THE BOTANICAL GARDEN ORGANIZATION
PRIME MINISTER'S OFFICE

NEWSLETTER

Number 06 September, 1998

Her Majesty Queen Sirikit paid the 3 rd royal visit to see the progression in the development of Queen Sirikit Botanic Garden on January 29, 1998.

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Her Majesty Queen Sirikit's Third Royal Visit

Her Majesty the Queen with Mr. Chaiyot Sasomsub, Minister to the Prime Minister's Office the BGO Executive Board, and some QBG administrative staff.

Her Majesty visited the Orchid Nursery where more than 400 species of Thai wild orchids have been cultivated for conservation purposes. Mr. Chaiyot Sasomsub, and Dr. Weerachai Nanakorn were attending Her Majesty's interest in the native orchids.

Her Majesty visited the newly developed 'Rock Garden'. Prof. Thawatchai Santisuk, Executive Board Member (far left) gave a presentation on rare plants species along the path.

QBG NEWS

During 11-14 December, 1997, the QBG participated in the Northern Agricultural Fair at Chiang Mai University. HRH Princess Maha Chakri Sirindhorn presided over the opening ceremony and visited the QBG's exhibition. Dr. Pongsuk Angasith, BGO board member (second right); and the QBG Director (left) welcomed HRH the Princess.

Prof. Kai Larsen, Emeritus Professor of Botany, Aarhus University Denmark; and an advisory board member of the BGO, presented an exhibition on a new species, recently described as *Bauhinia sirindhorniae*. The name of the species is dedicated to HRH Princess Maha Chakri Sirindhorn, who has made great efforts to conserve natural resources of the country.

Bauhinia sirindhorniae sp.nov. K. Larsen & S.S. Larsen

Local name: Sib song pradong

Family: Leguminosae-Caesalpinioideae

Description:

Climber with tendrills, 10-20 m long. Very young branches are covered with reddish brown hairs. Old branches are glabrous. Simple leaf, oval shape; apex varying from entire to emarginate or slightly bifid to deeply bifid almost to the base. The inflorescence is particularly interesting as it is composed of dichasia, a character not previously described in the genus. Flowers yellowish to orange-red.

Distribution and habitat are only known from the type of locality collected from Nong Khai Province, NE Thailand. The collector, Dr. Chawalit Niyomdham, Director of the Forest Herbarium, Bangkok noted that the species was commonly found along margin of dry evergreen forest.

Farewell and Welcome

The QBG staff would like to welcome two new executive board members, Dr. Charnchai Musignisakorn, Deputy Director General, the Fiscal Policy Office, Ministry of Finance; and Dr. Wongsatit Chuakul, Associate Professor, Department of Pharmaceutical Botany, Faculty of Pharmacy, Mahidol University, Bangkok.

Dr. Musignisakorn and Dr. Chuakul have replaced Mr. Prasit Ujjin and Pol. Gen. Visut Kittivatana. Mr. Ujjin has recently resigned to take up a position as an executive board member of the Asian Development Bank (ADB), the Phillippines. We wish him every success in his new position at the ADB. Pol. Gen. Kittivatana has resigned due to his demanding responsibity as Deputy Chief Police Commander. The QBG staff would like to express sincere gratitude to both out-going executive board members for their commitment while sitting in the committee.

Staff Training

1. Dr. Suyanee Vessabutr, Head, Technical and Research Department; attended an *International Diploma Course on Plant Conservation Techniques* at the Royal Botanic Gardens, Kew, UK; during 7 July - 29 August, 1997. A sponsorship of 2,500 pounds for the course fee, provided by the Rufford Foundation, UK, is greatly appreciated.
2. During 20 January - 19 February, 1998, Ms. Woranutch Laongsri, QBG taxonomist was a guest of Japan Bioindrustry Association (JBA) to visit various Japanese Institutions involved in conservation and sustainable use of tropical bioresources.

Special Lectures/Presentations

The QBG invited Dr. Peter Wyse Jackson, Secretary General, the Botanical Gardens Conservation International or (BGCI), UK, to visit the Garden during 9-10 November, 1997. Dr. Wyse Jackson gave a presentation to the Garden staff, and invited academic guests from Chiang Mai, and Mae Jo universities on *Conservation Concerns of Botanical Gardens Worldwide*. A demonstration on the use of BG RECORDER - a plant record database management system for botanic gardens- was shown to the QBG staff after the presentation.

Prof. Kai Larsen a renowned Danish plant taxonomist gave a special lecture on *Petaloids Monocot (Liliflorae) - Systematic and Evolution*, to the QBG staff and academic members from several universities in the North.

Dr. David Harris, Specialist in International Development, University of Wales (Bangor), visited the Garden on 23 April, 1998. He gave a presentation with focus on seed priming.

On 11 August, 1998, Dr. John Moode a Zingiberaceae expert from Hawaii Botanical Garden; along with Prof. Kai Larsen gave presentations on Zingiberaceae of Southeast Asia and Papua New Guinea.

NMCP Assistance

Since early 1998, the QBG has received professional help from volunteers of the Netherlands Management Cooperation Programme (NMCP). Two NMCP senior advisors were assigned as consultants for Queen Sirikit Botanic Garden:

1. Mr. J. Bergsma, Ing., assisted in the area of water supply and distribution during 16 February to 15 March, 1998.

2. Mr. J. A. van Dort, Ir., assisted in the field of water drainage and erosion control during 30 August to 29 September, 1998.

