SCIENTIFIC NEWS

Forest biodiversity and the continuing search for new pharmaceuticals

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The tropical rain forests, which occupy only 7% of the world's land surface, harbor an estimated 50% (c. 120,000) of all species of flowering plants found on our planet. Yet, these forests have given us only about 25 of the 119 or so drug entities in clinical use worldwide (Farnsworth & Soejarto, 1991). This relatively low number of tropical rain forest-derived pharmaceuticals is usually attributed to the little amount of research that has been carried out on plants of the tropical rain forests, with estimates to as low as 1% of the species which have been investigated for their medical potential (Balick et al., 1996). Yet, the monetary value of tropical forest-derived pharmaceutical products in the United States alone in 1990 was about $5 billion (estimate based on figures given by Farnsworth & Morris, 1976 and by Principe, 1996). Convinced that a greater number of drug entities could still be found if more extensive studies are undertaken in the search for new pharmaceuticals from plants from these forests, teams of scientists with multidisciplinary expertise continue to pursue such an endeavor. By far, the largest of such an effort is the drug discovery program of the United States National Cancer Institute (NCI) in the search for biologically active molecules from the tropical rain forest plants as potential drug candidates for the treatment of cancer and AIDS (Cragg & Boyd, 1996). The University of Illinois at Chicago (UIC), at its Program for Collaborative Research in the Pharmaceutical Sciences (PCRPS) at the College of Pharmacy, has been responsible for the explorations of the tropical rain forests of Southeast Asia in the sourcing of plant materials in this drug discovery effort (Soejarto et al., 1996a). This UIC-based, NCI-sponsored, Southeast Asia plant exploration program was initiated in

1986 and will be continuing until the year 2001, after two renewals every five years. Aside from its primary goal to search for and collect plants for drug screening purposes, the unstated goal of this plant exploration effort is to increase our botanical and biogeographic knowledge of plants of Southeast Asia.

From approximately 16,000 samples, comprising more than 3,500 species, collected through our efforts, and with the cooperation of numerous institutions and individuals in the U.S., in Southeast Asia, and in other countries, the team of scientists at the NCI discovered two in vitro active anti-AIDS compounds, (+)-calanolide A and (-)-calanolide B from two members of the *Guttiferae*, *Calophyllum lanigerum* Miq. var. *austrocoriaceum* (C.T. White) P.F. Stevens and *C. teysmannii* Miq. var. *inophylloide* (King) P.F. Stevens, respectively (Kashman et al., 1992; Fuller et al., 1994). Work to develop these compounds by a pharmaceutical firm toward clinical application, in cooperation with the NCI, is continuing.

For reasons of property rights, as well as of logistics, technicalities, and personal safety (Soejarto, 1993), the sourcing of the raw plant materials in the NCI program has been a central issue. This issue has now become even more serious, as a result of the introduction of a new set of rules and regulations on the collection of biological materials for bioprospecting purposes in many countries, especially those rich in biodiversity, following the 1992 Rio Summit (Soejarto et al., 1996b). In the NCI-sponsored, UIC-based plant exploration program, the success of the operation has been accomplished to date through close collaboration with the host institutions in the country of collection; such collaboration includes conducting joint plant collecting expeditions, sharing plant materials collected, sharing results of test, sharing authorship of published papers, and strengthening the personnel (through field training) and infrastructure of the collaborating institutions (through curatorial support). Additionally, agreements that cover transfer of technology and the sharing of future monetary benefits, in the form of patent royalties, are set up with host/collaborating institutions.

Among the scientific benefits of the NCI-sponsored plant explorations in Southeast Asia are an increase in the Southeast Asia herbarium database, the increase of botanical knowledge (discovery of new records and new taxa), and the advancement of scientific and technological knowledge of the staff of the collaborating host institutions in the countries of collection, as well as in the promotion of research activities.

