

ความหลากหลายทางชีวภาพและนิเวศวิทยาของไลเคน ณ อุทยานแห่งชาติเขาใหญ่
Biodiversity and ecology of lichens at Khao Yai National Park

กัญชกรีย์ บุญประกอบ << พิบูล มงคลสุข ณิชฐารังค์ หอมจันทร์ และ เอก แสงวิเชียร

Kansri Boonpragob<<, Piboon Mongkolsuk, Natsurang Homchantara and Ek Sangvichien.
Department of Biology, Faculty of Science, Ramkhamhaeng University.
e-mail address: kansri@ram1.ru.ac.th

บทคัดย่อ การสำรวจไลเคน ณ อุทยานแห่งชาติเขาใหญ่ระหว่าง พ.ศ. 2542 – 2544 มีวัตถุประสงค์เพื่อศึกษาอนุกรมวิธาน การแพร่กระจาย การเติบโต และภูมิอากาศเฉพาะแห่งที่ไลเคนเติบโต รวมทั้งการแยกสายพันธุ์ราบริสุทธิ์จากไลเคน การศึกษาครั้งนี้ จำแนกไลเคนได้ 518 ชนิด มีเพียงร้อยละ 30 เท่านั้นที่เคยมีรายงานการพบในประเทศไทยมาก่อน ร้อยละ 45 เป็นการพบครั้งแรกในประเทศไทย ส่วนร้อยละ 25 อาจเป็นสายพันธุ์ใหม่ของโลก โดยส่วนมากเป็นไลเคนพวกครัสโทสที่พบในป่าดิบชื้น ป่าดิบเขา ป่ารุ่นสองและป่าดิบแล้ง ไลเคนที่ได้รับการยืนยันและพิมพ์เผยแพร่เป็นสายพันธุ์ใหม่แล้วมี 10 ชนิด ส่วนสายพันธุ์ราบริสุทธิ์แยกได้ 60 ชนิด ป่าดิบชื้นมีความหลากหลายของสายพันธุ์ไลเคนมากที่สุด โดยพบถึง 300 ชนิด รองลงมาพบในป่าดิบแล้ง 250 ชนิด ป่าดิบเขา 215 ชนิด ป่ารุ่นสอง 184 ชนิด ป่าเบญจพรรณ 80 ชนิด พรรณไม้ปลูก 67 ชนิด และป่าเต็งรัง 60 ชนิด

ความชื้นสัมพัทธ์ที่ถึงจุดอิ่มตัวในเวลากลางคืนทุกฤดูกาล ความเข้มของแสงเวลา 6.00 – 10.00 น. สูงกว่า $200 \mu\text{mol.m}^{-2}.\text{s}^{-1}$ ที่วัดจากป่าดิบชื้น ป่าเต็งรังและป่าดิบเขาเป็นปัจจัยที่จำเป็นต่อการดำรงอยู่ของไลเคน อุณหภูมิในระบบนิเวศเหล่านี้มีค่า $20 - 40^{\circ}\text{C}$ ซึ่งอยู่ในช่วงที่เหมาะสมต่อกระบวนการทางชีววิทยา อัตราการเติบโตของไลเคนแบบแผ่นใบ มีค่า 6 มม./ปี (ช่วง 2.4 – 20.4 มม./ปี) ส่วนไลเคนแบบฝุ่นผง มีค่า 1.2 มม./ปี (ช่วง 0 - 12 มม./ปี) โดยฤดูฝนเป็นฤดูที่มีอัตราการเติบโตสูงกว่าฤดูอื่นเกือบสี่เท่า

Abstract Intensive exploration of lichens at Khao yai nation parks during 1999 – 2001 had the objectives to study taxonomy and distribution of lichens, measure growth and microclimate of lichen habitats, and isolate the mycobionts. The study found 518 species. Only 30 % of these are previously known for Thailand, 45 % are new records and 25 % are probably new species. Most of them are crustose lichens collected from the Tropical Rain Forest, the Lower Montane Forest, the Secondary Forest and the Dry Evergreen Forest. Eleven new species are already published. Sixty mycobionts were isolated by single spore technique. The highest diversity was found in the Tropical Rain Forest, which consisted of 298 species. Lesser numbers of species were discovered from the Dry Evergreen Forest 224 species, the Lower Montane Forest 215 species, the Secondary Forest 184 species, the Mixed Deciduous Forest 80 species, tree plantation 67 species and the Dry Dipterocarp Forest 60 species.