The NMCP is an independent organization supported by the Netherlands government that assigns senior advisors to countries around the world to share their knowledge and experience without receiving any financial reward.

We would like to express our sincere appreciation for their insightful advice.

Educational and Training Courses at QBG

During August, 1998, the QBG organized its first youth training course in "Young Environmental Conservationists". The course was offered to elementary students from public and private schools in Chiang Mai province. The course instruction was given by the QBG scientists and guest speakers with the aim to raise awareness and concerns in environmental conservation amongst the young generation.

Parataxonomist Training Course

The Fourth Parataxonomist Training was organized during 3-7 September, 1998. Fifty three participants from different sectors attended the course which was given at the Garden, and the field trips at Doi Suthep and Doi Inthanon.

QBG-DANCED Workshops

The first QBG - DANCED Workshop held during 22-24 September, 1997, was followed by a six-month planning process for the development of a project entitled " Capacity Building in the Field of Biodiversity". The process included the exchange of Thai - Danish experts for study visits in Thailand and Denmark, and a two-day workshop at the QBG during 22-23 June, 1998. The workshop was a success with the prospect of the project implementation in early 1999 for a duration of 30 months.

QBG Publications

Flora of QBG Vol. 4 (in Thai) has been published and distributed to libraries and academic establishments. We are preparing Vol. 5 which should be available before the end of the year. If you are an organization involved in botany, biodiversity, and conservation; and interested to obtain the publications, please send your request to:

Dr. Weerachai Nanakorn, Director, Queen Sirikit Botanic Garden, Box 7 Mae Rim, Chiang Mai 50180, THAILAND.

Sanga Sabhasri Research Foundation (SSRF)

We are pleased to announce the establishment of the Sanga Sabhasri Research Foundation (SSRF) with its office located at Queen Sirikit Botanic Garden. The first meeting of the administrative members of SSRF was held at QBG on 28 October, 1997.

Dr. Tiwa Sappakit (right) presenting his contribution to Dr. Sanga Sabhasri (SSRF Founder).

More about SSRF

The Foundation was established with the initial endowment of ฿ 200,000 by Professor Dr. Sanga Sabhasri, Founder of the Botanical Garden Organization of Thailand and former Chairman of the BGO Executive Board. The SSRF aims to promote research and public education in the fields of environmental sciences and natural resources conservation.

The SSRF also promotes local wisdom and indegenous culture by cooperating with other organizations/foundations on relevant activities. In the near future the Foundation will provide scholarships for quailified students who are in need of financial support to pursue studies in environmental management and conservation.

Greeting cards produced by the SSRF are now available. A set of four cards bearing the pictures of Thai wild orchids can be ordered for only ฿ 60 (plus shipping and handling). Please place your orders to:

Sanga Sabhasri Foundation,
c/o Miss Sineenat Honhuta,
QBG, Box 7 Mae Rim, Chiang Mai 50180,
THAILAND.

VISITORS

1. The Sultana of the Kalantan State, Malaysia, visited the QBG on 3 February, 1998.

2. H.E. Mr. Chuan Leekpai, Prime Minister, has become our regular visitor. He, along with his family, paid a private visit to the QBG on 13 October, 1997.

3. On 25 July, 1998, Mr. Chaiyot Sasomsub, Minister, Prime Minister's Office, visited the QBG to observe the activities and progress of the Garden. Mr. Sasomsub also attended the monthly meeting of the BGO Executive Board.

4. On 16 May, 1998, Mr. Mans Lonnroth, Deputy Minister, Ministry of Science and Environment, Sweden, visited the QBG.

5. Junior Team Canada mission visited the QBG on 21 August, 1998.

6. The QBG has received more than 30,000 visitors within the past 11 months. They were students, scientists, and tourists from Thailand and all over the world.

Feature Article

Doi Chiang Dao, A Mountain of Concern: Rare and Endangered Plants

Prof. Dr. Thawatchai Santisuk
Royal Forest Department

Introduction

Location and Climate

Doi Chiang Dao is located at 19° 24′ N lat, and 98° 54′ E long in Chiang Dao District of Chiang Mai Province, northern Thailand. It is a Permian limestone massif situated on an almost flat alluvial plain of about 400 meters above sea level (m.a.s.l.), covering an area of about 70 sq.km. The mountain has steep slopes at all sides, topped by three remarkable conical peaks which form a horse-shoe shape valley. The highest peak, Doi Luang Chiang Dao is about 2,190 m.a.s.l.

Doi Chiang Dao has three distinct seasons. The rainy season starts from May to October with an average annual rainfall at foothill c. 1,400 mm. The cool - dry period lasts from November to January, followed by the hot - dry season from February to April. The average min. and max. daily temperatures (at foothills) range from 21°C to 33° C in the rainy season; 14° C to 29° C in the cool - dry season; and 23°C - 35°C in the hot - dry season. Daytime temperature rises quickly, especially in the open areas. It can occasionally reach 38° C - 40°C in April. There has not been relevant climatological record at higher elevations of Doi Chiang Dao. Clouds and mists are a common phenomenon at the elevations above 1,600 m.a.s.l., therefore, night ground frost is quite common along the ridged tops during December and January.