The discovery of the anti-AIDS compounds from Southeast Asian forests is evidence that the high biodiversity of these forests clearly represents a pool of chemical diversity from which new clinically useful compounds may be derived in the future. Since the discovery of such promising compounds also signifies a promise of substantial future revenue to the country that possesses the biodiversity, such discovery may persuade decision makers to enact legislation that protects certain plant taxa, resulting in the protection and conservation of the forest ecosystem. The protection of species of *Calophyllum* in Sarawak (Malaysia) by the Sarawak State Government, as a result of the discovery of (+)-calanolide A and (-)-calanolide B, provides such a model (Anonymous, 1993a, 1993b). Thus, goodwill of the country possessing rich biodiversity and the conservation of forest resources should allow the continuing search for biologically active molecules from these forests, as potential candidates for drug development, and lead to the realization of the pharmaceutical potential of the tropical rain forest biodiversity.

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Woody species composition in the altitudinal zones of the mossy forest of Mt. Pulog, Luzon, Philippines

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Introduction

Studies on the altitudinal zonation of forests of the Philippines are very few. Yet such works are essential for a better understanding of the ecosystem structure and processes. On Mt. Pulog, the highest mountain of Luzon Island, Philippines, and the second highest of the entire Philippine Archipelago, a few taxonomic studies have been done (Merrill & Merritt, 1910; Jacobs, 1972; Santos, 1979), yet details of the altitudinal zonation of the forest is wanting. Here we present some preliminary information on the floristic composition and dominance on the different altitudinal zones of the mossy forest region particularly at elevations of 2300–2700 m.

Study area

The site of this investigation is the Mt. Pulog National Park. It has an elevation of 2924 m (Dickerson, 1928) with an area of 11,550 ha covering five municipalities of the three provinces of Benguet, Ifugao, and Nueva Vizcaya, northern Philippines. It is situated at about 60 km from the coast on the central range, its approximate position being 16° 30' 36" N latitude and 120° 50' 20" E (Merrill & Merritt, 1910). The park is accessible from Manila by land or air transport through the Manila-Baguio City route and by land from Baguio City.

The present study was conducted on the southern and eastern slopes of Mt. Pulog, Kabayan, Benguet area. As noted by Merrill & Merritt (1910) the slopes are quite steep and the soil is fairly deep, apparently formed for the greater part by the rapid decomposition of rock in place. The rock formation of at least the summit is andesite.

Method

The point-centered quarter method and the quadrat technique as outlined by Mueller-Dombois & Ellenberg (1974) were used to determine floristic composition and dominance of woody species in the altitudinal zones of the mossy forest of Mt. Pulog. At elevations of 2325, 2400, 2485, 2520, and 2585 m a minimum of 80 points were sampled per site. At elevations of 2640 and 2715 m, the forest limit, the quadrat technique (25 sq.m each) was used as the vegetation was very low and many species tended to be shrubby with many stems. Furthermore, the presence of the dense dwarf bamboo, *Yushania niitakayamensis* (Hayata) Keng f., made it very difficult to use the point-centered quarter method. Dominance was based on the relative basal area values (RBA). The investigation included only woody species of at least 1.3 m height.

List

Species enumerated at a certain altitude are arranged according to their dominance in the community. The first on the list is the most abundant. Numbers enclosed in parentheses after each scientific name are the relative basal area values indicating percentage of relative dominance towards other species, e.g., in the first listing below *Pinus kesiya* occupies 66.93% of the total relative basal area for all species in a particular altitudinal zone. Obviously some species are listed repeatedly to show their relative relationship with the other species. Family and common names (in Igorot) are also indicated. Nomenclature is mainly that of Merrill (1923a, 1923b, 1925, 1926).