Saturated atmospheric humidity during the night recorded in every season, and light intensity during 6 – 10 hours higher than $200 \mu\text{mol m}^{-2} \text{s}^{-1}$ at the TRF, DDF and LMF are essential for the existence of lichens. Temperatures in these ecosystems ranged between 17- 40°C , which were appropriate for most biological processes. Average growth rate of the foliose lichens is 6 mm/ year (range 2.4 – 20.4 mm/ year), that of the crustose lichens is 1.2 mm/year (range 0 – 12 mm/year). The highest growth rate was

measured during the rainy season, which is about four times higher than the dry and the cool seasons.

Materials and Methods: Taxonomic study of lichens at Khao yai National Park were performed from 6,400 specimens collected from seven ecosystems along the altitude 250 – 1400 meters. Information of the collecting sites was also recorded. The specimens were collected from barks, canopies, leaves, rocks and soils were air-dried and deposited at the herbarium of Ramkhamhaeng University. Taxonomic identification was based on morphology of thallus, apothecia, spores and chemistry of lichens.

Diurnal light intensity, humidity and temperature were recorded every ten minutes for 3 days each in every season at the canopies of TRF, LMF, and DDF. during 1999-2000. Growth of lichens were observed by drawing outline of 306 thalli on transparent sheets at times intervals. These were June 1999 – April 2002 - August 2000 – January 2001 representing growth during 11 months of the three seasons - rainy season - rainy and cool season respectively. Areas of thalli were transformed into diameters, and growth rates were calculated from expansion of thallus diameters against time.

Results, Discussion and Conclusion: Twenty five percent of 518 species of lichens found at Khao yai National Park are new to science with forty five percent are new records, and only thirty percent were previously known from Thailand (Figure 1). Some specimens are still undetermined. This information indicates that lichens in the park are largely unknown. Although Hales and Kurokawa (2), and Boonpragob et al.(1) reported their collections in this park. Those two studies were unable to represent status of biodiversity of lichen there. Intensive exploration in this study underpins gap of knowledge on biodiversity of lichens in Thailand, and most importantly species richness of lichens of the country.

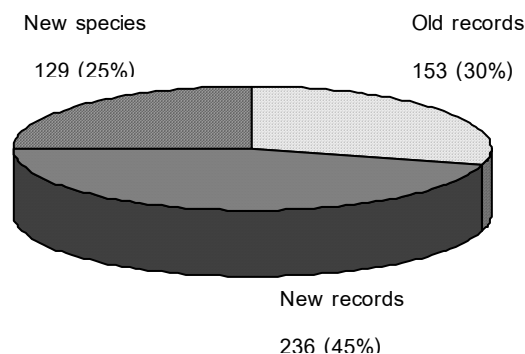


Fig.1 Numbers of new species, new records and old records of lichens identified from Khao yai National Park

Lichen has been studied intensively by the Thai botanists only after 1995. Previous collections by foreign botanists during 1909 to 1995 included easily accessible samples and localities, which amount as much as 554 taxa (3). Regardless of insufficient funding for basic research, among the difficulties in lichen studies are their small sizes and different systematic concept because of unique morphology, anatomy and chemistry. The unknown taxa found in this study are mostly crustose lichens, which are small, and canopy lichens, which are difficult to access. Many wilderness areas in Thailand never visit by any lichenologist need to be explored. Intensive and continuous studies of lichens in Thailand are necessary for sustainable utilization and conservation of this important biological resource.

