

LICHENS IN MANGROVE FOREST AT BAN PAK KLONG NUM CHIEW MUANG DISTRICT, AND BLACK SAND BEACH LAEM NGOP DISTRICT, TRAT PROVINCE

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Abstract: Three hundred and thirty one lichen specimens were collected during January-July 2011 from twelve dominant trees in mangrove forest. The collecting locations included Ban Pak Klong Num Chiew, Muang district and Black Sand Beach, Leam Ngop district, Trat province. The specimens were identified into twenty one families, forty eight genera, one hundred and seventeen species. *Rhizophora apiculata* Blume and *Lumnitzera racemosa* Willd supported the highest and second highest species diversity of lichens. Twenty-seven taxa were new records and thirty-six taxa were expected to be new to science. However *Bacidia submedialis*, *Cresponia proximata*, *Dirinaria picta*, *Graphis analoga*, *G. streimannii* and *Parmeliella mariana* were commonly distributed.

Introduction: Trat is a small city, totally covering of an area of 1,281 hectares, located at most eastern province of the Kingdom of Thailand. It situated between latitude 11° 34'-12° 45'N and longitude 102° 15'-102° 55'E, and has borders with Chantaburi province to the northwest, Cambodia to the east, and the Gulf of Thailand to the south. The province has long coastline, woodland, beach, waterfalls and the third biggest, Koh Chang island. Along 180 kilometers of coastline, mangrove forest is one of vegetation types normally dominated by *Avicennia alba* Blume, *Bruguiera gymnorrhiza* (L.) Savigny., *Ceriops tagal* (Perr.) C.B. Rob, *Excoecaria agallocha* L., *Hibiscus tiliaceus* L., *Lumnitzera littorea* (Jack)Voigt., *Lumnitzera racemosa* Willd., *Rhizophora apiculata* Blume, *Rhizophora mucronata* Poir., *Sonneratia alba* J. Sm., *Xylocarpus granatum* Koenig and *Xylocarpus moluccensis* (Lam.) M. Roem. This type of forest is found at Ban Num Chiew, Muang district (12° 10'25"N-102° 28' 37"E) and Black Sand Beach, Leam Ngop district (12° 10' 11"N-102° 24' 27"E). Almost all trees are covered by different lichens; crustose, foliose and some species of fruticose, however they have never been studied.

Methodology: The lichen specimens collected from mangrove forest at Ban Num Chiew, Muang district and Black Sand Beach, Leam Ngop district, Trat province during January-July 2011, were prepared for herbarium preservation. Taxonomic identification performed prior to herbarium storage, included examination of the lichens morphological and anatomical features under light microscope and stereomicroscope. Taxa were determined according to (1), (2), (3), (4), and (5). Chemistry of the thalli and lichen products were characterized by spot test and thin layer chromatography (TLC) following to White and James (6).

Results, Discussion and Conclusion: Three hundred and thirty one lichens specimens collected from twelve host trees were classified into twenty one families; Agariomyceae, Arthoniaceae, Bacidiaceae, Coccocarpiaceae, Collemataceae, Graphidaceae, Lecanoraceae,

Lecideaceae, Malmideaceae, Monoblastiaceae, Mycoporaceae, Pannariaceae, Parmeliaceae, Pertusariaceae, Physciaceae, Pilocarpaceae, Pyrenulaceae, Ramalinaceae, Rocellaceae, Thelotremataceae and Trypetheliaceae. It consisted of forty eight genera, one hundred and seventeen species, of which twenty-seven taxa were new records to Thailand, and thirty- six taxa were expected to be new to science. Only fifty- four species were known (Table 1). The highest numbers of species as many as seventy- seven taxa were recorded on *Rhizophora apiculata* Blume from 193 specimens (Table 2). Most taxa were crustose lichens which grew covering trunk and prop-root. It is traditionally known that at mature the *Rhizophora apiculata* Blume stem barks are peeled off by its self, thus foliose lichens are difficult to grow on this plant. Nevertheless, the plants are exposed to the sun and have good ventilation, which are preference habitats for foliose lichens family Physciaceae. The second highest numbers of species included thirty – eight taxa of lichen was found on *Lumnitzera racemosa* Willd. Notably, this plant usually hosted cyanolichens of the families Coccocarpiaceae, Collemataceae and Pannariaceae. However *Bacidia submedialis*, *Cresponea proximata*, *Dirinaria picta*, *Graphis analoga*, and *G. streimannii* were dominated on *Rhizophora apiculata* Blume. Whereas, *Parmeliella mariana* found abundantly on *Lumnitzera racemosa* Willd (Figure 1, A-F).

