B5_017_PF: BIODIVERSITY OF DISCOCRUSTOSE LICHEN OF MANGROVE FOREST IN THE EASTERN COAST OF THAILAND.

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Abstract: During December 2014 to March 2016, the discocrustose lichen one thousand six hundred and sixty seven samples from 22 phorophyte and stone of mangrove forest in The Eastern coast; Chachoengsao, Chanthaburi, Chonburi, Rayong and Trat province of Thailand were compiled and taxonomically catalogued into nine families thirteen genera thirty one species. *Bacidia convaxula* (Müll.Arg.) Zahlbr., and *Lopadium disciforme* (Flot.) Kullh., are the first time to be found in Thailand. Whereas *Caloplaca* sp. and *Ramboldia* sp. are expected to be new. However the highest species diversity is *Lecanora helva* Stizenb.

Keywords: Mangrove forest, discocrustose lichens, biodiversity, The Eastern Coast

Introduction: Along 126.6 square kilometers from Chachoengsao, Chanthaburi, Chonburi, Rayong and Trat provinces coastline are found mangrove forests in which surrounding of water and vegetations. Lichens are abundant and have never been explored extensively. For discocrustose lichen in this study are referred to as crustose lichens with disc-like apothecia. The apothecial disc may be exposed, flat, convex or concave and normally upraised on the thallus. Two type of apothecia were found, the margin of an apothecium can be concolorous that have been called lecanorine because they typically have algae incorporated with, and it will often be delimited by a cortex. On the other hand, apothecia with only a proper margin are referred to as lecideine or biatorine, which they have no algae incorporated with in the margin of apothecia. Ascospores are colourless and produced within the ascus with the distinguished variety of ascospores type as simple, septate submuriform or muriform ascospores [1]. Discocrustose lichen in these areas were expect to vas discover. From the past decade until today, the discocrustose lichen investigations in Thailand were performed only on the mainland and have been neglected in mangrove forest. In order to update lichen database in Thailand collecting discocrustose lichens samples in mangrove forest are indispensable for the known taxonomy, diversity and distribution as well as an information for the conservation and sustainable utilization of biodiversity resource. After 2013 under the Biodiversity of Lichen in Mangrove Forest at Eastern Sea Coast on the Gulf of Thailand and Managing and Developing Database and Lichen Herbarium, Ramkhamhaeng University project, to fill the biodiversity data gap between inland and island, 15 species (6 families, 8 genera) were reported in mangrove forest [5]. We will explore many species of discocrustose lichen that diverse around Thailand.

Methodology: Discocrustose lichens were collected from mangrove forest of Chachoengsao 4.83 km² (13° 41' 19" N 101° 4' 15" E), Chanthaburi 38.93 km² (12° 36' 38" N 102° 6' 15" E), Chonburi 0.92 km² (13° 21' 43" N 100° 58' 45" E), Rayong 6.56 km² (12° 40' 6" N 101° 16' 30" E), and Trat provinces 75.34 km² (12° 13' 54" N 102° 30' 48" E). All specimens were examined for their anatomical, morphological and chemical characteristics. Chemicals were clarified by using spot test and Thin Layer Chromatography (TLC). Preliminarily color tests for lichen substances are usually carried out with the following reagents according to Elix's method [6]. Thin layer chromatography was performed according to the standard method of White and James [7]. Taxa were determined according to Awasthi (8) Brodo et. al (9),
Kantvilas et. al (10), Lumbsch (11) and Rambold (12).

