

## CRUSTOSE AND PLACOID PHYSCIACEAE (LICHENIZED ASCOMYCOTA) IN THAILAND

Sanya Meesim,<sup>1,\*</sup> Pachara Mongkolsuk,<sup>1</sup> Kansri Boonpragob,<sup>1</sup> Kawinnat Buaruang<sup>1</sup>, Klaus J. Kalb,<sup>2</sup> Leka Manoch,<sup>3</sup>

<sup>1</sup> Lichen Research Unit, Department of Biology, Faculty of Science, Ramkhamhaeng University, Bangkok 10330, Thailand

<sup>2</sup> Lichenologisches Institut Neumarkt Im Tal 12D-92318 Neumarkt, Germany

<sup>3</sup> Department of Plant Pathology, Faculty of Agriculture, Kasetsart University, Bangkok 10900, Thailand

\* e-mail: meesim\_sanya@hotmail.com

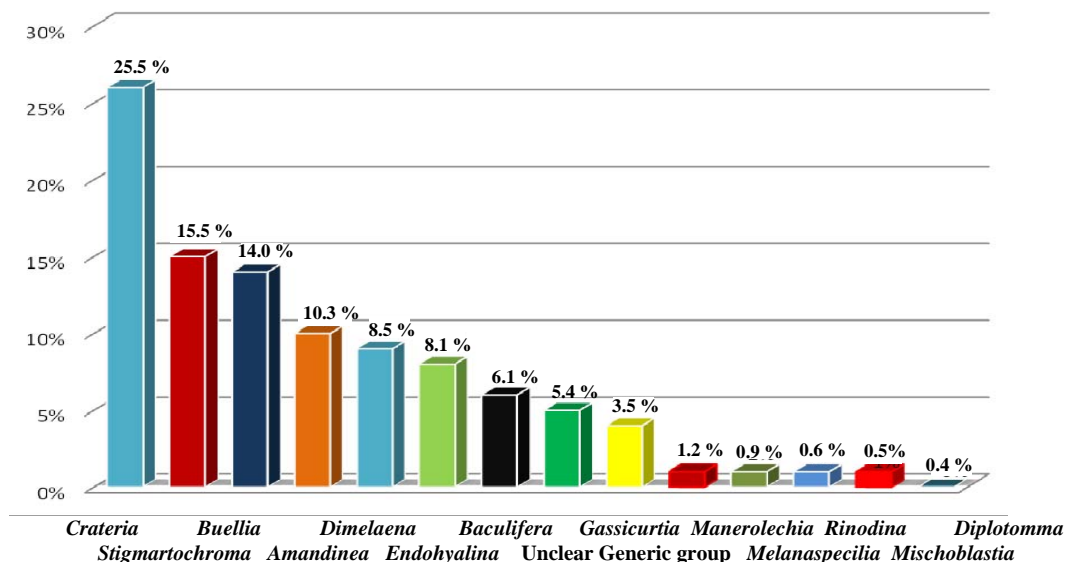
**Abstract:** The main objectives of this investigation were to collect crustose lichens of the family Physciaceae at various places of Thailand for taxonomic identification and to provide keys for determinations. One thousand and four samples of corticolous and saxicolous crustose lichens in the family Physciaceae were collected from 17 provinces and 11 forest types in Thailand: coniferous forests (CF), dry dipterocarp forests (DDF), dry evergreen forests (DEF), hill evergreen forests (HEF), lower montane rainforests (LMRF), lower montane scrubs (LMS), mixed deciduous forests (MDF), mangrove forests (MF), secondary forests (SC), strand vegetations (SV) and tree plantations (TP). The survey started from 1995 to 2010, and the samples were incorporated into 13 genera and 69 taxa with one unclear generic group. The taxa number of *Amandinea* M. Choisy ex Scheid Michx. *Baculifera* Marbach & Kalb, *Buellia* De Not. *Cratiria* Marbach, *Dimelaena* Norman, *Diplotomma* Flot, *Endohyalina* Marbach emend. Giralt, P. Boom & Elix, *Gassicurtia* Fée, *Melanaspicilia* Vain., *Mischoblastia* A. Massal., *Monerolechia* Trevis, *Rinodina* (Ach.) Gray, *Stigmatochroma* Marbach and Group unclear generic were 7, 6, 15, 7, 2, 2, 1, 11, 1, 2, 1, 4, 4 and 6 species, respectively. Whereas *Amandinea brugierae*, *A. conioops*, *Amandinea diorista*, *A. hypopelidna*, *A. lecideina*, *Baculifera imshaugiana*, *B. tobleri*, *B. remensa*, *Buellia bahiana*, *Buellia desertica*, *B. cf. penichra*, *B. homophylia*, "*B.*" *pallidomarginata*, *Buellia proximata*, *B. sequax*, *Cratiria dissimilis*, *C. melanochlora*, *C. obscurior*, *C. rutilans*, *Diplotomma alboatrum*, *D. venustum*, *Endohyalina circumpallida*, *Gassicurtia chermesina*, *G. dodecaspora*, *Monerolechia badia* and *Stigmatochroma glaucotheca* were new records in Thailand. There were 27 unidentified taxa of which were expected to be new records of science. It is interesting to note that *Amandinea hypopelidna*, "*Buellia*" *pallidomarginata*, *Cratiria* sp.1 and *Endohyalina circumpallida* were found in all forest types.

