.hariyati@gmail.com

of the food chain in the waters and the presence of plankton in these waters describe whether in good condition or not fertile characteristics of a body of water.

In accordance with the statement of the Round (1971), epiphytic algae is a part of microalgae group (auwuch) whose live attached to various substrates, such as leaves, stones, rocks, gravel, and other hard objects. Epiphytic algae in the water body serve as producer. The presence in water can also serve as biological indicators of water quality. Various types of epiphytic algae may show different capacities to adaptation to the environmental conditions where growing. The eight divisions of algae, which are commonly found as epiphytic algae are Chlorophyta, Chrysophyta, Cyanophyta, and Euglenophyta.

Given the role and function of the mangrove ecosystem in coastal areas are very important for humans and the surrounding environment, both physically, economically and ecologically. The existence of mangrove waters should be preserved so that fertility is maintained and mangrove ecosystem function is working properly. This study aimed to determine the community structure of epiphytic algae on different types of mangrove leaf litter and determine the condition of the physical quality of the chemical environment of mangrove habitat in coastal waters Morodemak-Demak, Central Java.

II. MATERIAL AND METHODS

The experiment was conducted in coastal Morodemak in mangrove areas by taking a sample of some leaf litter mangrove of *Rhizophora sp.*, *Avicennia alba*, and *Sonneratia sp.*

Sampling

Dropping mangrove leaf litter are collected by using nylon nets with a size of 1x1 meters were placed under 0.75 meters tall mangrove plants from plant roots. A total of 25 pieces of mangrove leaf litter is taken and placed in rectangular nylon size of 60 cm x 30 cm with 2 mm mesh. Then immersed in water up to 10 cm from the surface of the water. In order not to drift / fourth wave bouffant side nylon attached to a wooden beam. Litter leaves on the nylon rectangular taken 15 pieces after immersion for six weeks and observed algae epiphytic.

Observations epiphytic algae.

Epiphytic algae observation followed the method Hutchinson (1975) and Mills et al. (2002) by brushing the surface of mangrove leaf litter gently using a soft brush covering an area of 6.25 cm², and accommodated in the bottom petri dish and then sprayed with distilled water to a volume of 25 ml. Water from the pitcher was then entered in a sample bottle and was given 3 -4 drops of 4% formalin solution as a preservative. As many as 1 ml water sample was poured into the Sedgwick-Rafter Counting Cells (SRCC) and epiphytic algae for observation using a microscope magnification of 400 x. After identification, epiphytic algae data from each sample was calculated to get Shannon-Wiener diversity index, index of abundance, relative abundance index and the index dominance.

The data were analyzed using descriptive quantitative display data in tables and graphics. Quantitative descriptive aims at developing and using mathematical models, theories and/or hypotheses pertaining to natural phenomena. The measuring process is a central part in the quantitative research because it provides the fundamental connection between empirical observation and mathematical expression of quantitative relationships. Water quality parameter measurements performed in situ, which includes temperature, dissolved oxygen, pH, turbidity, and salinity.

III. RESULTS AND DISCUSSION

Epiphytic algae communities

The results found the number of species, abundance, Epiphytic algae diversity and equalization on each of the different mangrove leaf litter at *Rhizophora* found epiphytic algae of Chlorophyta species, were found four species on the *Mougeotia sp.*, *Palmella hyaline*, *Monoraphydium*, and *Geminella interrupta*. While the division has discovered 17 species, Chrysophyta consists of *Coscinodiscus sp.*, *Amphora sp.*, *Cymbella sp.*, *Fragillaria sp.*, *Navicula sp.*, *Nitzschia longissima*, *Synedra ulna*, *Surirella cuniata*, and *Stepanodiscus sp.* Chyanophyta Division has 5 species which are found among others *Tribonema taeniatum*, *Rhodomonas minuta*, *Coleosphaerium sp.*, *Gomphosphaeria sp.*, and *Coccochloris sp.* Leaf litter of *Avicennia alba* was Chrysophyta which discovered 16 species and one species of Cyanophyta, that is *Tribonema sp.* *Sonneratia* found in leaf litter were four groups of Chlorophyceae and 13

Chrysophyta. Types of epiphytic algae are always found in the third mangrove leaf litter is *Melosira sp*, *Coscinodiscus sp*, *Cymbella sp*, dan *Surirella sp*. Epiphytic algae groups *Cymbella sp*., *Surirella sp*., And *Melosira sp* is a group of algae that has raphe which can secrete mucilage layer so as to stick to the substrate.

In general, the total amount of the highest individual epiphytic algae found in leaf litter *Rhizophora sp* is equal to 622 ind / cm² after immersion for one month. At the beginning immersion, leaching process has occurred in the leaf litter so that the wax layer on the leaf surface so it will be more degraded epiphytic algae attached to the substrate mangrove leaf litter. According to Noor *et al.* (1999), leaf litter leaves *Rhizophora* has a surface skin thicker when compared with leaf litter and *Sonneratia*, *Avicennia*.

Table 1. Community structure of epiphytic algae at different mangrove leaf litters on Morodemak coast

	<i>Avicenia alba</i>	<i>Sonneratia sp</i>	<i>Rhizophora mucorata</i>
Total number of individuals (N) (ind/cm ²)	321	459	622
The number of individuals (n _i)	19	17	26
diversity Index (H')	2.47	2,54	2,68
Dominasi Index (D)	0,89	0.87	0.93

According to Prayitno (2006), the diversity index describes the state of populations of organisms mathematically to make it easier to analyze information on the number of individuals of each species in the community. Good environmental conditions have a high diversity index which illustrates the community that there is no dominance of a species with a high amount, so the presence of a number of species is relatively the same. Diversity index of epiphytic algae in the three mangrove leaf litter is greater than 2. This indicates that the value of the index is in the medium category. Index diversity of epiphytic algae leaf litter *Rhizophora* 2.68, *Avicennia* 2.47, and *Sonneratia* 2.54. In general, the above data shows the stability of the epiphytic algae communities in all mangrove leaf litter.