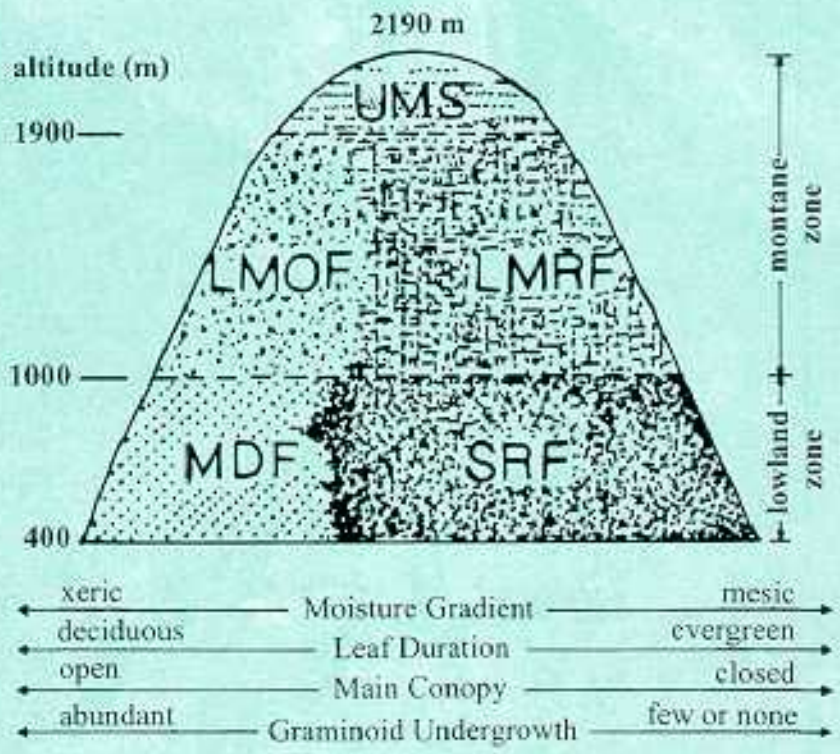
Vegetation and Flora

Current classification of the four main vegetation types of Doi Chiang Dao is based on two factors; moisture conditions and elevation (Fig. 1).

The vegetation below 1,000 m.a.s.l. is called "lowland vegetation" and consists of seasonal rain forest (SRF) and (tropical) mixed deciduous forest (MDF). The vegetation above 1,000 m.a.s.l. is called "montane vegetation" and is further subdivided into lower montane rain forest (LMRF), lower montane oak forest (LMOF), and upper montane scrub (UMS). The dividing altitudinal line at approximately

1,000 m.s.a.l. between the lowland and montane zones is remarkably supported by the floristic disparity of these two ecological zones. The typical lowland vegetation (SRF, MDF) consists of plant species mainly belonging to the tropical lowland components (e.g. Annonaceae, Anacardiaceae, Lythraceae, Meliaceae, Moraceae, Myristicaceae, Sterculiaceae, Verbenaceae, Zingiberaceae, etc.) whilst the tropical montane vegetation (LMRF, LMOF, UMS) is dominated by plant species belonging to the temperate or montane components (e.g. Aceraceae, Betulaceae, Cephalotaxaceae, Ericaceae, Fagaceae, Gentianaceae, Juglandaceae, Lauraceae, Liliaceae, Rosaceae, Ranunculaceae, Theaceae, etc.). For more details on the classification of the vegetation in the northern region see Santisuk (1988).

The moister foothills and lower valleys of Doi Chiang Dao are covered with seasonal rain forest (or dry evergreen forest), whereas the drier foothills or the exposed slopes are occupied by mixed deciduous forest. Both vegetation types creep up slopes at the elevations of about 900 m.a.s.l. The moist valleys or depression areas at the elevations from 1,000 - 1,900 m.a.s.l. are covered by patches of natural, lower montane rain forests characterized by closed and dense canopy. In contrast, the lower montane oak forest with more or less open canopy, occupy the drier, exposed slopes with limestone outcrops. At elevations from 1,200 to 1,900 m.a.s.l. patches of agricultural and abandoned areas are common. As a consequence, secondary growth of varying age from grassy patches to tall pioneer tree species can be encountered everywhere. The exposed, barren, ridged tops from 1,900 to 2,100 m.a.s.l. support the upper montane scrubs, in what is undoubtedly the most fragile habitat in Doi Chiang Dao.



A two - dimensional diagram of Doi Chiang Dao limestone massif (400 - 2,190 m.a.s.l.) showing the interrelations between the vegetation types in the horizontal (SRF & MDF), and vertical or altitudinal (including LMRF, LMOF and UMS) distribution along the moisture gradient.

Certain physiognomic characters of vegetation (evergreen/ deciduous, nature of main canopy, and presence of graminoid undergrowth) are available in accordance with the moisture condition parameter. Two marked ecological zones, lowland and montane, are divided by the 1,000 m. altitudinal line.

