H_H0024: BIODIVERSITY OF DISCOLICHENS IN MANGROVE FOREST AT CHANTABURI AND TRAT PROVINCES

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Abstract: The objective of this study was to explore the discolichen species in mangrove forest and to full fill the lichen checklist on biodiversity data gap between island and island forests around Thailand. Four hundred and sixty-nine discolichen samples were collected in mangrove forest at Chantaburi and Trat Provinces, during November 2012 to June 2014. The samples were taxonomically recognized into nine families, thirteen genera and thirty-four species. Nine species, including *Bacidia arceutina*, *B. assulata*, *B. friesiana*, *B. neosquamulosa*, *B. schweintzii*, *Bactrospora metabola*, *Catillaria chalybeia*, *Cresponia flava*, and *Lecania erysibe* were substantiated for the first time in Thailand and five species, including *Bacidia* MG1-C, *Badimia* MG1-C, *Dimerella* MG1-C, *Catillaria* MG1-C, and *Malmidea* MG1-C were undescribed and expected to be new to science. However, *Lecanora helva* is generally established.

Introduction: Discolichens 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. 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 produced within the ascus with the distinguished variety of ascospores type as simple, septate or muriform ascospores.[1] Previous studies of discolichen were made in difference types of forest in the North, West and South of Thailand by foreign botanists.[2, 4] 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 discolichen that diverse around Thailand.

Methodology: Discolichens were collected from mangrove forest of Koh Chang (12° 0' 38" N 102° 20' 56.95" E) and Koh Kood (11° 40' 0.87" N 102° 33' 51.01" E) in Trat province and Ao Krung Krabaen (12° 34' 19.06" N 101° 53' 59.59" E), Ban Bang Sakao (12° 30' 42.05" N 102° 05' 38.76" E) and Thason learning center and ecotourism mangrove forest (12° 22' 06.66" N 102° 20' 37.23" E) in Chantaburi province. All specimens were examined for their morphological and anatomical characteristics and chemistry. Chemicals were perceived by using spot test and Thin Layer Chromatography (TLC). Preliminarily color test 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 morphology and anatomy structures.[8-12]

Results and Discussion: Discolichen, three hundred and seventeen samples of Ao Kung Kabaen, Ban Bang Sakao and Thason learning center and ecotourism mangrove forest Chantaburi province were gathered and taxonomically classified to 7 families 10 genera and 23 species, whilst one hundred and fifty-two specimens from Koh Chang and Koh Kood, Trat province were compiled and catalogued to 8 families 11 genera and 22 species (Table. 1).It is

shown that fringing mangrove forest type of Koh Chang and Koh Kood, Trat province has more species diversity of lichens than riverine mangrove forest of Chantaburi. Because their environmental climates such as air ventilation, light direction and acidic smooth bark of dominant phorophyte trees are amiable reformed for lichen colonizing [13]. The highest species diversity was in family Ramalinaceae (10 taxa), the second highest was in Lecanoraceae (7 taxa). Observation on the occurrence of lichens on the various phorophytes revealed that thirty-four species grow on the many varieties of mangrove trees. However, *Catillaria chalybeia* (Borrer) A. Massal. is recognized as corticolous and saxicolous lichens (Table2). Among fifteen varieties of the mangrove trees, the acidic smooth bark of *Rhizophora apiculata* Bl. supports the maximum number of twenty-four species of lichens, followed by *Rhizophora mucronata* Poir. with fifteen species, unidentified trees with twelve species (Figure 1). However, *Acrostichum aureum* L., *Clerodendrum inerine* (L) Gaertber, *Hibicus tiliaceus* L. *Sonneratia caseolaris* (L.) Engl. *S. griffithii* Kurz, and sandstone were discovered for one species of lichen. Almost all of nine lichen taxa which occupied phorophyte trees were new records of Thailand including; *Bacidia arceutina, B. assulata, B. friesiana, B. neosquamulosa, B. schweintzii, Bactrospora metabola, Catillaria chalybeia, Cresponea flava* and *Lecania erysibe* [14], [15],[16] and undescribed species of *Bacidia* MG1-C, *Badimia* MG1-C, *Dimerella* MG1-C, *Catillaria* MG1-C and *Malmidea* MG1-C, are expected to be new to science. Besides, *Lecanoara helva* was frequently found.