Tuliling: 2325 m alt.; slope 70°; exposure NE 58°; boundary between the mossy and pine forest:

Plant name (relative basal area %)	Family	Common name
Pinus kesiya Royle ex Gordon (66.93)	*Pinaceae*	pine
Deutzia pulchra Vid. (9.06)	*Saxifragaceae*	itangan
Schefflera oblongifolia Merr. (6.33)	*Araliaceae*	octopus
Saxifragaceae sp. (3.86)	*Saxifragaceae*	anatil
Eurya nitida (Korth.) Dyer (3.86)	*Theaceae*	salingsingan
Clethra luzonica Merr. (2.62)	*Clethraceae*	amoweg
Rapanea philippinensis (A.DC.) Mez (2.24)	*Myrsinaceae*	sopak

Viburnum odoratissimum Ker. (1.54)	*Caprifoliaceae*	iilog
Cyathea fuliginosa (Christ.) Copel. (1.26)	*Cyatheaceae*	giant fern
Decaspermum paniculatum (Lindl.) Kurz (1.15)	*Myrtaceae*	lado
Rhododendron subsessile Rendle (0.8)	*Ericaceae*	
Neolitsea microphylla Merr. (0.38)	*Lauraceae*	kawasi
Meliosma multiflora Merr. (0.36)	*Sabiaceae*	bangtinan
Persea philippinensis Elmer (0.14)	*Lauraceae*	
Vaccinium indutum Vidal (0.13)	*Ericaceae*	lusong
Daphniphyllum glaucescens Blume (0.11)	*Euphorbiaceae*	
Skimmia japonica Thunb. (0.04)	*Rutaceae*	

Taltalpoc: 2400 m alt.; slope 50°; exposure NE 22°:

Lithocarpus woodii (Hance) A. Camus (51.92)	*Fagaceae*	oak
Eurya nitida (Korth.) Dyer (14.48)	*Theaceae*	salingsingan
Neolitsea microphylla Merr. (7.84)	*Lauraceae*	kawasi
Syzygium besukiense (Miq.) Masam. (6.51)	*Myrtaceae*	arosip
Dacrycarpus steupii de Laub. (4.37)	*Podocarpaceae*	
Euodia reticulata Merr. (4.31)	*Rutaceae*	atipan
Cyathea fuliginosa (Christ.) Copel. (3.98)	*Cyatheaceae*	giant fern
Polyosma philippinensis Merr. (3.36)	*Saxifragaceae*	
Clethra luzonica Merr. (1.16)	*Clethraceae*	amoweg
Eurya coriacea Merr. (0.82)	*Theaceae*	big baltik
Meliosma multiflora Merr. (0.54)	*Sabiaceae*	bangtinan
Macaranga dipterocarpifolia Merr. (0.35)	*Euphorbiaceae*	binonga
Rapanea philippinensis (A.DC.) Mez (0.3)	*Myrsinaceae*	sopak
Psychotria crispipila Merr. (0.04)	*Rubiaceae*	
Drimys piperita Hook. f. (0.01)	*Winteraceae*	inototan

Taltalpoc: 2485 m alt.; slope 45°; exposure SE 47°:

Lithocarpus woodii (Hance) A. Camus (19.61)	*Fagaceae*	oak
Dacrycarpus steupii de Laub. (17.82)	*Podocarpaceae*	
Lithocarpus sp. (11.47)	*Fagaceae*	oak
Psychotria crispipila Merr. (10.09)	*Rubiaceae*	
Helicia robusta Wall. (9.88)	*Proteaceae*	bonot
Pinus kesiya Royle ex Gordon (9.3)	*Pinaceae*	pine
Viburnum odoratissimum Ker. (5.12)	*Caprifoliaceae*	iilog
Eurya nitida (Korth.) Dyer (4.31)	*Theaceae*	salingsingan
Clethra luzonica Merr. (3.73)	*Clethraceae*	amoweg
Cyathea fuliginosa (Christ.) Copel. (2.65)	*Cyatheaceae*	giant fern
Neolitsea microphylla Merr. (2.54)	*Lauraceae*	kawasi
Syzygium besukiense (Miq.) Masam. (1.69)	*Myrtaceae*	arosip
Neolitsea megacarpa Merr. (0.52)	*Lauraceae*	domaplas
Gaultheria cumingiana Vid. (0.39)	*Ericaceae*	lusong
Vernonia benguetensis Elmer (0.27)	*Asteraceae*	
Maesa denticulata Mez (0.19)	*Myrsinaceae*	