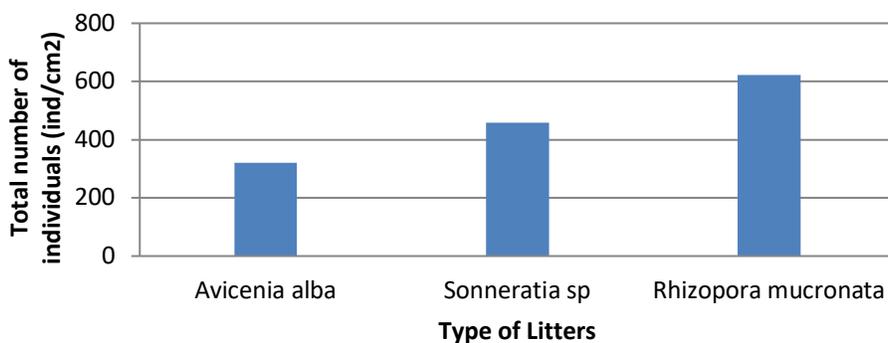


Figure 1. Total Number of Individuals (N) (individual/cm²) algae epiphytic at different mangrove leaf litters on Morodemak coast

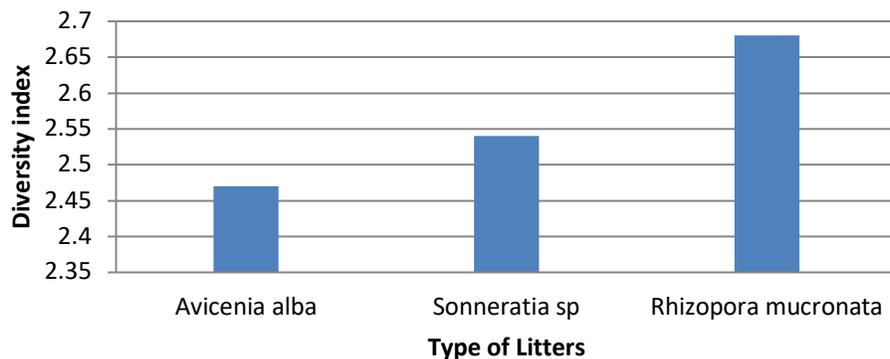


Figure 2. Index diversity of algae epiphytic at different mangrove leaf litters on Morodemak coast

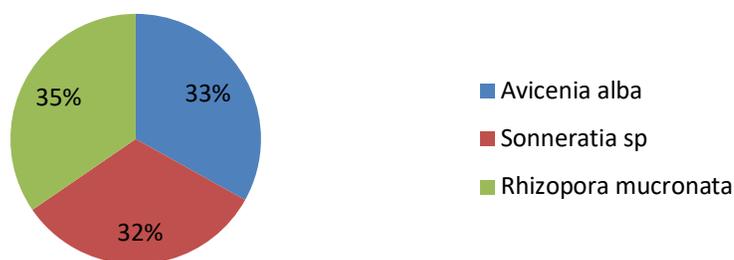


Figure 3. Index dominance of algae epiphytic at different mangrove leaf litters on Morodemak coast

Dominance Index of epiphytic algae on leaf litter Rhizophora 0.93 (35%), Avicennia 0.89 (33%) and Sonneratia, 0.87 (32%). Dominance index epiphytic algae on all types of mangrove leaf litter is close to one. The figure indicates the high uniformity of the type so that the kinds of epiphytic algae are not much different in the three mangrove leaf litter.

Environment quality parameters

Good water carrying nutrients N and P will enrich estuarine areas, where these nutrients are needed by the epiphytic algae growth. The composition and abundance of epiphytic algae will change at different levels in response to changes in environmental conditions, either physical, chemical and biological content (Reynolds, 1984). Mangrove leaf litter that falls to the surface contribute to the increase in the total amount of nitrogen and phosphorus.

The content of total N and total P in the mangrove habitat is 0.19 ppm and 0.37 ppm. Nitrogen, phosphorus and an essential nutrient needed to support the epiphytic algae growth and reproduction (Bold and Wyne, 1985). The temperature of the water at the beach area Morodemak 28⁰ C, pH 6.8, salinity 30‰ and dissolved oxygen 4.6 ppm. The general condition of the inshore waters of the mangrove areas Morodemak support life epiphytic algae and still the performance is still good conditions for the growth and reproduction of epiphytic algae or mangroves. Based on the water quality parameters Morodemak beach is still good in the life support aquatic organism.

Based on the results of research on some mangrove leaf litter, Rhizophora has the highest number of epiphytic algae than Avicennia or Sonneratia, i.e., 26, 19 and 17 species respectively. The type of species that always exist in the three mangrove leaf litter is *Coscinodiscus sp.*, *Cymbella sp.*, *Melosira sp.* and *Surirella cuniata*. The total number of individuals is the most abundant in the Rhizophora leaf litter, i.e., 622 ind/cm², Sonneratia 459 ind/cm² and Avicennia 321 ind/cm². Diversity index shows that the third litter of mangrove leaves have the same relative value of diversity which ranges from 2,7 to 2.9 and dominance index values is close to 1, so it can be said community in stable condition and have equitable distribution. In general, the group of Bacillariophyta (diatoms) is the dominant species in some mangrove leaf. Based on the water quality parameters, Morodemak beach is still good in supporting the life of aquatic organisms, especially for the growth and reproduction of epiphytic algae or mangroves.

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