

## THE COMPOSITION OF EPIPHYTIC DIATOM ON NIPAH TREES (*Nypa fruticans*) AT DUMAI RIVER ESTUARY, DUMAI CITY

by:

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### Abstract

In recent years, Dumai River Estuary has become one of area indicated increasing of pollution caused by human activities. Nipah Trees is abundant found in this location. In directly, epiphytic diatom composition attached with Nipah Trees will be affected by river environment. The aim of this research is to describe the composition of epiphytic diatom on Nipah Trees from several area at Dumai River Estuary. Epiphytic diatom sampel was collected by scrapping 5 x 5 cm on Nipah Trees from 5 station (from river mouth to river body) on July 2011. Water quality parameter was also measured in the same time when diatom collected.

Thirteen species (*Actinocyclus ehrenbergi*, *Bacillaria paradoxa*, *Biddulphia granulata*, *Biddulphia reticulata*, *Coscinodiscus sp*, *Licmophora abbreviate*, *Melosira sp*, *Navicula sp*, *Pleurosigma sp*, *Rhizosolenia alata*, *Skeletonema costatum*, *Thalassiothrix frauenfeldii*, *Triceratum reticulum*) were found at Dumai River Estuary. Moreover, The number of diatom species were 3 species at mouth river estuary and was only 1 species at river body. The abundance of epiphytic diatom on Nipah Trees along Dumai River Estuary ranged from 1634 to 6536 cells/cm<sup>2</sup>. The highest abundance of epiphytic diatom was found at the mouth river estuary and was gradually tended to decrease toward river body.

Beside that values of water quality parameters were varied along the river estuary, with Salinity ranged was from 1 to 24 ppt, pH was 4,8 to 7, Total Solid Suspence was 30 to 143 ppm, Current was 0.02 to 0.72, BOD<sub>5</sub> was 4.2 to 9.0 ppm and COD was 10.8 to 43.2 ppm. Based on number and abundance spesies, water quality parameters that affected the composition of epiphytic diatom was current.

*Keywords: epiphytic diatom, composition, nipah, estuary*

### 1. INTRODUCTION

Based on their attachment to substrate, diatom were classified into 8 type namely; Epiphytic (attached to trees), Episamic (attached to sand), Epipellic (attached to sediment), Endopelic (attached to sediment body), Epilithic (attached to stone surface), Endolithik (attached to stone body Epizoik (attached to invertebrate animal), and Fouling (attached to solid materials in the waterbed) (Kasim in Fitri, 2009).

Generally in Indonesia, Nipah trees (*Nypa fruticans*) one of mangrove species were often abundant along river estuary. In recent years, Dumai River Estuary has become one of area



indicated increasing of pollution caused by human activities such as industry, harbor and palm plantation. Nipah Trees is abundant found in this location. In directly, epiphytic diatom composition attached to Nipah Trees will be affected by river estuary environment. Meanwhile, the investigation on the epiphytic diatom composition which attached to Nipah Trees in the river estuary is few. Therefore, the aim of this research is to describe the composition of epiphytic diatom on Nipah Trees from several areas at Dumai River Estuary.

## 2. MATERIAL AND METHODS

Survey methods was applied in this research which conducted on July 2011 at Dumai River Estuary. Materials and equipment used were presented in Table 1.

Table 1. Materials and equipment used

Parameters (unit)	equipment	Materials	Analisis
<b>Physical</b>			
1. Temperature ( $^{\circ}$ )	<i>Thermometer</i>	water sample	<i>In situ</i>
2. Currents (m/det)	<i>Current drouge, Stop watch</i>	-	<i>In situ</i>
3. Solid suspended total (ppm)	<i>Whatman paper filter GF/7 47 mm, Oven,</i>	water sample	<i>Lab</i>
4. Turbid (NTU)	Turbidimeter	water sample	<i>In situ</i>
<b>Chemical</b>			
1. Derajat Keasaman (pH)	pH meter	water sample	<i>In situ</i>
2. Salinity (ppt)	<i>Hand refractometer</i>	water sample	<i>In situ</i>
3. BOD <sub>5</sub> dan COD (ppm)	<i>Tube bottle</i>	water sample	Lab
<b>Biological</b>			
1. Diatom epiphytic Sample (ind/cm <sup>2</sup> )	Spatula, plastic quadrant, <i>ice box</i> and sample bottle.	Aquades, lugol 4%, hidrogen peroksida, sediment	Lab

### Sample collection, preparations and analysis

Fifteen quantitative diatom samples at Nipah Trees were purposively taken from 5 stations in different area from river body to mouth of estuary (Fig.1). Collecting technique of all the specimens was adopted by the method described by Kobayasi and Mayama (1982) and Mayama and Kobayasi (1984). The epiphytic diatom samples were taken from 5x5 cm<sup>2</sup> plastic square established on surface of submerged Nipah Tree. The material within each square was carefully isolated by removing the surrounding material, and then scraped off using toothbrush. The obtained material was transferred into plastic bottles and brought-up to volume of 50 ml with distilled water, and then preserved in 4 % lugol solution. Diatom samples identification were referred to book of Yamaji (1976) dan APHA (1992).