**Introduction:** The cosmopolitan lichenized ascomycete family Physciaceae is widespread in almost all areas from lowland to mountain summits. It grows very well at the good ventilation, strong light intensity and high humidity of coastal sea lines. Normally it is discovered on palm plants in which its thalli occur in mutualism between ascomycota fungi and green algal *Trebouxia*. Its thallus types include three forms: crustose, foliose and fruticose genera. It is mainly characterized by the brown, septate spores, often having spore wall thickening.<sup>1</sup> The physciacean lichens exhibit totally 49 genera and 1,190 species in various habitats worldwide.<sup>2,3,4</sup> Twenty crustose genera are accepted: *Amandinea*, *Australiaena*, *Baculifera*, *Buellia*, *Chrimofulvia*, *Cratiria*, *Dermatiscum*, *Dermiscellum*, *Dimealaena*, *Diploicia*, *Diplotomma*, *Endohyalina*, *Gassicurtia*, *Hypoflavia*, *Mobergia*, *Redonia*, *Rinodina*, *Rinodinella*, *Sculptolumina*, *Stigmatochroma* and *Tetramelas*.<sup>5,6</sup> However, these crustose genera are species rich. There is a great lack of knowledge in this group in Thailand. During 1909-2007, studies of physciacean crustose in northern, western,

and northeastern parts of Thailand were performed by some lichenologists.<sup>6,7,8,9</sup> They revealed only 5 genera: *Amandinea*, *Buellia*, *Cratiria*, *Gassicurtia* and *Rinodina* running up to 48 species. However, this intensive study has been covered throughout every part in 16 provinces from 11 forest types in north, south, west, and east of Thailand.

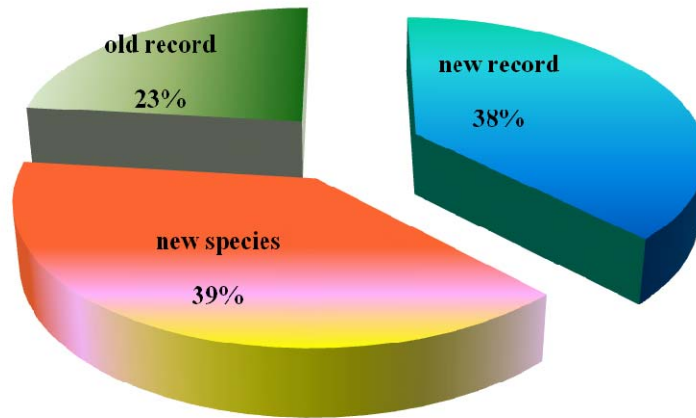
**Methodology:** After collecting the lichen samples from 11 forest types in Thailand: coniferous forests (CF), dry dipterocarp forests (DDF), dry evergreen forests (DEF), hill evergreen forests (HEF), lower montane rainforests (LMRF), lower montane scrubs (LMS), mixed deciduous forests (MDF), mangrove forests (MF), secondary forests (SC), strand vegetations (SV) and tree plantations (TP) at Phu Luang Wildlife Sanctuary, they were dried under room temperature for herbarium preservation and taxonomic study. The investigation of morphological and anatomical characters as well as chemistry was performed.<sup>9,10</sup>

**Results, Discussion and Conclusion:** From 1004 specimens of 39 host tree species, rocks and other substrates, they were identified into 13 genera and 63 species, with 6 species of unclear generic group. Under specimen percentage calculation, 25.5 % belong to *Cratiria*, 15.1 % to *Stigmatochroma*, 14.0 % to *Buellia*, 10.3 % to *Amandinea*, 8.5 % to *Dimelaena*, 8.1 % to *Endohyalina*, 6.1 % to *Baculifera*, 5.4 % to Group unclear generic, 3.5 % to *Gassicurtia* and 1.2, 0.9, 0.6, 0.5 0.4 % to *Monerolechia*, *Melanspicilia*, *Rinodina*, *Mischoblastia*, *Diplotomma* respectively (Figure 1). Twenty-six species of *Amandinea brugierae*, *A. coniops*, *A. diorista*, *A. hypopelidna*, *A. lecideina*, *Baculifera imshaugiana*, *B. tobleri*, *B. remensa*, *Buellia bahiana*, *B. desertica*, *B. cf. penichra*, *B. homophylia*, "*B.*" *pallidomarginata*, *B. proximata*, *B. sequax*, *Cratiria dissimilis*, *C. melanochlora*, *C. obscurior*, *C. rutilans*, *Diplotomma alboatrum*, *D. venustum*, *Endohyalina circumpallida*, *Gassicurtia chermesina*, *G. dodecaspora*, *Monerolechia badia* and *Stigmatochroma glaucotheca* are new records of science discovered in Thailand and calculated to be 38 %. 23 % of the investigated taxa previously reported from Thailand, and 39% undescribed which expected to be new to science (Figure 2).