TRF comprised the largest number of species and unknown taxa, with lesser species in DDF, LMF, SF, MDF, areas of tree plantation and DDF (Figure 2). Large numbers of species are found in four ecosystems, TRF, DEF, LMF and SF. The Tropical Rain Forest comprises the largest area among the seven ecosystems of the park, and consists of various microhabitats influenced by canopy cover. The Secondary Forest contributes small area, but it receives bright light because of sparse canopy cover of the successional vegetation.

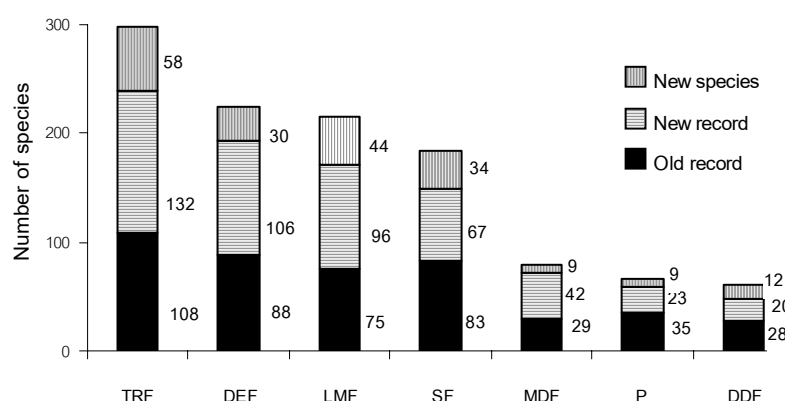


Fig. 2 Proportion of new species, new records and old record among 518 species of lichens identified from seven forest type at Khao yai National Park. TRF (Tropical Rain Forest), DEF (Dry Dipterocarp Forest), LMF (Lower Montane Forest), SF (Secondary Forest), MDF (Mixed Deciduous Forest), P (Plantation area), DDF (Dry Dipterocarp Forest).

Six months of rainy season and optimum temperature through most of the year in the tropic resulted in higher growth rate of crustose and foliose lichens than those reported from the other regions. However, light intensity is far more important for establishment and growth of lichens in the tropic. Dense canopy limits light penetration, and consequently lichen distribution to the lower levels. In addition, forest ecosystems with bright light or high humidity seem to house large number of species..

Acknowledgement: We would like to thank the former Office of Environmental Policy and Planning of the Ministry of Science, Technology and Environment for the possibility of funding, and The Royal Forest Department for accessing to the study site. Sincere gratitude are expressed to Professor T. Ahti (Finland), Dr. B. Coppins (U.K.), Professor J.A. Elix (Australia), Professor D. Hawksworth (U.K.), Professor K. Kalb (Germany), Professor M. Lai (Taiwan), Dr.R. Licking (Germany), Dr. P. McCarthy (Australia), Professor P.W. Rundel (U.S.A.) and Professor A. Whalley (U.K.). This project could not complete without cooperation of students and staffs at the Lichen Research Unit.

References:

- (1) Boonpragob K., Homchantara N., Coppin B. J., McCarthy P. M. and Wolseley P. A. 1998. An introduction of lichen flora of Khao yai National Park. Thailand. Botanical Journal of Scotland 50(2): 209-219.
- (2) Hale M. E. and Kurokawa S. 1964. Studies on *Parmelia* subgenus *Parmelia*. Contribution from the United States National Herbarium 36: 121-191.
- (3) Wolseley P. A., Aguirre-Hudson B. and McCarthy P. M. 2002. Catalogue of the lichens of Thailand. Bull. Nat. Hist. Mus. Lond. (Bot.) 32(1): 13-59.

Key words: Lichens, biodiversity, new species, distribution, Khao yai National Park