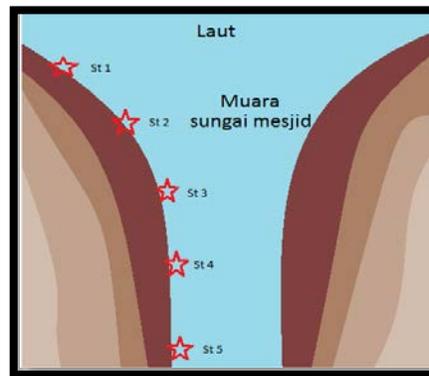


Figure1. Diatom Epiphytic Station

To get information on environmental conditions in each station, water quality parameters such as pH, salinity, temperature, water turbid, were measured in situ, while BOD<sub>5</sub> and COD were further analyzed in laboratory.

To summarize the composition of epilithic diatom, the relative abundance was calculated as percentage contribution by each species, while species abundance was calculated using formulation of modification Lackey Drop Microtransecting Methods (APHA, 1992):

$$N = \frac{3O_i}{O_p} \times \frac{V_r}{3V_o} \times \frac{1}{A} \times \frac{n}{3p}$$

Where :

- N = Diatom number per width unit (cells/cm<sup>2</sup>)
- O<sub>i</sub> = width of cover glass Luas (625 mm<sup>2</sup>)
- O<sub>p</sub> = width of viewing (1,306 mm<sup>2</sup>)
- V<sub>r</sub> = Concentrate volume in samples bottle (50 ml)
- V<sub>o</sub> = Volume of 1 sample drop (0,05 ml)
- A = width of scrapping area (25 cm<sup>2</sup>)
- n = Number of diatom counted
- p = Number of width of viewing (25)

### 3. RESULTS

#### Diatom species composition

A total of 13 diatom species belonging to 12 genera were recorded during this study (Fig 2.). The number of species present at all stations at Nipah Trees were listed in Table 2.

#### Table 2. Epiphytic Diatom at Nipah Trees at all Stations

No	Species	St 1	St 2	St 3	St 4	St 5
1	<i>Actinocyclus Ehrenbergi</i>	*	-	-	-	-
2	<i>Bacillaria paradoxa</i>	*	-	-	-	-
3	<i>Biddulphia granulata</i>	-	-	*	-	-
4	<i>Biddulphia reticulata</i>	-	-	-	-	-
5	<i>Coscinodiscus sp</i>	-	-	-	-	-
6	<i>Licmophora abbreviata</i>	*	-	-	-	-
7	<i>Melosira sp</i>	-	-	-	-	*
8	<i>Navicula sp</i>	-	-	-	-	-
9	<i>Pleurosigma sp</i>	-	-	-	-	-
10	<i>Rhizosolenia alata</i>	-	*	-	*	-
11	<i>Skeletonema costatum</i>	-	-	-	-	-
12	<i>Thalassiothrix frauenfeldii</i>	-	-	-	-	-
13	<i>Triceratium reticulatum</i>	-	-	-	-	-
<i>total</i>		5	1	1	1	2

Note : \* = recorded - = none

Based on Table 2. shown that five species were found at station 1 while, two species at station 5. and only one was found at station 2,3,4. Additionally, *Rhizosolenia alata* was recorded in two stations, others species were only found in one station.



*Actinocyclus Ehrenbergi*



*Bacillaria paradoxa*



*Biddulphia reticulata*



*Coscinodiscus sp*



*Licmophora abbreviata*



*Navicula sp*



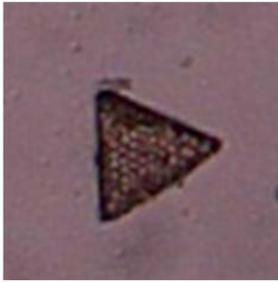
*Pleurosigma sp*



*Rhizosolenia alata*



*Thalassiothrix frauenfeldii*



*Triceratum* sp

Figure 2. Pictures of Epiphytic Diatom Recorded in Present Study

Moreover, The abundance of Epiphytic Diatom strongly varied at 5 stations. The result of Epiphytic Diatom abundance showed on Figure 3.