Rapanea philippinensis (A.DC.) Mez (0.17)	*Myrsinaceae*	sopak
Schefflera oblongifolia Merr. (0.16)	*Araliaceae*	octopus
Drimys piperita Hook. f. (0.05)	*Winteraceae*	inototan
Diplycosia sp. (0.03)	*Ericaceae*	

Taltalpoc: 2520 m alt.; slope 55°; exposure SE 85°:

Dacrycarpus steupii de Laub. (37.01)	*Podocarpaceae*	
Lithocarpus woodii (Hance) A. Camus (21.92)	*Fagaceae*	oak
Lithocarpus sp. (18.82)	*Fagaceae*	oak
Syzygium besukiense (Miq.) Masam. (11.5)	*Myrtaceae*	arosip
Cyathea fuliginosa (Christ.) Copel. (3.61)	*Cyatheaceae*	giant fern
Eurya coriacea Merr. (2.63)	*Theaceae*	big baltik
Euodia reticulata Merr. (1.28)	*Rutaceae*	atipan
Macaranga dipterocarpifolia Merr. (0.84)	*Euphorbiaceae*	binonga
Clethra luzonica Merr. (0.58)	*Clethraceae*	amoweg
Rhododendron subsessile Rendle (0.38)	*Ericaceae*	
Schefflera oblongifolia Merr. (0.34)	*Araliaceae*	octopus
Helicia robusta Wall. (0.32)	*Proteaceae*	bonot
Deutzia pulchra Vid. (0.32)	*Saxifragaceae*	itangan
Gaultheria cumingiana Vid. (0.23)	*Ericaceae*	lusong
Drimys piperita Hook. f. (0.18)	*Winteraceae*	inototan

Mogawan: 2585 m alt.; slope 55°; exposure SW 60°:

Syzygium besukiense (Miq.) Masam. (35.46)	*Myrtaceae*	arosip
Leptospermum flavescens Sm. (20.33)	*Myrtaceae*	mogawan
Dacrycarpus steupii de Laub. (12.93)	*Podocarpaceae*	
Lithocarpus woodii (Hance) A. Camus (12.62)	*Fagaceae*	oak
Eurya nitida (Korth.) Dyer (6.92)	*Theaceae*	salingsingan
Euodia reticulata Merr. (3.68)	*Rutaceae*	atipan
Vaccinium indutum Vid. (3.67)	*Ericaceae*	lusong
Macaranga dipterocarpifolia Merr. (3.29)	*Euphorbiaceae*	binonga
Cyathea fuliginosa (Christ.) Copel. (0.67)	*Cyatheaceae*	giant fern
Eurya coriacea Merr. (0.35)	*Theaceae*	big baltik
Clethra luzonica Merr. (0.09)	*Clethraceae*	amoweg
Ilex crenata Thunb. forma *luzonica* (Rolfe) Loes. (0.01)	*Aquifoliaceae*	

Pulag: 2640 m alt. (forest limit); slope 45°; exposure NW 80°:

Rhododendron subsessile Rendle (41.55)	*Ericaceae*	
Syzygium besukiense (Miq.) Masam. (25.8)	*Myrtaceae*	arosip
Eurya nitida (Korth.) Dyer (15.62)	*Theaceae*	salingsingan
Clethra luzonica Merr. (8.48)	*Clethraceae*	amoweg
Lithocarpus woodii (Hance) A. Camus (3.14)	*Fagaceae*	oak
Drimys piperita Hook. f. (2.49)	*Winteraceae*	inototan
Neolitsea microphylla Merr. (2.3)	*Lauraceae*	kawasi
Vaccinium sp. (0.62)	*Ericaceae*	