Results and Discussion: Discocrustose lichens, one thousand six hundred and sixty seven samples from Chachoengsao, Chanthaburi, Chonburi, Rayong and Trat province were collected and catalogued into nine families, thirteen genera and thirty one species (Table. 1). It is shown that fringing mangrove forest type of Chanthaburi and Trat, province has more species diversity of lichens than mangrove forest of Rayong, Chachoengsao, and Chonburi because their vegetations and environmental climates such as air ventilation, light direction and acidic smooth bark of dominant phorophyte trees are amiable reformed for lichen colonizing [13]. The List of lichen-taxa on phorophyte in mangrove forest is shown in table 2. The highest species diversity are in family Lecanoraceae and Ramalinaceae (7 taxa). The second highest is in Malmideaceae (4 taxa). Observation on the occurrence of lichens on the various phorophytes revealed that thirty species grow on the various mangrove trees. However, the highest species diversity of lichen was recovered twenty four taxa on *Rhizophora apiculate* Bl. followed by *Ceriops lagal* (Perr.) with sixteen species, *Thespesia populneoiders* (Roxb.) with thirteen species (Figure 1). However, *Acrostichum aureum* L., *Brownlowia tersa* (L.)., *Clerodendrum inerme* L., and *Hibiscus tiliaceus* L. were discovered for one species of lichen. Almost all of two lichen taxa which occupied phorophyte trees were new records of Thailand including; *Bacidia convaxula* (Müll.Arg.) Zahlbr., and *Lopadium disciforme* (Flot.) Kullh. [14], [15], [16] and undescribed species of *Caloplaca* sp. and *Ramboldia* sp. are expected to be new to science. The morphological examination revealed that *Caloplaca* sp. is similar to *Pyrrhospora varians* but it is simple ascospore broadly ellipsoid shape while *Caloplaca* sp. found simple ascospores, polarilocular. Moreover, it is similar to *Caloplaca gilfillaniorum* as thallus scattered isidioid granules K+purple pigment in the apothecia [15], [17]. *Ramboldia* sp. is similar as *Ramboldia brunneocarpa* but it is parasitizing other lichens and containing norstictic acid [15], [18]. Besides, *Lecanoara helva* was frequently found.

Conclusions: Distribution of discocrustose lichens species. There are Twenty-one species found in Chanthaburi province. Twenty species in Trat province, nine species in Rayong province, seven species in Chachoengsao province and only three species in Chonburi Province. It's mean that mangrove area surveyed, only 0.92 square kilometers of Chonburi Province. One thousand six hundred and sixty seven samples Discocrustose lichens from twenty-three substratums were scrutinized and taxonomic classified to nine families thirteen genera and thirty species. *Rhizophora apiculata* Bl. is the highest lichen species rich (24 spcies), because it is dominant tree in mangrove forest while *Acrostichum aureum* L., *Brownlowia tersa*., *Hibiscus tiliaceus* and sandstone are only one species. *Bacidia assulata* is a saxicolous lichen on sandstone, However, The dominant species are *Lecanora helva* was found in five study site at Chonburi, Chachoengsao, Chanthaburi, Rayong, and Trat province respectively. The lichen communities that occur in mangroves indicate their tolerance to hot, humid and saline breeze environmental conditions prevailing in mangrove, It would be an interesting aspect to study in detail the environmental factors and the physiology of these lichens enabling them for the successful.

Table1. Lichen taxa of five study sites of eastern coastline provinces.

	Lichen taxa	Province					Total specimens
		CB	CS	CT	R	T	
Catillariaceae	*Catillaria chlybea*			1		23	24
Coengoniaceae	*Dimerella lutea*		1	6	18	1	26
	Dimerella pineti			2		2	4
Ectolechiaceae	*Calopadia subcoerulescens*					6	6
	Calopadia phyllogena			4		3	7
Lecanoraceae	*Lecanora achroa*			11	1		12
	Lecanora arthothethelinella			6			6
	Lecanora coronulans			2			2
	Lecanora gangaleoides					2	2
	Lecanora helva	27	115	297	394	4	837
	Lecanora leprocapa			6		4	10
	Ramboldia sp.			7	16		23
Malmideaceae	*Malmidea ceylanica*			3			3
	Malmidea granifera			3		16	19
	Malmidea infrata					8	8
	Malmidea perplexa			1		8	9
Pilocarpaceae	*Byssoloma subdiscoedans*					11	11
	Kalbionora palaeotropica					2	2
	Lopadium disciforme			1		3	4
Ramalinaceae	*Bacidia arceutina*			60		6	66
	Bacidia assulata					1	1
	Bacidia convaxula			1			1
	Bacidia medialis		79	6		3	88
	Bacidia polychroa		3	3			6
	Bacidia rubella			4			4
	Bacidia submedialis		1	57	62	41	161
Roccellaceae	*Bactrospora myriadea*	25	74		8		107
	Cresponia premnea				2	13	15
	Cresponia proximata			48	63	52	163
Teloschistaceae	*Caloplaca sp.*	2	20		18		40
Total lichen specimens		54	293	529	582	209	1,667

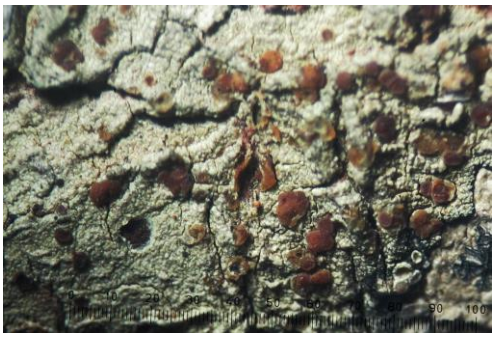
Note: (CB)=Chonburi, (CS)= Chachoengsao, (CT)= Chanthaburi, (R)= Rayong and (T)= Trat