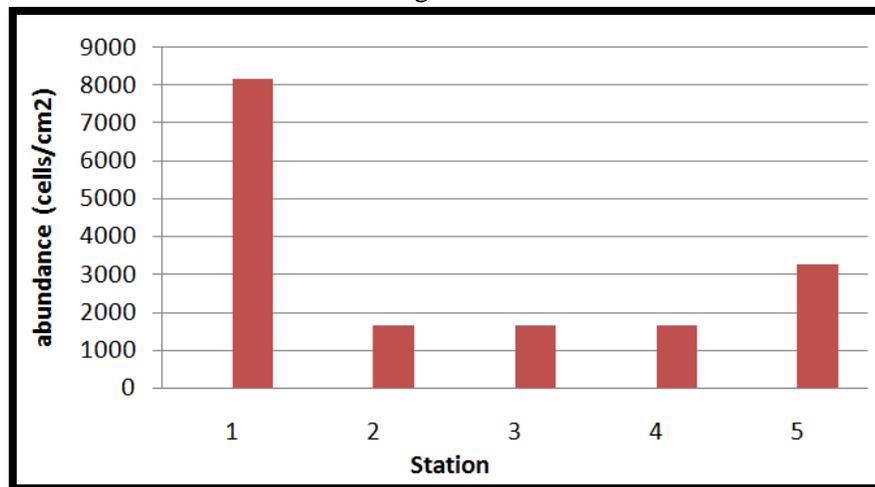


Figure 3. Grafik of Epiphytic Diatom abundance at each station

The result of abundance of epiphytic diatom on Nipah Trees at all stations ranged from 1634 to 8170 cells/cm<sup>2</sup>. The highest abundance of epiphytic diatom was found at station 1 (8170 cells/cm<sup>2</sup>), followed station 5 (3268 ind/cm<sup>2</sup>) and station 2, 3, 4 (1634 ind/cm<sup>2</sup>) respectively.

### Water Quality Parameter

In present research, The result of water quality parameters were shown that extremely varied in TSS, Salinity, and water current. On the other hand, temperature value was similar at all stations as seen in Tabel 3.

Tabel 3. Value of Water Quality Parameters at all Station

ST	TSS (ppm)	BOD <sub>5</sub> (ppm)	COD	Salinity (‰)	Temp (°C)	Current s m/s)	pH	Turbid (NTU)
1	110	6.6	10.8	24	28.3	0.02	7	9.56
2	143	5.4	32.4	22	28	0.12	7	33.36
3	108	5	32.4	17	28.5	0.33	6.7	18.08
4	62	9	43.2	5	28.5	0.72	6.4	26.63
5	30	4.2	21.6	1	28.5	0.302	4.8	18.68

Based on Table 3., Shows that values of water quality parameters were varied along the river estuary, with Salinity ranged was from 1 to 24 ppt, pH was 4,8 to 7, Total Solid Suspence was 30 to 143 ppm, Current was 0.02 to 0.72, BOD<sub>5</sub> was 4.2 to 9.0 ppm and COD was 10.8 to 43.2 ppm

#### 4. DISCUSSIONS

The composition epiphytic diatom on Nipah Trees both on the number species and abundance have been varied at all stations. Where the highest was found at station 1, followed at station 5 and station 2,3,4 respectively. It can be affected by water currents at stations 1 and 5 lower than other stations. Therefore, the condition of Nipah trees habitat at station 1 and 5 were relatively stable with comparing to station 2,3 and 4. So that epiphytic diatom can be survived at surface at Nipah trees. Several hypotheses can be considered to explain the relation of the present results. Stevenson (1996), state that main physical disturbance (such as currents, salinity and wave) responsible for loosing of attached diatom species. It can be concluded that the number and abundances of epiphytic diatom at the mouth river estuary was high and was gradually tended to decrease toward river body.

Moreover, Three of water quality parameter were gusted affecting in number and abundances of epiphytic diatom namely salinity, TSS, and water currents. It can be seen that there are pattern of value TSS and current. Otherwise, *epiphytic diatom* has a tendency to prefer living at low currents and TSS. shows at the mouth of river tend to lower than at the river body. In conclusion, it can be note that water quality affected the composition of epiphytic diatom was current, salinity and TSS.

To get more detail image of epiphytic diatom composition in estuary river system is still needed other research in simultaneous, which covered physiological characteristics of each diatom species, herbivory insect, physical and chemical aspects at other substrate.

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