Pulag: 2715 m alt. (forest limit); slope 45°; exposure NE 45°:

Eurya nitida (Korth.) Dyer (43.11)	*Theaceae*	salingsingan
Lithocarpus woodii (Hance) A. Camus (26.25)	*Fagaceae*	oak
Cyathea fuliginosa (Christ.) Copel. (13.69)	*Cyatheaceae*	giant fern
Rhododendron subsessile Rendle (8.42)	*Ericaceae*	
Macaranga dipterocarpifolia Merr. (4.57)	*Euphorbiaceae*	binonga
Eurya coriacea Merr. (3.7)	*Theaceae*	big baltik
Drimys piperita Hook. f. (0.26)	*Winteraceae*	inototan

Discussion

The first 3 or 4 species in each altitudinal zone of the lists above are abundant and dominant in each site. *Pinus kesiya* is the most dominant at 2325 m altitude. This site has been known as the 'ecotone' by the forest officers in the area as this is the boundary between the mossy forest (from 2325–2715 m alt.) and the pure pine stand (below 2325 m alt.). The area is quite steep and pines grow well along deep creeks and gullies. Unlike the pines in the pure pine stand, however, they are well-adorned with mosses and lichens on trunks, branches and twigs in this zone.

Species composition in the succeeding altitudinal zones is more or less similar. This is also an observation in a qualitative investigation of Schoenig et al. (1975) on Mt. Apo in the southern Philippines, the country's highest mountain (2954 m alt.). *Lithocarpus woodii, Syzygium besukiense, Eurya nitida*, and *Dacrycarpus steupii* are the dominant species in these successive zones. *Leptospermum flavescens* is abundant and dominant, too, at c. 2585 m altitude. Its crown is so very prominent in the canopy that people call the place by its vernacular name, 'Mogawan'.

At elevations of 2640 and 2715 m (forest limit), some of the aforementioned dominants still occur but there is the addition of *Rhododendron* and *Cyathea*. *Vaccinium*, though not dominant in this zone, yet, is conspicuous because of its reddish colored leaves. Another remarkable species at this altitude is the dense dwarf bamboo, *Yushania niitakayamensis*, which practically covers 100% of the entire sampling area. This species, which is also present in the alpine prairies of Szechuan and Yunnan of mainland China (Santos, 1979) and in Taiwan at an altitude of almost 3600 m (Hsieh et al., 1994) dominates the grassland summit of Mt. Pulog. Santos (1979) reported its occurrence at high elevations (2580 m) on Mt. Halcon, Mindoro.

A paper on the diversity and community characteristics of the various zones of the mossy forest of Mt. Pulog is in preparation for publication.

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The Berau area – A case of extremely high botanical diversity in East Kalimantan, Indonesia

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During a 12-day field trip in October 1996, exploring the Flora of the Berau area, about 250 specimens with either flowers or fruits have been collected. Duplicate sets have been distributed to the Wanariset Herbarium (WAN) and the Rijksherbarium, Leiden (L), and part of the collection has been studied taxonomically in detail by several specialists. Even in the field it became at once obvious that the floristic composition of the Berau area is significantly different from the well-known lowland Mixed Dipterocarp Forest (MDF) found around Wanariset, Samboja, or at the PT ITCI concession area. Detailed studies of some families revealed that so far at least three new records for Kalimantan have been discovered.

Most spectacular is the collection of the first female plant of *Horsfieldia sterilis* W. J. de Wilde (*Myristicaceae*, nutmeg family), which was known only from a single male sheet collected a few years ago in Sabah. Within the same family another new record for East Kalimantan should be mentioned: *Myristica smythiesii* J. Sinclair ('pala hutan'), a rare species which seems to be relatively common in the Berau area. The *Myristicaceae* are very diverse indeed in the Berau forest. We collected 16 fertile specimens representing 3 genera and 10 different species.