Table 1 Checklist of lichens at Ban Pak Klong Num Chiew, Muang district, and Black Sand Beach, Leam Ngop district, Trat province.

Previously known		
<i>Anisomeridium ambiguum</i>	<i>Anisomeridium leucochlorum</i>	<i>Arthopyrenia subnexa</i>
<i>Bacidia submedialis</i>	<i>Coccocarpia adnata</i>	<i>Coccocarpia dissecta</i>
<i>Coccocarpia erythroxyli</i>	<i>Coccocarpia palmicola</i>	<i>Coccocarpia pellita</i>
<i>Collema coilocarpum</i>	<i>Cratiria dissimilis</i>	<i>Dictyonema sericeum</i>
<i>Diorygma hieroglyphicum</i>	<i>Diorygma junghuhnii</i>	<i>Dirinaria aegialita</i>
<i>Dirinaria picta</i>	<i>Dyplolabia afzelii</i>	<i>Glyphis cicatricosa</i>
<i>Glyphis scyphulifera</i>	<i>Graphis caesiella</i>	<i>Lecanora pallida</i>
<i>Leptogium azureum</i>	<i>Leptogium cochleatum</i>	<i>Leptogium cyanescens</i>
<i>Mycoporum indicum</i>	<i>Pallidogramme chrysenteron</i>	<i>Parmeliella brisbanensis</i>
<i>Parmotrema cristiferum</i>	<i>Parmotrema gardneri</i>	<i>Parmotrema overeemii</i>
<i>Parmotrema saccatilibum</i>	<i>Pertusaria ceylonica</i>	<i>Pertusaria cicatricosa</i>
<i>Pertusaria cicatricosa</i> var. <i>cicatricosa</i>	<i>Pertusaria irregularis</i>	<i>Pertusaria leioplaca</i>
<i>Pertusaria leucostigma</i>	<i>Pertusaria pallida</i>	<i>Pertusaria pertusella</i>
<i>Pertusaria puffina</i>	<i>Pertusaria tretrathalamia</i>	<i>Pertusaria xanthonaria</i>
<i>Pertusaria xylophyes</i>	<i>Phaeographis brasiliensis</i>	<i>Phaeographis caesioradians</i>
<i>Phaeographis intricans</i>	<i>Physma byrsaeum</i>	<i>Pyrenula confinis</i>
<i>Pyrenula macularis</i>	<i>Pyxine consocians</i>	<i>Pyxine convexior</i>
<i>Thelotrema lepademersum</i>	<i>Trypethelium eluteriae</i>	<i>Trypethelium tropicum</i>
New records		
<i>Anisomeridium polycarpum</i>	<i>Arthonia cinnabarina</i>	<i>Arthopyrenia consobrina</i>
<i>Arthothelium chiodectoides</i>	<i>Canoparmelia amazonica</i>	<i>Cresponea chloroconia</i>
<i>Cresponea plurilocularis</i>	<i>Cresponea proximata</i>	<i>Erioderma javanicum</i>
<i>Graphis analoga</i>	<i>Graphis streimannii</i>	<i>Lecanora achroa</i>
<i>Leptogium crispatellum</i>	<i>Malcolmiella cinereovirens</i>	<i>Myriotrema punctum</i>
<i>Myriotrema rugiferum</i>	<i>Ocellularia</i> cf. <i>eumorpha</i>	<i>Parmeliella mariana</i>
<i>Parmotrema reticulatum</i>	<i>Phaeographis neotricosa</i>	<i>Physcia undulata</i>
<i>Polymeridium</i> cf. <i>subcinereum</i>	<i>Pyrenula andamanica</i>	<i>Pyrenula cayennensis</i>
<i>Pyrenula tenuisepta</i>	<i>Ramalina tenella</i>	<i>Thelotrema</i> cf. <i>bicinctulum</i>

Table 1. Checklist of lichens at Ban Pak Klong Num Chiew, Muang district, and Black Sand Beach, Leam Ngop district, Trat province. (Continue)

