UNIVERSITI PUTRA MALAYSIA

ECOLOGY AND TEMPORAL CHANGES IN ALGAL COMPOSITION AND SPATIAL DISTRIBUTION OF PERIPHYTON COMMUNITY OF A DROWNED TROPICAL FOREST RESERVOIR IN MALAYSIA

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By

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Dissertation Submitted in Fulfilment of the Requirements for
the Degree of Doctor of Philosophy in the
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Dedicated

to my grand father, Late Alhajj Md Hashem Ali Howlader,

to my parents, Alhajj Md Abdul Mozid and Janila Khatun

and

to my wife, Fatema Zohra

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Abstract of the dissertation presented to the Senate of the Universiti Putra Malaysia in fulfilment for the degree of Doctor of Philosophy

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Chairman: **Assoc. Prof. Dr. Hj. Mohd. Azmi bin Ambak**

Faculty: **Applied Science and Technology**.

A study on periphyton was carried out in Kenyir Reservoir in the tropical environmental perspectives. It included species abundance, species composition, diversity, standing crop, primary production and their vertico-temporal changes. The physico-chemical features of the lake littoral environment were also characterised.

The lake physico-chemical features were influenced by monsoon and dry seasons. The lake water shifted to alkaline in dry period and weak acidic in monsoon. There occurred significant correlationship (at $p<0.05$) between water level and some important water parameters like conductivity, alkalinity, ammonium-nitrogen and nitrite-nitrogen.

A total of 392 periphytic algae species under 132 genera was identified from the all sorts of substrates. Out of which the highest number of species belonged to diatoms (183) followed by cyanophytes (123), chlorophytes (81) and dinoflagellates (5). Although, diatoms possessed the highest number of species, cyanophytes maintained dominance in terms of standing crop.

The substrate based periphyton species composition showed that 329 species were found on standing tree substrates. One hundred thirty-six epilithic species with predominance of diatoms were collected on rocks. Forty-two epiphytic periphyton species were encountered on macrophytes. One hundred twenty seven species were collected on plywoods and one hundred species were collected on glass slides.

The cyanophytes and diatoms species exhibited groups of cluster in dendrogram which showed good indication regarding the occurrence of the concerned species, their environmental response and attachment between the species. Species diversity as indicated by the index (H′) manifested clear seasonal trend, the lowest (H′= 2.87) in wet season and the highest (H′= 3.66) in dry season.

The periphytic floral species number and standing crop manifested seasonal changes between monsoon and dry period (significant in Mann-Whitney U test at $p<0.05$). The cluster analysis on monthly species abundance data also showed conspicuous grouping between the two seasons. The dominance of species between the seasons varied in response to ambient environmental changes. Moreover, the periphytic floral monthly mean species number and cell counts (standing crop) data demonstrated significant temporal differences between the months at $p<0.05$ in one-way ANOVA. The spatial differences of the periphyton between the two stations were not significant except diatoms ($p<0.05$ in one-way ANOVA).

The periphyton assemblage showed gradual decrease of species number and standing crop with the depths. However, the chlorophyll *a* was higher at the lower depths than that of the upper depth. The species composition was different with

depths. The environmental factors influencing the vertical distribution were light, temperature, pH. and conductivity.

The annual mean value of chlorophyll *a* was 283.32 mg/m^2 substrate surface The mean chlorophyll *a* values varied two folds in dry season compared to monsoon (significant in t-test ($p<0.05$). The annual mean autotrophic index (AI) values were 153 and 110 at the Dam side and the Petang River stations respectively. The annual mean primary production at the littoral ranged 67.15g/m^2 to 93.33g/m^2 of the lake surface at the aforementioned stations respectively. The correlation between chlorophyll *a* and ambient environmental parameters like pH, temperature, dissolved oxygen, temperature, solar radiation, alkalinity, water transparency, nitrate, silica, sunshine hour and lake water level were significant ($p<0.05$).

It can be concluded that the reservoir supports a diverse and wide array of periphytic autotrophs. The limnological features of the water body exhibited differences between dry and monsoon seasons. The flora clearly demonstrated seasonal as well as depth profile variations. The autotrophs contributed substantially to the lake primary production which probably being utilised by higher trophic fauna. All these ecological indications and insights will be of immensely beneficial and contribute to the understanding of the tropical limnology as well as autotrophs ecology