The genera *Lophopetalum* and *Kokoona* of the *Celastraceae* family are known to the forester for their important light hardwood called 'perupuk'. In Berau we collected a small treelet of the genus *Euonymus* in the same family, namely *E. castaneifolius* Ridl., which also represents a species new for East Kalimantan. Its fruit is a capsule that splits open and shows the orange-red cup-shaped aril at the base of the otherwise black seed which will be certainly eaten and thus dispersed by birds or small mammals.

Within the *Oxalidaceae Sarcotheca rubrinervis* Hallier f. ('belimbing hutan') has been collected frequently. The sour dark red fruits are said to be a remedy for cough. This species has a very special distribution in Borneo. In Sabah it is only known from the Tawau area, in East Kalimantan the species has been recorded from few localities in Kutai and now also from Berau.

The family *Euphorbiaceae* comprises in Borneo alone roughly 80 genera and 350 species. The genus *Mallotus* is of special interest as some of its species are confined to primary forest as others usually only occur in secondary forest and thus behave as pioneers. One of the primary forest species which is very restricted in its distribution is *M. eucaustus* Airy Shaw. This tree has usually been identified as the very common *M. penangensis* Müll.Arg. but differs in the soft hairs on twigs and leaves and some other fruit characters.

The 'nyatoh' (*Sapotaceae*) family is economically quite important for the forester as several genera provide useful timber trees. With more than 40 species the genus *Palaquium* is the largest one. During this trip we collected the first specimen of *P. calophyllum* (Teijsm. & Binn.) Pierre with old flowers and fruits; in the past only two sterile specimens have been recorded from this area, although it is said to be a common species in the lowland of Peninsular Malaysia, Borneo, and Mindoro (Philippines), where it usually grows along rivers, never higher than up to 200 m altitude.

This short preliminary analysis already indicates the richness of the flora in the Berau area. We are far away from knowing or even understanding its whole diversity. Regular floral surveys should be conducted as a matter of urgency. It seems probably superfluous to mention that this area certainly should not be converted into oil palm plantations!

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FIELD WORK

Sumatra — Messrs. T. Uji and F.J. Windradi (BO) explored Bukit Reges, Kerinci Seblat National Park from 29 September to 13 October, 1996. They collected living material of fruit plants (6 spp) and orchids (19) for the Garden in Tahura, Bengkulu.

Java — Messrs. A. Sulaeman and T. Uji (BO) visited Gunung Andam, Gunung Beser, and Gunung Herang in the Gunung Halimun National Park between 21 and 31 August, 1996. They collected 92 species of 36 families of plants.

BORNEO (Kalimantan, Sabah, Sarawak)

Kalimantan — Dr. T. Basuki and Ismael and R. Yusuf (BO) studied the ecology and medicinal uses of plants near Desa Tanjung Lokang, Bentuang Karimun, Kabupaten Kapuas Hulu, West Kalimantan, 300–400 m alt., between 20 April and 10 June, 1996, funded by the MacArthur Foundation. 307 numbers were collected.

A second study was made by Dr. T. Prawiroatmodjo, Mr. H. Soedjito (BO), Ms. D. Wowor and others of the Museum Zoologicum Bogoriense with a grant of the WWF for basic data for a management plan. 210 numbers were collected.

An International Park has been proposed by joining the Bentuang Karimun and the Lanjak Entimau Parks of Kalimantan and Sarawak. An exploratory expedition, the ITTO Trans Borneo Expedition, financed by WWF and ITTO will be launched in July 1997 at the Borneo Festival and will take off in September. It is to last three months with c. 30 participants of many professions.

An ecological study in Gunung Palung, West Kalimantan, was carried out by Messrs. Ismail and E. Mirmanto (BO), and T. Laman (GH) in September and October, 1996.

