



UNIVERSITI PUTRA MALAYSIA

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

A J M ABDUR ROUF

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SPATIAL DISTRIBUTION OF PERIPHYTON COMMUNITY OF A
DROWNED TROPICAL FOREST RESERVOIR IN MALAYSIA**

By

A J M ABDUR ROUF

**Dissertation Submitted in Fulfilment of the Requirements for
the Degree of Doctor of Philosophy in the
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Universiti Putra Malaysia**

June 1997



Dedicated

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

to my parents, Alhajj Md Abdul Mazid and Janila Khatun

and

to my wife, Fatema Zohra

TABLE OF CONTENTS

	Pages
ACKNOWLEDGMENTS	iv
LIST OF TABLES	xiv
LIST OF FIGURES	xix
LIST OF PLATES	xxiv
ABSTRACT	xxv
ABSTRAK	xxviii
CHAPTER	
I INTRODUCTION	1
Objectives of the study	8
II LITERATURE REVIEW	9
Periphyton Methodology	9
Structure and Changes of Periphyton Communities	11
Tropical Area	14
Primary Production	16
III GENERAL DESCRIPTION OF THE SAMPLING AREA AND THE SAMPLING PROGRAMME	18
General Features of the Sampling Area	18
Climate	24
Rainfall	24



	Temperature	25
	Relative humidity	26
	Geology	26
	Sampling Programme	29
	The Dam side (Lentic zone)	29
	The Petang River station (Riverine zone)	30
	Duration of Sampling Period.	33
	Sampling Strategy	33
IV	LIMNOLOGICAL PROFILE OF THE STUDY SITES IN LAKE KENYIR	36
	Materials and Methods	37
	Water chemistry	37
	Other Environmental Parameters	38
	Results	39
	Water chemistry	39
	Other Environmental Parameters	47
	Discussion	50
	Water Chemistry	50
	Other Environmental Parameters	57
V	COMMUNITY STRUCTURE OF PERIPHYTIC ALGAE FROM NATURAL AND ARTIFICIAL SUBSTRATES.	59
	Materials and Methods	60
	Standing Dead Trees Trunk Substrates	60
	Artificial Substrates	60

Natural Rock Substrate	62
Macrophyte Substrate	62
Accrual and Succession Study	63
Sample Preservation	63
Algal Preparation for Microscopy Studies	63
Special Preparation for Diatom Samples	65
Identification of Algae using Light and Scanning Electron Microscope	67
Counting of Algal Cells	67
Numerical Analysis	68
General Statistics	68
Jaccard Index of Similarity	69
Cluster Analysis	69
Results	70
General Floral Composition of the Periphytic Algae in Lake Kenyir	70
Cyanophyta	71
Diatom	72
Chlorophyta	74
Dinophyta	75
The Community Structure of the Natural Periphyton on the Standing dead trees	78
Cyanophytes	78
Diatoms	80
Chlorophytes	82
Species similarity index	86
Cluster analysis	86

	Community correlation ship	87
	Algal Accrual and Succession study	93
	The Community Structure of the Epilithic Periphyton	97
	The Community Structure of the Epiphytic Periphyton on Macrophyte	100
	The Community Structure of Periphyton developed on Artificial Substrates	101
	Plywood	101
	Glass slides Substrates	102
	Other Biota	102
	Discussion	103
	Natural Periphyton Communities	
	Cyanophytes	103
	Diatoms	108
	Chlorophytes	112
	Epilithic Algae	113
	Periphytic Algae of the Artificial Substrates	113
	Algal Accrual and Succession studies	114
	Interrelationship Between the different Groups of Algae in the Periphyton Assemblage	115
VI	ELEMENTARY ARCHITECTURE OF THE PERIPHYTIC MAT IN LAKE KENYIR	117
	Materials and Methods	118
	Results and Discussion	119



VII	TEMPORAL CHANGES IN PERIPHYTIC COMMUNITIES OF LAKE KENYIR	127
	Materials and Methods	128
	Numerical analysis	129
	Results	129
	Temporal Changes in Species Richness and Standing Crop	129
	Quantitative Change in Species Number and Species Composition	131
	The Change in the Standing Crop (by cell numbers)	133
	The Relative Changes in Algal Community Composition	134
	The Qualitative Changes: The Characteristics of the Periphytic mat and its Temporal Changes.	138
	The Dam side	138
	The Petang River	139
	Species Abundance	142
	Numerical Analysis	145
	ANOVA on Periphyton Species Number and Cell Counts	145
	Mann-Whitney U-test Comparison between the Periphyton of the two seasons	147
	Cluster Analysis	148
	The Correlation analysis between Environmental Parameters and Algal species as well as Standing crops	149
	Periphyton of the Artificial Substrate	151
	Discussion	154
	Periphyton of the Standing Dead Trees	154
	Periphyton of the Artificial Substrate	160