Upper montane scrub is a unique vegetation type and grows in one of the most fragile habitats in Thailand, worthy of recognition from both botanical and ecological points of view. This vegetation is recognized as an open hill evergreen forest at 1,900- 2,200 m.a.s.l. by Smitinand (1966). It occurs along the crests of exposed, barren summit areas of Doi Chiang Dao. The ridge tops from 1,900 to 2,190 m. a.s.l., being much dissected and devoid of a soil layer, surprisingly harbour a great number of temperate genera and species. Upper montane scrub is overwhelming dominated by herbaceous plants and many low shrubs thriving in the mossy crevices of limestone rock, giving the impression, in general appearance, of an attractive rock garden-like vegetation typical of sub-alpine and alpine vegetation at higher altitudes. The harsh environment, i.e. frequent clouds, cool winds, and barren; favour the typical sub-alpine and alpine plants, e.g. *Circaea*, *Delphinium*, *Gentiana*, *Geranium*, *Primula*, *Saxifraga*, and *Silene*. The prominent palm trees scattered along the crests and ridged tops are solely represented by an apparent new species of *Trachycarpus* showing affinities with the East Himalayan *T. martianus* (Wall.) Wendl. A deciduous hemi-epiphytic tree *Wightia speciosissima* (D. Don) Merr. (Scrophulariaceae), is infrequently found on moderate rocky slopes of the lower summit ridges. At elevations from 1,800 to 2,000 m, the uppermost limit of lower montane oak forest can be recognized by the presence of gnarled oak trees, *Quercus franchetii* Skan, *Q. lamellosa* J.E. Smith, *Q. lanata* J.E. Smith and *Q. semecarpifolia* J.E. Smith. The occurrence of an endemic rhododendron, *Rhododendron ludwigianum* Hoss. (Ericaceae), is noteworthy because rhododendrons are typically calcifuge species. The accumulated mosses and other organic matter in the cracks and crevices of limestone rock may possibly render an acidic growth medium for the growth and development of this limestone rhododendron.

Botanical Surveys

The first botanical survey of Doi Chiang Dao was undertaken by C.C. Hosseus, a German botanist during 1904 - 1905. Subsequent botanical collections were conducted by A.F.G. Kerr in 1913, 1921, and 1937. After the second world war, many Thai and foreign botanists followed the same tracks and seasons for their expeditions. Botanically, Doi Chiang Dao is considered as underexplored due to the difficult terrains, especially at the higher elevations. While a comprehensive floristic information has not been reached, plant diversity of Doi Chiang Dao are severely threatened by uncontrolled shifting cultivation and undisciplined trekkers.

Threatened Plants of Doi Chiang Dao

A large number of plants especially in the montane vegetation zones of Doi Chiang Dao are threatened due to the disturbance of their natural habitats.

The rare and endemic plant in the montane vegetation zones of Doi Chiang Dao are enumerated below:

Status: E - endemic (with restrict distribution within Thailand).
Ed - endemic to Doi Chiang Dao.
R - rare with restrict distribution within and outside Thailand.

Habitat: CL - clearing area or abandoned agricultural area.
LMOF - lower montane oak forest.
UMS - upper montane scrub.

Species	Habitat	Status
ACANTHACEAE		
1. *Justicia khasiana* C.B. Clarke	UMS	R
2. *Strobilanthes chiangdaoensis* H. Terao	UMS	Ed
ACERACEAE		
3. *Acer chiangdaoense* Santisuk	LMRF	Ed
APOCYACEAE		
4. *Alstonia rupestris* Kerr	LMOF, UMS	R
ASCLEPIADACEAE		
5. *Marsdenia calcicola* Kerr	LMOF, UMS	R
BALSAMINACEAE		
6. *Impatiens kerriae* Craib	LMOF, UMS	Ed
7. *I. musicola* Craib	UMS	R
BEGONIACEAE		
8. *Begonia putii* Craib	UMS	E
CAMPANULACEAE		
9. *Campanula colorata* Wall.	LMOF, UMS	R
CAPRIFOLIACEAE		
10. *Viburnum atro-cyaneum* C.B. Clarke	UMS	R
CARYOPHYLLACEAE		
11. *Silene burmanica* Coll. & Hemsl.	LMOF, UMS, CL	R

Species	Habitat	Status
CEPHALOTAXACEAE		
12. *Cephalotaxus griffithii* Hook.f.	LMRF	R
COMPOSITAE		
13. *Camchaya calcarea* Kitamura	LMOF, UMS	R
14. *Pertya hossei* Craib ex Hoss.	LMOF, UMS	Ed
15. *Saussurea venosa* Kerr	UMS	Ed
16. *Senecio craibianum* Hoss.	LMOF, UMS, CL	E
CORNACEAE		
17. *Cornus oblonga* Wall. var. *siamica* Geddes	LMOF, UMS	Ed
CRASSULACEAE		
18. *Sedum susanae* Hamet	LMOF, UMS, CL	R
DIPSACACEAE		
19. *Scabiosa siamensis* Craib	UMS	Ed
ERICACEAE		
20. *Rhododendron ludwigianum* Hoss.	UMS	Ed
FUMARIACEAE		
21. *Dicentra scandens* (D.Don) Walp. var. *siamensis* Craib	LMOF, CL	R
GERANIACEAE		
22. *Geranium lamberti* Sweet ssp. *siamensis* (Craib) T. Shimuzu	UMS	E
GENTIANACEAE		
23. *Gentiana hesseliana* Hoss.	LMOF, UMS	R
24. *G. leptoclada* Balf.f. & Forr. ex Forr. ssp. *australis* (Craib) Toyokuni	LMOF, UMS, CL	Ed
25. *Swertia calcicola* Kerr	UMS	E
26. *S. striata* Coll. & Hemsl.	LMOF, UMS	R
LABIATAE		
27. *Leucosceptrum canum* W.W. Smith	CL, LMOF, UMS	R
LILIACEAE		
28. *Lilium primulinum* Baker var. *burmanicum* (W.W. Smith) Stearn	LMOF	R
29. *Paris polyphylla* Smith	LMOF	R
30. *Veratrum chiengdaoense* K. Larsen	UMS	E