Sabah — Dr. L.G. Saw, Dr. L.S.L Chua, Ms. A. Noorsiha (KEP), Dr. R. Kiew, Mr. Anthonysamy (UPM), and KEP staff made a collecting trip to the Tahan National Park near Merapoh between 30 July and 8 August 1996. In all, about 750 numbers were taken.

A collecting expedition to the ***Gunung Rara Forest Reserve*** in the southern part of Sabah, in the Kinabatangan District was conducted between 31 March and 11 April 1997. 18 botanists took part. In all, about 650 specimens were collected.

The *Lower Kinabatangan floodplain* possesses a rich array of natural habitats. Lowland Dipterocarp forests, riverine forests, freshwater swamps, forested mangrove, and limestone outcrops are the major habitats of this floodplain. These habitats have been identified by the Sabah Conservation Strategy (1992) as a very 'high priority habitat' for conservation because of their significance in supporting wildlife with many endangered species, and the intensity of disturbance they suffer from human activities.

Previous studies were on the wildlife; this will be the first systematic study of the habitats with particular emphasis on plant diversity and conservation. The major vegetation types and natural plant life will be documented. As part of the project the use and impact of human activities on the various habitats will be assessed. Another important component will be to assist the WWF-Malaysia staff's professional career development. This will take the form of a M.Sc. degree to be carried out during the project period.

The project is currently coordinated by Mr. R. Azmi (WWF-Malaysia Scientific officer) with the assistance and cooperation of SAN. The project started in January 1996 and is due to run until December 1998. So far, at least 600 collections have been recorded. Voucher specimens are deposited in SAN with duplicates in KEP, SAR, K, and L.

Major project activities for 1997 will include:

a) Intensive field surveys of selected habitats – 'structure and composition'.
b) Field and lab work for the M.Sc. study – 'taxonomic and ecological studies of *Ceriscoides* (*Rubiaceae*) in the Kinabatangan'.
c) Curation and identification of Kinabatangan plant collections.
d) Completion of plant checklist for the Lower Kinabatangan.

It is hoped that this project will serve as an important foundation for the development of effective management plans for the floodplain's natural habitats.

Sarawak — A party consisting of Messrs. A. Schuiteman, A. Vogel and Ms. T. Roelfsema (L) collected living orchids in Sarawak in March 1997 for cultivation in the Leiden Botanical Garden. Areas visited, mostly jointly with staff from the Forest Department, Kuching, also included the Kelabit Highlands around Bario and several localities near Kuching, e.g. Gunung Penrissen, of which the summit region was found to be partly cleared to accommodate a golf course. On Gunung Gading several specimens of *Amorphophallus hewittii* (including one c. 2 m tall) as well as *Rafflesia arnoldii* were seen in flower.

A collecting expedition to the *Bakun Hydro-Electric Dam area* was conducted on 11 through 28 August 1995. 14 botanists took part. A total of 752 specimens were collected.

Dr. L.G. Saw, R.C.K. Chung, A. Noorsiha, S. Julia (KEP) and staff from SAR made a collecting trip to the *Mulu National Park* between 26 February and 5 March 1997. In all, about 50 numbers were taken.

Moluccas — Dr. D. Darnaedi (BO) and M. Kato (TI) visited Ceram and Ambon from December, 1996, to January, 1997. They collected ferns, limestone plants and living material for cytological studies. They also collected material of the *Matonia* group for DNA studies.

New Guinea (Irian Jaya, Papua New Guinea)

Irian Jaya — Dr. H. Wiriadinata (BO) has been identifying the c. 500 collections made by Dr. G. Shea (Freeport MacRolan, Timika) since September 1996.