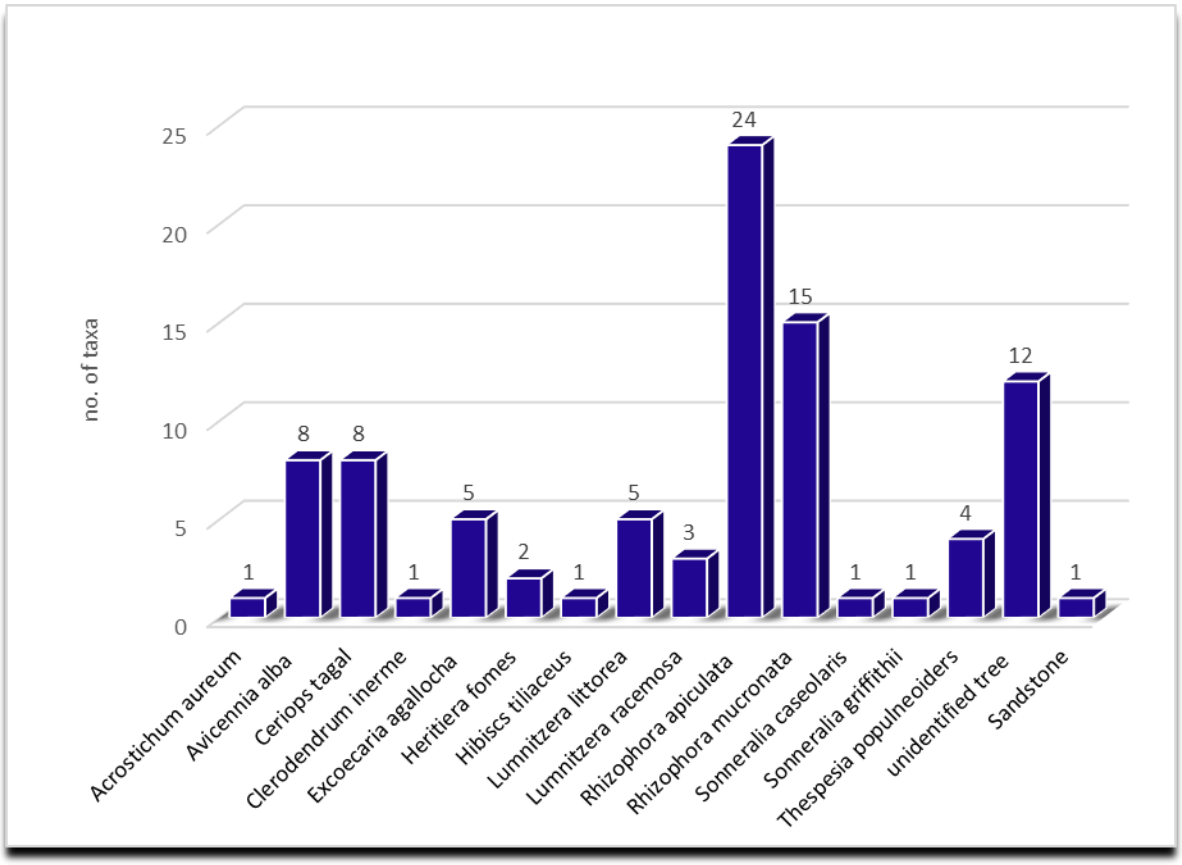

Figure 1. The number of discolichen taxa on sixteen substrata.

Table. 1 Lichen taxa of five study sites at Chantaburi and Trat provinces

Lichen taxa	CHANTABURI			TRAT		No. of specimens
	1	2	3	4	5	
Bacidiaceae						
**Lecania erysibe* (T)				1	2	3
Catillariaceae (C,T)						
**Catillaria chalybeia* (C,T)	1			4	15	20
Catillaria MG1-CP (T)				4		4
Coengoniaceae						
Dimerella lutea (C)		3				3
Dimerella MG1-CP (C)	2					2
Ectolechiaceae						
Calopadia subcoerulescens (T)					6	6
Lecanoraceae						
Lecanora achroa (C)		9				9
Lecanora carpinea (C)	5	1	1			7
Lecanora coronulans (C)	2					2
Lecanora gangaleoides (T)				2		2
Lecanora helva (C,T)	47	80	24	2		153
Lecanora leprocapa (C,T)	5			1		6
Lecanora tropica (C)	1					1
Malmideacea						
Malmidea chrysostigma (C,T)	2				2	4
Malmidea MG1-CP (T)				6		6
Malmidea perplexa (C,T)	1				6	7
Pilocarpaceae						
Badimia MG1-CP (C)	1				1	2
Byssoloma meadii (T)				5		5
Byssoloma subdiscoedans (T)				5		5
Lopadium disciforme (T)					1	1
Ramalinaceae						
**Bacidia arceutina* (C,T)	54	4	3	10		71
**Bacidia assulata* (T)				1		1
Bacidia fraxinea (T)				1		1
**Bacidia friesiana* (C)	1					1
Bacidia MG1-CP (C)	2					2
**Bacidia neosquamulosa* (C,T)	6			4		10
Bacidia pallidocarnea (C,T)	3			3	1	7
**Bacidia schweintzii* (T)				10	5	15
Bacidia submedialis (C)	6					6
Biatora vernalis (C)	4					4
Roccellaceae						
**Bactrospora metabola* (C,T)			1	1		2
Cresponia chloconia (C)			8	1		9
**Cresponia flava* (C,T)	32			25	13	70
Cresponia proximata (C,T)	8			13	1	23
Total lichen-specimens	183	97	37	99	53	469
	317			152		

Note: 1= Thason, 2= Bang Sa Kao, 3= Ao Khung Krabaen, 4= Koh Chang, 5= Koh Kood, C = Chantaburi province, T = Trat province and *= new records

Table 2. List of lichen-taxa on phorophyte trees and sandstone in mangrove forest at Chantaburi and Trat provinces.