VIII	VARIATION IN THE PERIPHYTIC COMMUNITIES ALONG DEPTH PROFILE	161
	Materials and Methods	163
	Collection of “Natural Periphyton”	163
	Artificial Periphyton	165
	Environmental Data	165
	Results	165
	Natural periphyton: The Community Structure and Standing crops	165
	Cyanopyta	166
	Diatom	167
	Chlorophyta	169
	Species Abundance Along the Depth Gradients	170
	Species Diversity	174
	Chlorophyll content	175
	‘Artificial Periphyton’	176
	Species Composition of the ‘Artificial Periphyton’	176
	Species Abundance	176
	Cyanophytes	176
	Diatoms	177
	Chlorophyll content of the ‘Artificial Periphyton’	182
	Statistical Analysis	183
	Linear Regression on Depth Profile attributes of the periphytic community	183
	The ambient Environment along Depth and its Relation with Algal attributes	184
	Discussion	188
	‘Natural Periphyton’	188



	‘Artificial Periphytic Flora’	192
	Chlorophyll content	194
IX	SPECIES DIVERSITY OF THE PERIPHYTIC COMMUNITY	196
	Materials and Methods	197
	Shannon Weaver Index of Diversity	197
	Evenness Index (J')	198
	Strategy for tracing H'	198
	Results	199
	Species Diversity of the Periphyton of the Standing dead trees	199
	Whole assemblage	199
	Cyanophytes	203
	Diatoms	205
	Chlorophytes	207
	The Epilithon Periphyton	210
	The Periphyton of Plywood Substrates	210
	Discussion	213
X	CHLOROPHYLL BIOMASS OF THE PERIPHYTIC ALGAE COMMUNITY	217
	Materials and Methods	220
	Determination of Chlorophyll by Trichomatic Method.	220
	Ash Free Dry Weight	221
	Autotrophic Index	222
	Results	222



Periphyton of the Standing Dead Trees	222
Chlorophyll α	222
Seasonal Differences	223
Ash Free Dry Weight (AFDW)	225
Rock Substrates	230
Artificial Substrate: Plywood	231
Artificial Substrate: Glass slides	232
Discussion	233
Chlorophyll from periphyton of the standing Dead trees	233
Comparison of the chlorophyll content data with other tropical lakes	238
Epilithic periphyton	239
XI SUMMARY AND CONCLUSIONS	240
Summary	240
Conclusions	251
Further studies	252
BIBLIOGRAPHY	254
APPENDICES	281
VITAE	292



LIST OF TABLES

Table	Page
1 Morphometric index data of the Lake (Reservoir) Kenyir.	20
2 The limnological parameters of the lake at the Dam side.	40
3 The limnological parameters of the lake at the Petang River.	41
4 Environmental parameters data statistics for the year 1994 and 95	47
5 Total number of periphytic algal species under each class encountered in the Lake Kenyir on different substrates during 1995.	70
6 List of the most common cyanophyte species encountered on both natural and artificial subjects .	71
7 List (in alphabetical order) of the most common periphytic diatom species encountered on both natural and artificial substrates.	73
8 List of the rare diatom species which specifically found only once on a particular substrata (except rock) during the whole sampling period, 1995.	73
9 The number of species under each cyanophyte genus encountered on all types of substrates in Lake Kenyir during 1995.	75
10 The number of species under each diatom genus encountered on all types of substrates in Lake Kenyir during 1995.	76
11 The number of species under each chlorophytea genus encountered on all types of substrates in Lake Kenyir during 1995.	77
12 Total numbers of algal species encountered on the submersed standing dead trees in one-year sampling, 1995.	78
13 The monthly mean abundance of common cyanophyte species found on standing dead trees at the Dam side based on one-year sampling, 1995.	82
14 The monthly mean abundance of diatom species on the standing dead tress at the Petang River station based on one-year sampling, 1995.	84
15 Floral similarity between the Dam side and Petang River stations based on Jaccard similarity index.	86