New species		
<i>Anisomeridium</i> sp. 1	<i>Arthonia</i> sp. 1	<i>Arthothelium</i> sp. 1
<i>Arthothelium</i> sp. 2	<i>Astrothelium</i> sp. 1	<i>Bacidia</i> sp. 2
<i>Bactrospora</i> sp. 1	<i>Byssoloma</i> sp. 1	<i>Cryptothecia</i> sp. 1
<i>Cryptothecia</i> sp. 2	<i>Cryptothecia</i> sp. 3	<i>Cryptothecia</i> sp. 4
<i>Cryptothecia</i> sp. 5	<i>Cryptothecia</i> sp. 6	<i>Cryptothecia</i> sp. 7
<i>Enterographa</i> sp. 1	<i>Fissurina</i> sp. 1	<i>Lecanora</i> sp. 1
<i>Lecanora</i> sp. 2	<i>Lecidea</i> sp. 1	<i>Lecidea</i> sp. 2
<i>Leptogium</i> sp. 1	<i>Leptogium</i> sp. 2	<i>Lithothelium</i> sp. 1
<i>Lithothelium</i> sp. 2	<i>Lithothelium</i> sp. 3	<i>Mycoporum</i> sp. 2
<i>Mycoporum</i> sp. 3	<i>Myriotrema</i> sp. 1	<i>Opegrapha</i> sp. 1
<i>Parmotrema</i> sp. 1	<i>Pertusaria</i> sp. 1	<i>Phaeographis</i> sp. 1
<i>Phyllopsora</i> sp. 1	<i>Platygramme</i> sp. 1	<i>Thelotrema</i> sp. 1

Table 2. Checklist of seventy-seven lichen taxa on *Rhizophora apiculata* Blume at Ban Pak Klong Num Chiew, Muang district and Black Sand Beach, Leam Ngop district, Trat province.

Family	Genus-species
1. ARTHONIACEAE	<i>Arthonia</i> sp.1, <i>Arthopyrenia consobrina</i> , <i>Arthothelium chiodectoides</i> , <i>Chiodectois</i> sp.1, <i>Chiodectois</i> sp.2, <i>Cryptothecia</i> sp.1, <i>Cryptothecia</i> sp.2, <i>Cryptothecia</i> sp.3, <i>Cryptothecia</i> sp.4, <i>Cryptothecia</i> sp.5, <i>Cryptothecia</i> sp.6, <i>Cryptothecia</i> sp.7
2. BACIDIACEAE	<i>Bacidia</i> sp.2, <i>B. submedialis</i>
3. COCCOCARPIACEAE	<i>Coccocarpia dissecta</i>
4. COLLEMATACEAE	<i>Leptogium cochleatum</i>
5. GRAPHIDACEAE	<i>Diorygma hieroglyphicum</i> , <i>D. junghuhnii</i> , <i>Dyplolabia afzelii</i> , <i>Enterographa</i> sp.1, <i>Fissurina</i> sp.1, <i>Graphis analoga</i> , <i>G. caesiella</i> , <i>G. streimannii</i> , <i>Opegrapha</i> sp.1, <i>Phaeographis caesioradians</i> , <i>P. intricans</i> , <i>P. neotricosa</i> , <i>Platygramme</i> sp.1
6. LECANORACEAE	<i>Lecanora achroa</i> , <i>L. pallida</i> , <i>Lecanora</i> sp.1, <i>Lecanora</i> sp.2
7. LECIDEACEAE	<i>Lecidea</i> sp.1, <i>Lecidea</i> sp.2
8. MALMIDEACEAE	<i>Malcolmiella cinereovirens</i>
9. MONOBLASTIACEAE	<i>Anisomeridium ambiguum</i> , <i>Anisomeridium polycarpum</i>
10. MYCOPORACEAE	<i>Mycoporum</i> sp.2, <i>Mycoporum</i> sp.3
11. PARMELIACEAE	<i>Canoparmelia amazonica</i> , <i>Parmotrema gardneri</i> , <i>P. saccatilobum</i>
12. PERTUSARIACEAE	<i>Pertusaria cicatricosa</i> , <i>P. irregularis</i> , <i>P. leioplaca</i> , <i>P. leucostigma</i> , <i>P. pallida</i> , <i>P. pertusella</i> , <i>P. puffina</i> , <i>Pertusaria</i> sp.1, <i>P. tretrathalamia</i> , <i>P. xanthonaria</i> , <i>P. xylophyes</i>
13. PHYSCIACEAE	<i>Cratiria dissimilis</i> , <i>Dirinaria picta</i> , <i>Physcia undulata</i> , <i>Pyxine consocians</i>
14. PILOCARPACEAE	<i>Byssoloma</i> sp.1