Lichen taxa	Substrates																Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Bacidiaceae																	
**Lecania erysibe* (T)											1				2		3
Catillariaceae																	
**Catillaria chalybeia* (C,T)		1								11	3				3	2	20
Catillaria MG1-CP (T)										1	3						4
Coengoniaceae																	
Dimerella lutea (C)								1	1	1							3
Dimerella MG1-CP (C)										2							2
Ectolechiaceae																	
Calopadia subcoerulescens (T)			1			1				4							6
Lecanoraceae																	
Lecanora achroa (C)		2							5	2							9
Lecanora carpinea (C)								1		1				5			7
Lecanora coronulans (C)										2							2
Lecanora gangaleoides (T)			1							1							2
Lecanora helva (C,T)		92	1		5			11	16	13	2	2		10	1		153
Lecanora leprocapa (C,T)		1			1					2	2						6
Lecanora tropica (C)								1									1
Malmideacea																	
Malmidea chrysostigma (C,T)					1					2					1		4
Malmidea MG1-CP (T)			4	1						1							6
Malmidea perplexa (C,T)										2	1				5		8
Pilocarpaceae																	
Badimia MG1-CP (C)										1							1
Byssoloma meadii (T)			3							2							5
Byssoloma subdiscoedans (T)			3							2							5
Lopadium disciforme (T)															1		1
Ramalinaceae																	
**Bacidia arceutina* (C,T)	1	12			2		1			48	6		1		1		71
**Bacidia assulata* (T)															1		1
Bacidia fraxinea (T)			1														1
**Bacidia friesiana* (C)		1															1
Bacidia MG1-CP (C)														2			2
**Bacidia neosquamulosa* (C,T)		1			2			2		3	2						10
Bacidia pallidocarnea (C,T)										1	1				5		7
**Bacidia schweintzii* (T)			1							6	4				4		15
Bacidia submedialis (C)										6							6
Biatora vernalis (C)		1									1			2			4
Roccellaceae																	
**Bactrospora metabola* (C,T)											2						2
Cresponia chloconia (C)											7				1		8
**Cresponia flava* (C,T)						1				45	14				10		70
Cresponia proximata (C,T)										17	5						23
Total lichen-taxa	1	8	8	1	5	2	1	5	3	24	15	1	1	4	12	1	469

Note: 1= *Acrostichum aureum* L.; 2=*Avicennia alba* Bl.; 3= *Ceriops tagal* (Perr) C. B. Rob; 4= *Clerodendrum inerme* (L.) Gaertner; 5= *Excoecaria agallocha* L.; 6= *Heritiera fomes* Buch.-Ham; 7= *Hibiscus tiliaceus* L.; 8= *Lumnitzera littorea* (Jack) Voigt.; 9= *Lumnitzera racemosa* Wild.; 10= *Rhizophora apiculata* Bl.; 11= *Rhizophora mucronata* Poir.; 12= *Sonneralia caseolaris* (L.) Engl.; 13= *Sonneralia griffithii* Kurz.; 14= *Thespesia populneoiders* (Roxb.) Kostel.; 15= unidentified trees 16= sandstone, C = Chantaburi province, T = Trat province and *= new records

Conclusion: The collecting discolichen, four hundred and sixty-nine samples from six-teen substrata were investigated and taxonomic classified to nine families thirteen genera and thirty-four species. *Rhizophora apiculata* Bl. tree is the highest, twenty-four lichen species rich, whilst *Acrostichum aureum* L., *Clerodendrum inerme* (L.) Gaertner., *Hibiscus tiliaceus* L., *Sonneralia caseolaris* (L.) Engl., *Sonneralia griffithii* Kurz., and sandstone have only one species. However, *Lecanora helva* Stizenb. distributed throughout Ao Khung Kraben**,** Ban Bang Sa Kao, Thason learning center and ecotourism mangrove forest Chantaburi and Koh Chang, Trat province (Table 2). Whereas *Bacidia arceutina* (Ach.) Arnold, *B. neosquamulosa* Aptr. & Van Herk., *B. pallidocarnea* (Müll.Arg.) Zahlbr, *Bactrospora metabola* (Nyl.) Egea & Torrente, *Catillaria chalybeia* (Borrer) Massal., *Cresponia flava* (Vain.) Egea & Torrente, *C. proximat*a (Nyl.) Egea & Torrente, *Lecanora helva* Stizenb., *L. leproplaca* Zahlbr., *Malmidea chrysostigma* (Vain.) Kalb Plata & Lumbsh and *M. perplexa* Kalb were verified in both Chantaburi and Trat provinces.

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