Species	Habitat	Status
LEGUMINOSAE		
31. *Bauhinia brachycarpa* Wall. ex Benth.	LMOF, UMS	R
32. *Indigofera stachyodes* Lindl.	UMS	R
33. *Lespedeza harmsii* (Shindler) Craib	UMS, CL	R
34. *Sophora dispar* Craib	LMOF, CL	R
LOGANIACEAE		
35. *Buddleja macrostachya* Benth.	LMOF, UMS	R
MALVACEAE		
36. *Dicellostyles zizyphifolia* (Griff.) Phuphathanaphong	LMRF	R
MENISPERMACEAE		
37. *Stephania subpeltata* H.S. Lo	LMOF, UMS	R
ORCHIDACEAE		
38. *Bulbophyllum albibracteum* Seidenf.	UMS	E
39. *B. comosum Coll.* & Hemsl.	LMOF, UMS	R
40. *B. craibianum* Kerr.	LMOF	E
41. *B. muscarirubrum* Seidenf.	LMOF	E
42. *B. triviale* Seidenf.	UMS	E
43. *B. wendlandianum* (Krzl.) Dammer	LMOF	R
44. *Cheirostylis thailandica* Seidenf.	LMOF	E
45. *Dendrobium confinale* Kerr	LMOF	E
46. *D. dixonianum* Rolfe ex Downie	LMOF	E
47. *D. eserre* Seidenf.	LMOF	E
48. *Halumaria limprichtii* Schltr.	LMOF	R
49. *H. vidua* Par. & Reichb.f.	LMOF	R
50. *Hemipilia calophylla* Par. & Reichb. F.	LMOF	R
51. *Luisia thailandica* Seidenf.	LMOF	R
52. *Malaxis khasiana* (Hook.f.) Kze.	UMS	R
53. *Paphiopedilum parishii* (Reichb.f.) Stein var. *parishii*	LMOF, UMS	R
54. *Papilionanthe biswasiana* (Ghose & Mukerjee) Garay	UMS	R
55. *Robiquetia pachyphylla* (Reichb.f.) Garay	LMOF	R
56. *Sarcoglyphis thailandica* Seidenf.	LMOF	E
57. *Staurochilus joiceyanus* (J.J. Smith) Seidenf.	LMOF	R

Species	Habitat	Status
PALMAE		
58. *Trachycarpus aff. martianus* (Wall.) Wendl	UMS	Ed
PLUMBAGINACEAE		
59. *Ceratostigma stapfiana* Hoss.	UMS	R
POLYGALACEAE		
60. *Polygala isocarpa* Chodat	UMS	R
PRIMULACEAE		
61. *Androsace axillaris* Franch.	UMS, CL	R
62. *Lysimachia peduncularis* Wall. ex Hook.f.	UMS	R
63. *Primula siamensis* Craib	LMOF, UMS	E
RANUNCULACEAE		
64. *Clematis wattii* Drummond & Craib	LMOF, UMS, CL	E
65. *Delphinium scabriflorum* D.Don	LMOF, UMS	R
66. *Thalictrum calcicolum* T. Shimizu	LMOF, UMS	E
67. *T. siamense* T. Shimizu	UMS	Ed
RHAMNACEAE		
68. *Gouania leptostachya* DC.	LMOF, UMS	R
ROSACEAE		
69. *Cotoneaster franchetii* Bois	UMS	R
70. *Rosa helenae* Rehd. & Wils.	UMS, CL	R
71. *Rubus tiliaceus* J.E. Smith	LMOF, UMS	R
RUBIACEAE		
72. *Clarkella nana* (Edgw.) Hook.f. var. *siamensis* (Craib) Fukuoka & Kurosaki	LMRF, LMOF	Ed
RUTACEAE		
73. *Zanthoxylum acanthopodium* DC.	UMS, CL	R
SANTALACEAE		
74. *Osyris arborea* Wall.	LMOF, UMS	R
SAXIFRAGACEAE		
75. *Parnassia siamensis* T. Shimizu	UMS	Ed
76. *Saxifraga gemmipara* Franch. var. *siamensis* T. Shimizu	UMS	Ed
SCROPHULARIACEAE		
77. *Phtheirospermum parishii* Hook.f.	LMOF, UMS, CL	R