16	Periphytic cyanophyte assemblage of the Lake Kenyir at the Dam side.	89
17	Periphytic Diatom assemblage of the Lake Kenyir at the Petang River.	91
18	Results of the Spearman correlation (R) between periphytic algal classes based on species numbers and cell density. (n=12)	92
19	The accrual of cell numbers in the periphyton community in a four-week study in June '96 at the Dam side station.	95
20	Results of linear regression between substrates exposure time and the cell density of different classes of algae at the Dam side station (P<0.05 level). (n=4)	97
21	Species composition of epilithic periphyton from the littoral of Lake Kenyir during four months sampling, Fenruary-May, 1995.	98
22	List of the diatoms exclusively encountered on natural Rock at the littoral of the Lake.	100
23	Seasonal differences in algal species numbers and standing crop by cell numbers based on monthly mean values.	130
24	The shifting of dominance (in decreasing order) in the diatom species between the dry and monsoon seasons based on one-year sampling in 1995	141
25	The results of one-way ANOVA on monthly mean species numbers of the periphytic algae encountered on submersed standing trees from both the sampling stations in one-year in 1995.	146
26	The results of one-way ANOVA on monthly mean cell counts of the periphytic algae encountered on submersed standing trees from both the sampling stations in one-year in 1995.	147
27	The results of the Product moment correlation analysis between the periphyton species and standing crop with the ambient environmental data at the Dam side	150
28	The variation in number of species and cell density of the periphytic algae collected on the plywood during the dry and monsoon months. (n=5)	151
29	The variation in number of species and cell density of the periphytic algae collected on glass slides during the dry and monsoon months at the Petang River. (n=5)	152

30	The shifting of dominance(in decreasing order) in the diatom species between dry and monsoon seasons on the artificial substrate, plywood at the Petang River station.	153
31	The changes in species number and cell density of the periphytic algae encountered on the standing dead trees at the three depth levels in June 1995. (n=7)	169
32	The changes in species diversity (H') and evenness (J') of the 'natural periphyton' community on standing deed trees at the three depth gradients in June 1995. (n=7)	174
33	The changes in species numbers and cell density of the 'artificial periphyton' at three depth levels on plywood exposed for one month, December in the Petang River. (n=5)	178
34	The changes in species numbers and cell density of artificial Periphyton along depth profile on glass slide exposed for one month, December 1995 in the Petang River. (n=4)	179
35	Changes in species diversity (H') and evenness (J') of 'artificial periphytic community' at the three depth gradients collected on the plywood exposed for one month, December 1995 in the Petang River. (n=5)	180
36	The changes in species diversity (H') and evenness (J') of the 'artificial periphytic community' at three depth levels collected on glass slides exposed for one month, December, 1995 in the Petang River. (n=5)	181
37	The Chlorophyll <i>a</i> value of the 'artificial periphyton' collected at the three depth levels on glass slides exposed for one month in December, 95 in the Petang River.	182
38	The results of linear regression between the different algal attributes at the different depth levels (P<0.05 level).	183
39	The ambient environmental data at the different water depths in the Dam side.	185
40	The ambient environmental data at the different water depths in the Petang River.	186
41	The results of Product-moment correlation analysis between algae species numbers and cell density of standing trees and environmental parameters encountered at the different depth levels in the Dam side (P<0.05 level).	187

42	The mean 95% confidence limits of the species diversity, species richness and evenness and their respective ranges at the Dam side.	201
43	The mean 95% confidence limits of the species diversity species richness and evenness and their respective ranges at the Petang River for one year data (n=12).	202
44	The mean 95% confidence limits of species diversity, species richness and evenness of the periphyton on plywood and their respective ranges based on three months sampling.	211
45	<i>t-test</i> result on seasonal variation in monthly mean chlorophyll <i>a</i> biomass of the periphyton.	225
46	The seasonal variation in the AFDW of periphyton collected from the standing dead trees at the lake littoral in 1995.	227
47	The Autotrophic Index (AI) value of periphyton in the Lake Kenyir.	228
48	The variation in mean rate of chlorophyll <i>a</i> accumulation of periphyton on plywood and mean light energy during the monsoon and dry seasons in the Lake Kenyir.	228
49	Annual Production at the littoral zone of the Kenyir Reservoir.	229
50	The correlation of chlorophyll <i>a</i> with the environmental variables in the Lake Kenyir.	229
51	Chlorophyll content of epilithic periphyton at the Dam side and Petang River.	231
52	Chlorophyll content of periphyton on plywood at the Dam side and Petang River.	232
53	The chlorophyll contents of periphyton on microscopic glass slides at the Dam side and Petang River.	233
54	Comparison of chlorophyll <i>a</i> and dry weight contents of periphytic algal community of the selected tropical lakes.	239
55	Inventory of all the algal periphytic CYANOPHYTE species encountered in the Lake Kenyir.	282