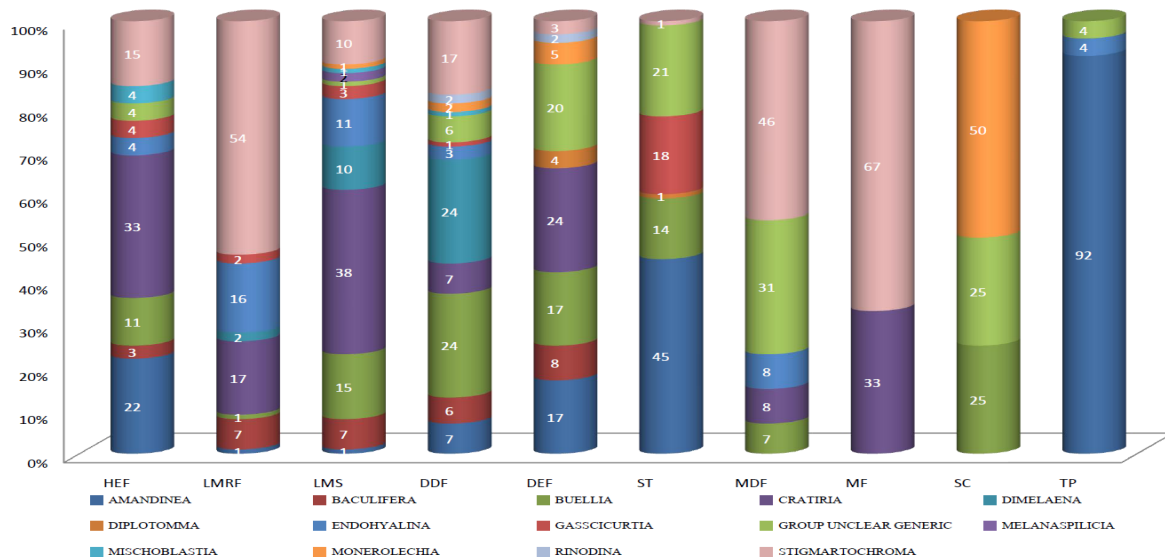


**Figure 1.** Percentage of specimens from 69 species of crustose lichen family Physciaceae found in Thailand.

It is interesting to note that *Amandinea hypopelidna*, “*Buellia*” *pallidomarginata*, *Cratiria* sp.1 and *Endohyalina circumpallida* were found in all forest types. The biodiversities of Physciaceae are distributed widely through different elevation gradients, substrates, climates, and environmental conditions. However species composition varied among different types of forest. The greatest deal of taxa diversities were in LMS, while the lower taxa diversities were in DDF, DEF, HEF, LMRF, MDF, ST and the lowest taxa diversity were in CF, MF, SC and TP (Figure 3).



**Figure 2.** Proportion of old records (23%), new records (38%) and new species (39%) shared among 69 species of crustose lichen in family Physciaceae.



**Figure 3.** The proportion of species in 14 genera of lichens inaugurated in the DDF = dry dipterocarp forest, DEF = dry evergreen forest, HEF = hill evergreen forest, LMRF = lower montane rainforest, LMS = lower montane scrub, MDF = mixed deciduous forest, MF = mangrove forest, SC = secondary forest, ST = strand vegetation, TP = tree plantation in Thailand.

**References:**

1. Henssen, A., & Jahns, H. M. (1974). *Lichenes*. Eine Einführung in die Flechtenkunde. Stuttgart, Germany: Thieme Verlage
2. Marbach, B. (2000). *Bibliotheca Lichenologica*, **74**, 46-384.
3. Lumbsch, H. T., & Huhndorf, S. M. (2007). *Myconet* **13**, 59-99
4. Kirk, P. M., Cannon, P. F., Minter, D. W., & Stalpers, J. A. (2008). *Ainsworth and Bisby's Dictionary of the Fungi* (10th ed.). Wallingford, United Kingdom: CAB International Press.
5. Nordin, A., & Mattsson, J. E. (2001). *The Lichenologist* **33**, 3-23.
6. Aptroot, A., Saipunkaew, W., Sipman, H. J. M., Sparrius, L. B., & Wolseley, P. A. (2007). *Fungal Diversity*, **27**, 75-134.
7. Vainio, E. A. (1909). *Botanisk Tidsskrift* **29**, 104-152.
8. Wolseley, P. A., Aguirre-Hudson, B., & McCarthy, P. M. (2002). *Bulletin of the Natural History Museum, London (Botany)* **32**, 13-59.
9. Mongkolsuk, P. (2003). *Ramkhamhaeng University Reseach Journal* **6**, 91-112.
10. White, F. J., & James. P. W. (1985). *British Lichen Society Bulletin* **57**, 1-41.

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**Keywords:** crustose, placoid, lichen, Physciaceae