Species	Habitat	Status
78. *Pedicularis nigra Vaniot* ex Bonati	LMOF	R
79. *P. siamensis* Tsoong	LMOF, UMS	Ed
80. *P. thailandica* Yamazaki	LMOF, UMS	E
UMBELLIFERAE		
81. *Heracleum barmanicum* Kurz	LMOF, CL	R
82. *Hydrocotyle chiangdaoensis* Murata	UMS	Ed
83. *H. siamica* Craib	LMOF, UMS, CL	R
84. *Ligusticum striatum* Wall. ex DC.	UMS, CL	R
85. *Peucedanum siamicum* Craib	LMOF, UMS, CL	Ed
86. *Seseli yunnanense* Franch.	LMOF, UMS, CL	R
VERBENACEAE		
87. *Garrettia siamensis* Fletch.	LMRF, LMOFR	E
88. *Premna interrupta* C.B. Clarke var. *smitinandii* Mold.	UMS, LMOF	E

Conclusions

The list presented above is not at all comprehensive. Many more taxa might be added to the list after thorough botanical explorations in Doi Chiang Dao is completed, particularly to the peaks and ridges which are normally inaccessible.

Recently, Doi Chiang Dao has been designated a wildlife sanctuary under the administration of the Royal Forest Department, Ministry of Agriculture and Cooperatives. However, no basic documentation of Doi Chiang Dao is available on which wildlife and plant conservation recommendations and action plans can be based with any certainty. It is of the utmost importance that immediate increased support, both financial and academic, be provided for Doi Chiang Dao Wildlife Sanctuary to produce a flora and a detailed checklist of the threatened plants of Doi Chiang Dao before it is too late.

References:

Santisuk, T. 1988. An account of the vegetation of northern Thailand. Geoecol. Res. 5: 1-101.

Smitinand, T. 1966. The vegetation of Doi Chiang Dao, a limestone massive in Chiang Mai, north Thailand. Natur. Hist. Bull. Siam Soc. 21:93-128.

RESEARCH NOTES:

Ferns of Doi Chiang Dao

Piyakaset Suksathan
Technical and Research Department, QBG

A study on taxonomy and ecology of epiphytic and lithophytic pteridophytes of Doi Chiang Dao, Chiang Dao District, Chiang Mai Province, was conducted between October 1994 - October 1997. Fern specimens were collected at different altitudes. Epiphytic and lithophytic ferns were found in various ecological types of the mountain such as in dry evergreen forest, mixed deciduous forest, lower montane rain forest, upper montane rainforest, grass land and sub-alpine zone. During the three year survey period at Doi Chiang Dao, the author found 84 species from 35 genera and 14 families of ferns, including a new record in Thailand - *Cheilanthes argentia* (Gmel.) Kunze., Family PARKERIACEAE.

Doi Chiang Dao has been heavily disturbed by human exploitation such as shifting cultivation by the hilltribes, and careless tourists. Several rare species of ferns have disappeared from Doi Chiang Dao. These species are *Asplenium humbertii* Tard., *A. rockii* C. Chr., and *Cheilanthes pseudoargentia* (S.K. Wu) K. Iwats. Many other plant species are threatened and deserve urgent attention to protect them from extinction.

Cheilanthes argentea (Gmel.) Kunze.
Local name: Kutt Ngod.
Distribution: Syberia, China, Korea, India, Japan, Taiwan. In Thailand, found at Doi Chiang Dao and Doi Inthanon, Chiang Mai Province; on rocks in exposed areas at about 1,500 m. alt.

Gymnopteris vestita (Hook.) Underw.
Local name: Chiang Dao's Velvet Fern, Mouse's Ear Fern.
Distribution: Nepal, N. India, SW China. In Thailand, found only at Doi Chiang Dao; in rock crevices at about 2,000 m. alt. in limestone areas.

Ferns Conservation by Tissue Culture

Suyanee Vessabutr,
Technical and Research Department, QBG

Introduction

Ferns are lower vascular plants (Division Pteridophyta) which evolved in the Devonian period , nearly 400 million years ago. They include some 10,000 species that dwell in a wide range of habitats. Ferns range in size from less than a centimeter in diameter (aquatic ferns) to tree ferns with trunks more than 24 meters tall and leaves more than 5 meters long (Raven and Johnson, 1995).

About 620 species from 34 families of ferns are found in Thailand (Tagawa and Iwatsuki, 1979; 1985, 1988 and 1989). More than 50 species are endangered due to habitat destruction and human exploitation (Thongtham, 1993).

In keeping with the global effort to conserve floral diversity, Queen Sirikit Botanic Garden is home to local and exotic fern species. There are close to 100 species from 25 families of ferns in the QBG living collections. Another activity to support the *ex situ* conservation programme at the Garden is germplasm collection by tissue culture techniques.

The QBG Tissue Culture Laboratory

Since the opening of the Unit in early 1997, the acitivities have been focused on micropropagation and conservation of native plant species at risk in the wild. Where appropriate, species under threat from commercial collecting, such as orchids and ferns, are mass propagated to provide a sustainable economic alternative. To conserve their genetic diversity, seeds, in case of orchids, and spores, in the case of ferns, are used as explant material. Derived plantlets are conserved as *in vitro* cultures. Some will be returned to the native wild habitats, and some will be for distribution to decrease pressure of overharvesting from the forests. Future activities will include research on germplasm collection using advanced tissue culture techniques (such as cryopreservation.)