56	Inventory of all the algal periphytic DIATOMS species encountered in the Lake Kenyir.	285
57	Species composition, cell density and species diversity of the epilithic community.	289
58	Detail comparative data on primary production of natural periphyton by wet weight, dry weight and organic weight for a single month (March, 1995).	290

LIST OF FIGURES

Figure		Page
1	Map of the Peninsular Malaysia showing the location of the Kenyir Reservoir	21
2	Map of the Kenyir Reservoir	22
3	Geological Map of the Lake Kenyir	28
4	The portion of Lake Kenyir showing the location of the Sampling Stations	31
5	The variation in pH at different months	41
6	The variation in Temperature at different months	42
7	The variation in Dissolved oxygen in different months	42
8	The variation in specific Conductivity at different months	43
9	The variation in TDS at different months	43
10	The variation in Turbidity at different months	43
11	The variation in water transparency at different months	44
12	The variation in Alkalinity at different months	44
13	The variation in Ammonium-nitrogen at different months	44
14	The variation in Reactive Orthophosphate at different months	45
15	The variation in Nitrate at different months	45
16	The variation in Nitrite at different months	46
17	The variation in Reactive Silica at different months	46
18	The monthly mean variation in water discharge through turbine	47
19	The monthly mean variation in water level	48
20	The monthly mean variation in Rain fall	48
21	The monthly mean variation in Sunshine hour	49
22	The monthly mean variation in Solar Radiation	49



23	The frequency of occurrence of the cyanophyte species on standing dead trees based on one-year sampling at the Dam side and Petang River stations, Lake Kenyir.	80
24	The frequency of occurrence of the diatom species on standing dead trees based on one-year sampling at the Dam side and Petang River stations, Lake Kenyir.	81
25	Dendrogram resulting from cluster analysis between periphytic cyanophyte species (Table 16 shows the correspondence between the legend and the name of a given species).	88
26	Dendrogram resulting from Cluster Analysis between periphytic diatom species (Table 17 shows the correspondence between the legend and the name of a given species).	90
27	The increase in number of species on plywood with the increment of substrate exposure period at the Dam side in June 1996.	94
28	The increase in number of species on glass slides with the increment of substrate exposure period at the Dam side in June 1996.	95
29	The temporal increase of periphyton species number along week gradients of exposure period at the Dam side station.	96
30	The temporal increase of periphyton cell density along different exposed period of substrates at the Dam side station.	96
31	The epilithic diatom species distribution at different months.	99
32	Bar-chart showing the number of epilithic diatom species under each genus.	99
33	Bar chart showing the number of diatom species under each genus collected on Plywood during 3 months sampling in 1995.	101
34	Monthly changes in the mean species numbers of the component periphytic communities in the Dam side during one-year sampling in 1995..	132
35	Monthly changes in the mean species numbers of the component periphytic communities in the Petang River during one-year sampling in 1995.	132

36	Temporal changes in the monthly mean cell density of the component periphytic community at the Dam side in one-year sampling.	133
37	Temporal changes in the monthly mean cell density of the component periphytic community at the Petang River in one-year sampling.	134
38	Monthly changes in percentage composition of the mean species number of the component periphytic algal communities at the Dam side during one-year sampling, 1995.	136
39	Monthly changes in percentage composition of the mean cell numbers of the periphytic algal communities at the Dam side during one-year sampling, 1995.	137
40	The monthly absolute mean abundance of the ten dominant cyanophyte species at the Dam side based on one-year sampling, 1995.	143
41	The monthly mean relative abundance of the ten dominant cyanophyte species at the Dam side based on one year sampling, 1995.	144
42	The monthly absolute mean abundance of the ten dominant diatom species at the Petang River station based on one year sampling, 1995.	144
43	The monthly relative mean abundance of the ten dominant diatom species at the Petang River station based on one year sampling, 1995.	145
44	The dendrogram resulting from cluster analysis between the monthly species abundance of the cyanophytes at the Dam side in one-year sampling, 1995.	148
45	The dendrogram resulting from cluster analysis between the monthly species abundance of the diatoms at the Petang River in one-year sampling, 1995.	149
46	The variation in abundance of the dominant cyanophyte species at the three depth levels in the Dam side in June 1995.	173
47	The variation in abundance of the dominant diatom species at the three depth levels in the Petang River in June 1995.	173
48	The variation in chlorophyll <i>a</i> concentration of the periphytic algae of 'natural periphyton' community at the different depths in the Dam side and Petang River collected in June 1995.	175