Table 2. List of Lichen-taxa on phorophyte trees and rock of mangrove forest in The Eastern Coast of Thailand

Lichen taxa	Lichen taxa																						Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
Catillariaceae																								
Catillaria chlybea (CT,T)		1													12	6						3	2	24
Coengoniaceae																								
Dimerella lutea(CS,CT,R,T)					1			4		1			1	15	3				1					26
Dimerella pineti (CT,T)								1							2		1							4
Ectolechiaceae																								
Calopadia subcoerulescens (T)								1			1				4									6
Calopadia phyllogena (CT)								1						1	2				1			2		7
Lecanoraceae																								
Lecanora achroa (CT,R)		1						2					1	6	2									12
Lecanora arthothethelinella (CT)															1				5					6
Lecanora coronulans (CT)															2									2
Lecanora gangaleoides (T)								1							1									2
Lecanora helva (CB,CS,CT,R,T)		177	105	1	26		1	49		40			14	175	135	46	3	2	57			6		837
Lecanora leprocapa (CT,T)			1							1			1		5	2								10
Ramboldia sp. (CT,R)		1			1					2			1		11	1			5		1			23
Malmideaceae																								
Malmidea ceylanica (CT)											1								2					3
Malmidea granifera (CT,T)								10		3					2				1			3		19
Malmidea infrata (T)								5	1						2									8
Malmidea perplexa (CT,T)															2	1						6		9
Pilocarpaceae																								
Byssoloma subdiscoedans (T)								7							4									11
Kalbionora palaeotropica (T)																						2		2
Lopadium disciforme (CT,T)															2							2		4
Ramalinaceae																								
Bacidia arceutina (CT,T)	1	11	8					1				1			34	5			5					66
Bacidia assulata (T)																							1	1
Bacidia convaxula (CT)	1																							1
Bacidia medialis (CS,CT,T)										15	3				2	2			44	8	3	11		88
Bacidia polychroa (CS,CT)		3																	3					6
Bacidia rubella (CS)										2			2											4
Bacidia submedialis (CB,CS,CT,R,T)		3	7		8		2	24		7				2	72	20	1		10		1	4		161
Roccellaceae																								
Bactrospora myriadea (CB,ST,R)		6	1			1		11		20	7				16	23			7	14		1		107
Cresponia premnea (R,T)								1						1	8	4						1		15
Cresponia proximata (CT,R,T)		1			3	1		1			1			8	177	19						12		163
Telochistaceae																								
Caloplaca sp. (CS,CT,R)		4	1					3						8	5				18			1		40
Total of lichen taxa	1	209	123	1	39	2	3	122	1	91	13	1	22	216	447	129	5	2	159	22	5	54	3	1,667

Note: 1= *Acrostichum aureum* L.; 2=*Avicennia* alba Bl.; 3= *Avicennia officinalis* L.; 4= *Brownlowia tersa* (L.); 5= *Bruguiera cylindrica* Bl.; 6=*Bruguiera gymnorrhiza* Wild.; 7=*Bruguiera sexangula* Poir; 8=*Ceriops tagal* (Perr.) C. B. Rob.; 9=*Clerodendrum inerme* L. Gaertner.; 10=*Excoecaria agallocha* Linn.; 11= *Heritiera littoralis* Ait.; 12=*Hibiscus tiliaceus* L.; 13=*Lumnitzera littorea* (Jack) Voigt.; 14=*Lumnitzera racemosa* Wild; 15=*Rhizophora apiculata* Bl; 16=*Rhizophora mucronata* Poir.; 17=*Sonneralia caseolaris* (L.); 18=*Sonneratia griffithii* Kurz.; 19=*Thespesia populneoiders* (Roxb.) Kostel.; 20=*Xylocarpus moluccensis* (Lam.) M. Roem.; 21=Vine 22= unidentified tree 23= Sandstone (CS)=Chachoengsao, (CB)=Chonburi, (CT)= Chantaburi, (R)=Rayong and (T)=Trat province

2A. *Caloplaca* sp.



2B. *Ramboldia* sp.

2C. *Lecanora helva* Stizenb.

Figure 2. Discocrustose lichens are expected to be new. (2A.) *Caloplaca* sp., and (2B.) *Ramboldia* sp., Common species in mangrove forest (2C.) and *Lecanora helva* Stizenb.

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