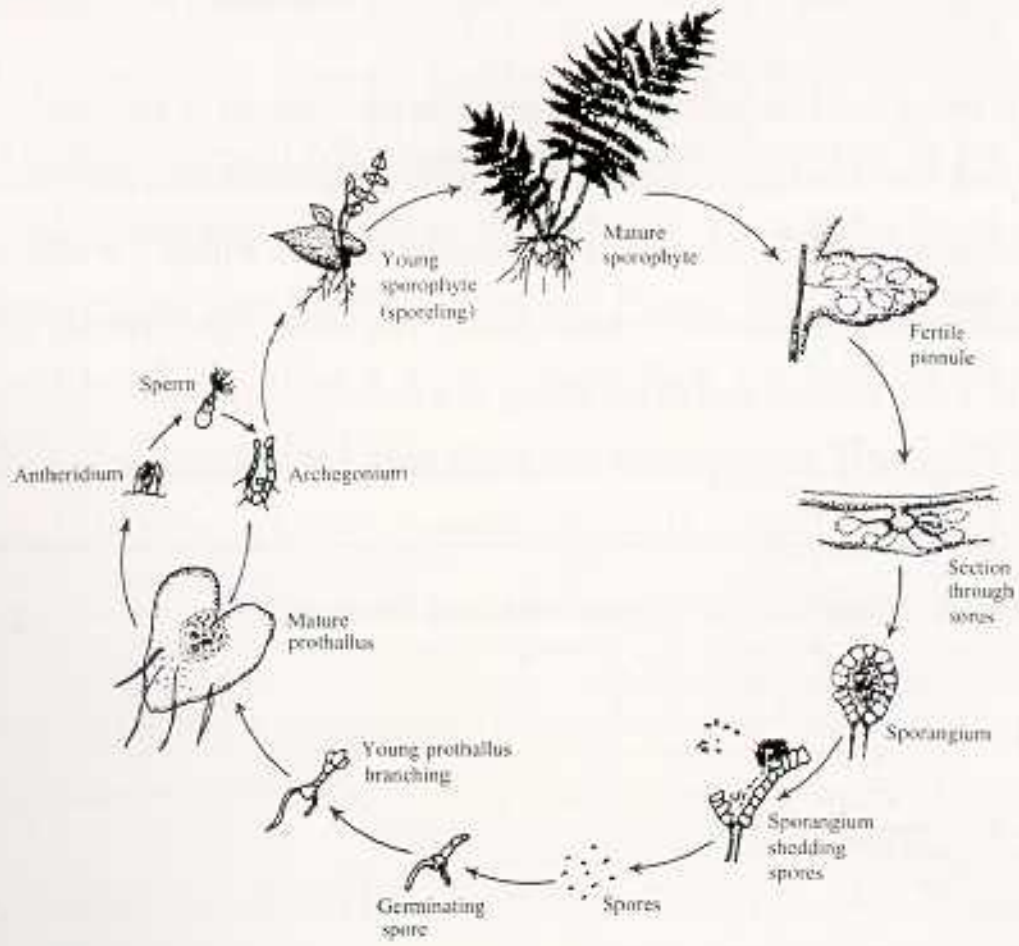
Initiation of Axenic Culture of Ferns from Spores

Fern life cycle

Ferns lead two lives: a gametophytic generation and a sporophytic generation.

Spores are produced at the edges or back of the leaves (fronds). The tiny spores are borne out of meiotic division, therefore they are haploid (having one set of chromosomes). The patterns, locations and shapes of the sporangia vary within different families; and taxonomists use them to classify ferns.

The spore germinates to create the gametophytic stage, which later allows genetic recombination to produce a diploid (having two sets of chromosomes) sporophyte. The familiar lacy green fern is the sporophytic stage which is the dominant generation of all ferns. Young leaves and adventitious roots arise from stems which grow horizontally underground (rhizomes) or along the ground surface (stolons). Young leaves are rolled into tight spirals called croziers or fiddleheads.



Materials and Methods

The methodology was developed by the author (Vessabutr, 1995) for a micropropagation programme to support the Fern Project of the Government of St. Lucia, the West Indies.

Explant: Mature spores. Collect spores by scraping off mature sporangia from the back of fern leaf (frond). The sporangia will break open and release tiny dust-like particles which are the spores.

Pretreatment: Soak spores in tap water for 24-48 hours.

Surface sterilization:

1. Centrifuge or filter to collect the spores.
2. Soak spores in 10% commercial bleach for 30 min.
3. Centrifuge the spores in bleach solution at about 1,000 rpm for 3 to 5 min.
4. Gently withdraw the supernatant with a sterile pasteur pipet. The spores remain as pellets at the botom of centrifuge tubes.
5. Wash the spores from the bleach residue by adding sterile double-distilled water into each tube and re-centrifuge for 3 to 5 min.
6. Repeat the washing step three more times by re-suspending and re-centrifuging in sterile double distilled water.

Culturing techniques:

After the final wash, gently re-suspend the pellets in a small amount of sterile double distilled water. Culture the spores on half strength Murashige and Skoog (1962) medium .

Results:

Unlike the conventional method of sowing spores on compost or soil, this technique allows the spore populations of fern free from any contamination with microorganisms and spores of other fern species. Pretreatment enhances spore germination. Protonema occurs within 3 weeks after sowing of spores. Prothalli develop about one week after protonema development. Sporophytes could be obtained by transferring prothalli to a soil mixture and maintaining in a nursery.