49	The number of algal species encountered on plywood exposed for one month in December 1995 at the different depth intervals in the Petang River.	179
50	The changes in the number of algal species encountered at the different depth levels on glass slides exposed for one month, December 1995 in the Petang River.	180
51	The species abundance of the dominant diatom species encountered at the three depth levels on glass slides exposed for one month, December 1995 in the Petang River.	181
52	The monthly variation in species diversity index (H') of the component periphytic communities in one-year sampling, 1995 at the Dam side.	200
53	The monthly variation in species diversity index (H') of the component periphytic communities in one-year sampling, 1995 at the Petang River.	201
54	The index of diversity (H') in relation to the whole periphyton assemblage of species richness (S) at the Dam side.	202
55	The index of diversity (H') in relation to the whole periphyton assemblage of species richness (S) at the Petang River.	202
56	The index of diversity (H') in relation to the whole periphyton assemblage of species evenness (J) at the Dam side.	203
57	The index of diversity (H') in relation to the whole periphyton assemblage of species evenness (J) at the Petang River.	203
58	The cyanophytes index of diversity (H') in relation to components of species richness (S) at the Dam side.	204
59	The cyanophytes index of diversity (H') in relation to components of species richness (S) at the Petang River.	204
60	The cyanophytes index of diversity (H') in relation to components of species evenness (J) at the Dam side.	205
61	The cyanophytes index of diversity (H') in relation to components of species evenness (J) at the Petang River.	205
62	The diatom index of diversity (H') in relation to components of species richness (S) at Dam side.	206
63	The diatom index of diversity (H') in relation to components of species richness (S) at the Petang River.	206

64	The diatoms index of diversity (H') in relation to components of species evenness (J) at Dam side.	207
65	The diatoms index of diversity (H') in relation to components of species evenness (J) at the Petang River.	207
66	The chlorophytes index of diversity (H') in relation to components of species richness (S) at the Dam side.	208
67	The chlorophytes index of diversity (H') in relation to components of species richness (S) at the Petang River.	208
68	The chlorophytes community index of diversity (H') in relation to components of species evenness (J) at the Dam side.	209
69	The chlorophytes community index of diversity (H') in relation to components of species events (J) at the Petting River.	209
70	The index of diversity (H') of the periphytic community on plywood in relation to species richness (S) components at the Petting River.	212
71	The index of diversity (H') of the periphytic community on plywood in relation to species events (J) at the Petting River.	212
72	The monthly mean of chlorophyll a value of the periphyton collected from standing dead trees at the Dam side during July 94-December 95. (Sample numbers number are indicated in side the column)	224
73	The monthly mean of chlorophyll a value of the periphyton collected from standing dead trees at the Petting River station during July 94-December 95. (Sample numbers are indicated in side the column)	225
74	The monthly mean of AFDW value of the periphyton on standing dead trees at the Dam side station in 1995. (The number inserted i n column are sample numbers)	226
75	The monthly mean of AFDW value of the periphyton on standing dead trees at the Petang River in 1995. (The number inserted in column are sample numbers)	227

LIST OF PLATES

Plate		Page
1	View of the Kenyir Reservoir Dam and the main basin.	23
2	View of the Kenyir Reservoir with wide open water and hill tops at the far end.	23
3	View of the Dam side station with standing trees at the lake littoral.	32
4	View of the Petang River station.	32
5	Periphyton sampler made of stainless steel	64
6	Epilithic rock sampler made from PVC	65
7	Vertical section of a periphytic mat showing partially the different layers under compound microscope.(X200)	121
8	Vertical section of a periphytic mat showing the spongy and perforated middle layers under compound microscope.(X200)	122
9	Another microphotograph showing the middle layers under compound microscope .(X200)	122
10	Microphotograph showing the encrusted bottom layers under compound microscope .(X200)	123
11	Microphotograph showing the biota embedded in the mat (X200)	123
12	TEM microphotograph showing microbes with in coherent fibrous sheath.	124
13	TEM microphotograph showing microbes with in coherent fibrous sheath.	124
14-15	TEM microphotograph showing dinoflagellate, diatoms (?) and green algae embedded in the mat	124
16	TEM microphotograph showing blue-green algae embedded in the mat.	125
17-19	TEM microphotograph showing the vacuoles and detritus within the mat	125



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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by

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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 correlation (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/m² 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/m² to 93.33g/m² 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