Table 2. Checklist of seventy-seven lichen taxa on *Rhizophora apiculata* Blume at Ban Pak Klong Num Chiew, Muang district and Black Sand Beach, Leam Ngop district, Trat province. (Continue)

Family	Genus-species
15. PYRENULACEAE	<i>Lithothelium</i> sp.1, <i>Lithothelium</i> sp.2, <i>Lithothelium</i> sp.3, <i>Pyrenula andamanica</i> , <i>P. cayennensis</i> , <i>P. confinis</i> , <i>P. tenuisepta</i>
16. ROCELLACEAE	<i>Cresponea chloroconia</i> , <i>Cresponea proximata</i>
17. THELOTREMATACEAE	<i>Myriotrema compunctum</i> , <i>Myriotrema rugiferum</i> , <i>Myriotrema</i> sp.1, <i>Ocellularia</i> cf. <i>eumorpha</i> , <i>Thelotrema</i> cf. <i>bicinctulum</i> , <i>Thelotrema</i> sp.1
18. TRYPETHELIACEAE	<i>Astrothelium</i> sp.1, <i>Trypethelium eluteriae</i> , <i>Trypethelium tropicum</i>

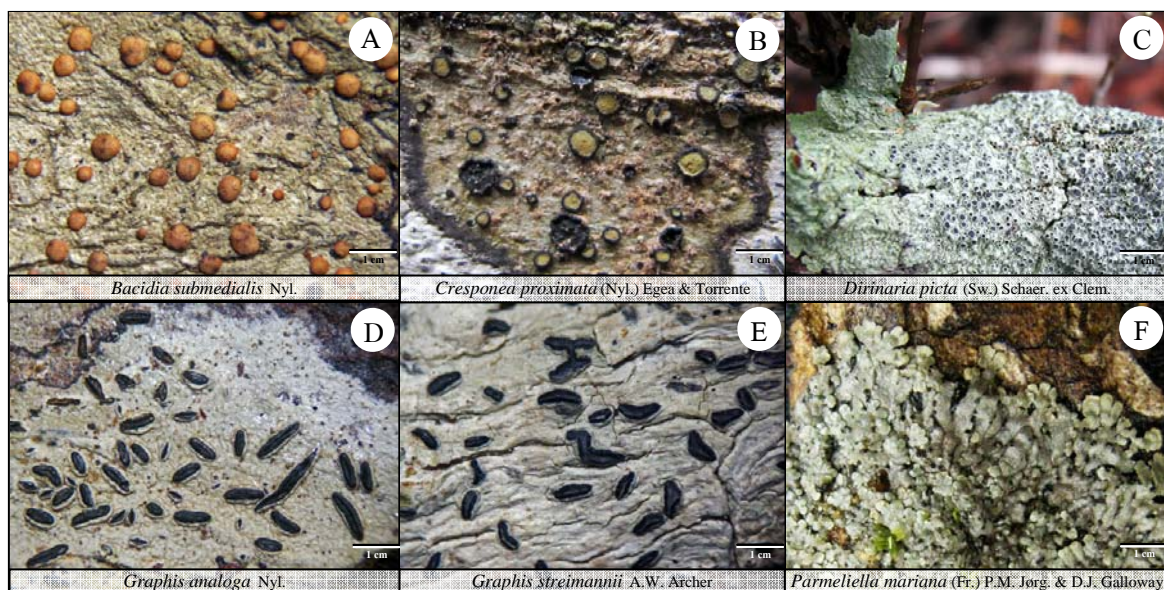


Figure 1. The six common lichens in mangrove forest at Ban Pak Klong Num Chiew, Muang district and Black Sand Beach, Laem Ngop district, Trat province.

References:

1. Archer, A. W. (2006) *Bibliotheca Lichenologica*, **94**, 1-191.
2. Archer, A. W. (2007) *Systematics and Biodiversity*, **5**, 9-22.
3. Awasthi, D. D. (1991) *Bibliotheca Lichenologica*, **40**, 1-340.
4. Elix, J. A. (2004) *Flora of Australia*, **56A**, 4-10.
5. Kalb, K., Staiger, B., Elix, J. A. (2004) *Symbolae Upsalienses*, **34**(1), 133-181.
6. White, F. J., James, P.W. (1985) *British Lichen Society Bulletin*, **57**, 1-41.

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Keywords: mangrove forest, diversity, taxa, dominant, classification