This technique was originally developed for ferns which do not produce rhizomes or stolons. Fern species which have been successfully cultured using the technique are of the following genera: Adiantum, Blechnum, Cyathea, Drynaria, Nephrolepis, Polystichum, and Rhumohra.

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Editor's Note

Dear Readers,

The importance of biodiversity conservation - plant genetic resources in particular - is well recognized at Queen Sirikit Botanic Garden. Many activities are geared towards biodiversity conservation, which are integral components of the Garden mandate. In line with this objective, the current issue of the newsletter contains an article by Dr. Thawatchai Santisuk entitled, *Doi Chiang Dao, A Mountain of Concern: Rare and Endemic Plants*. The author has long been known as an authority on Doi Chiang Dao flora. I wish to thank Prof. Santisuk for his contribution. Research notes on *Ferns of Doi Chiang Dao,* and *Fern Conservation by Tissue Culture* are also presented. I trust that you will find the newsletter informative and useful.

Sincerely yours,

Suyanee Vessabutr, Ph.D.

The Editor

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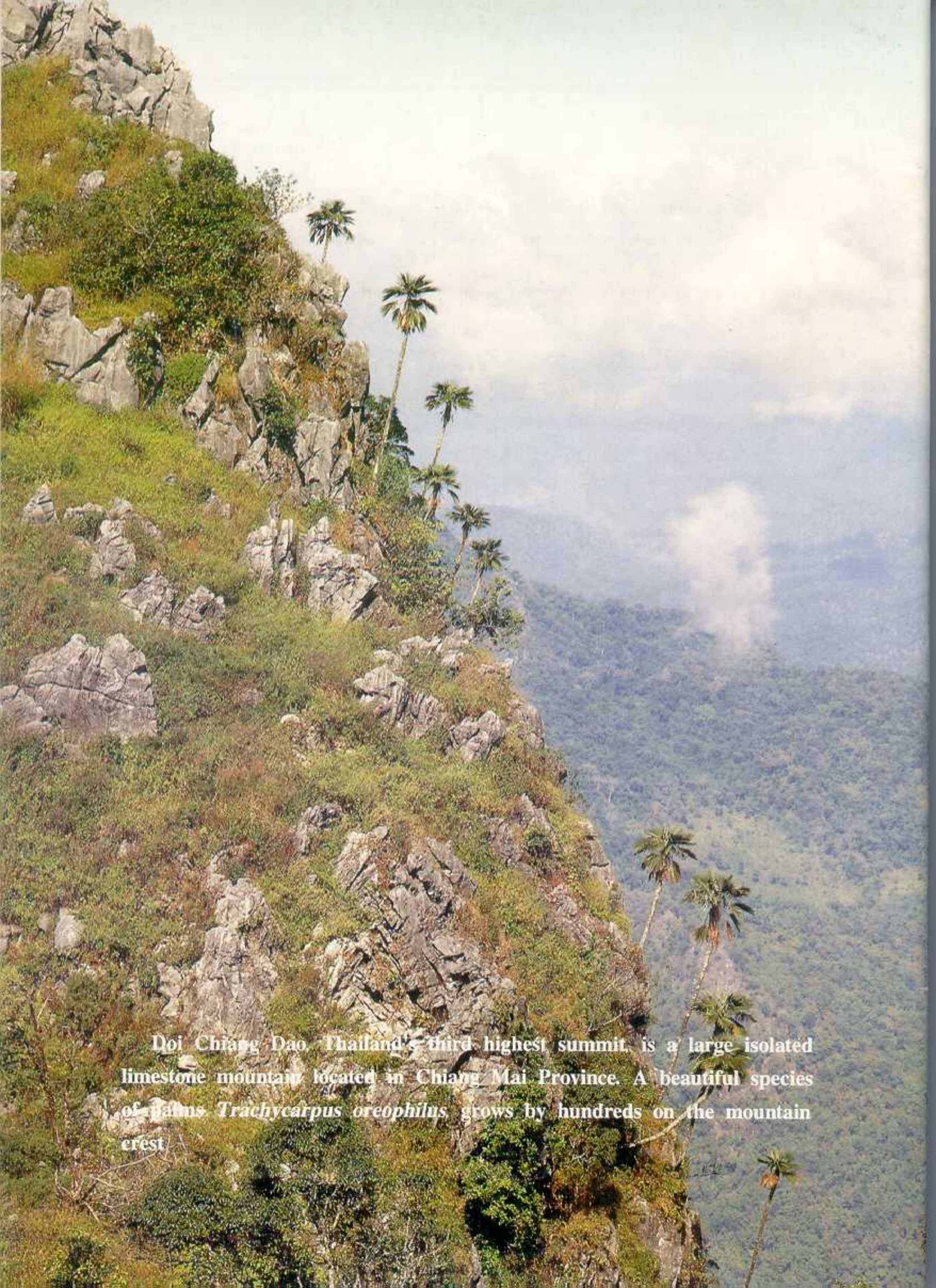

Doi Chiang Dao, Thailand's third highest summit, is a large isolated limestone mountain located in Chiang Mai Province. A beautiful species of palms, *Trachycarpus oreophilus*, grows by hundreds on the mountain crest.