From June 1995 to June 1996 Mr. M. Polak (L) has carried out a vegetation study in Indonesia for his Ph.D. project 'Vegetation ecology and floristic biodiversity of the Bird's Head Peninsula, Irian Jaya', as part of the ISIR Programme, an interdisciplinary programme focusing on Irian Jaya. The study area was the Ayawasi (Ayfat) region, situated at 450–625 m altitude in the centre of the Bird's Head Peninsula and dominated by karst features (pyramid and doline). About 2700 collections were made, and for some groups seen by specialists several apparently represent undescribed species as well as poorly known species.

Papua New Guinea — The first expedition of the Department of Systematic Botany, University of Aarhus (AAU) to Papua New Guinea was undertaken in November–December 1996. The participants were Dr. A. Barfod (leader) and graduate student, Mr. A. Damborg. Collection officer Mr. M. Ferrero of the Flecker Botanical Garden in Cairns, Australia, joined the expedition and contributed with his expert knowledge of the palms and the Sepik. Fieldwork focused on the palms, in particular the coryphoid genera *Licuala* and *Livistona*. The expedition was organized in collaboration with the Christensen Research Institute in Madang. The provinces of East and West Sepik were visited. About 50 different species of palms were collected of which several do not match published descriptions.

PUBLICATIONS

Balgooy, M.M.J. van. — The first volume of a series of three entitled *MALESIAN SEED PLANTS* will shortly go to the printer. It bears the subtitle **'Spot-characters** – An aid for identification of families and genera' and contains illustrated lists of special characters which help to identify a large number of Malesian seed plants at least to family and often to genus. A few examples of spot-characters: plants with opposite compound leaves, plants with glands on petiole or lamina, cauliflorous plants, plants with winged fruits. Volume 2, **'Portraits of tree families'** is being prepared for publication and should come out early next year.

The **Department of Botany, University of Malaya (KLU),** has produced a beautiful glossy on its history, teaching, research aims, Ph.D. and M.Sc. theses (unfortunately without authors), publications, and botanic garden (Rimba Ilmu; with checklist of genera represented in the garden). Portraits, research interests, and selected publications are given of e.g. Drs. H. Nair, A. Nawawi, M.A. Majid, A. Salleh, A.N. Boyce, H. Ibrahim, H.C. Ong, M.Y. Musa, W.H. Noorma, and Ms. A.L. Lim.

Levelink, J., A. Mawdsley & T. Rijnberg. 1996. **Vier wandelroutes Botanische Tuin Bogor.** English version (not seen): **Four guided walks Bogor Botanic Garden.** A nice little booklet colourfully illustrated for four walks through the Kebun Raya, with also a brief history. Only the Dutch version was seen, but apparently there is a Bahasa version, too. Published by PT. Bogorindo Botanicus. ISBN 979-95078-1-2 for the Dutch one.

Ng, F.S.P. 1991. **Manual of forest fruits, seeds and seedlings** is now also available on interactive CD-ROM: CIFOR No. 1 (1996). Address: POB 6596, JKPWB, Jakarta 10065.

Nova Buxbaumia — Dr. W. Meijer (KY) and R. Priddle (Victoria B.C., Canada) have started a new journal for tropical cryptogamic studies in Southeast Asia. The first issue contains various reminiscences of the senior editor.

Rimba Ilmu (Garden of Knowledge) is a new newsletter published by the Botanic Gardens, Kuala Lumpur, and the Botany Department of the Universiti Malaya. It is planned as a quarterly. The first issue appeared October 1996. It gives brief histories of the Botany Department and the Garden, a survey of the Academic and Administrative Staffs; a method of tissue culture of *Asplenium nidus*; a discussion with uses of *Tacca leontopetaloides*; survey of the *Liliiflorae* in the Garden.

The **Tree Flora of Sabah & Sarawak 2,** comprising 23 families, 317 species and 39 new species was published in November 1996. Price: MR 120.00 (including postage by sea-mail) for purchasers in the Malesian region, and US$ 100.00 (including postage by sea-mail) for purchasers outside the Malesian region. Available from: Publication Division, Forest Research Institute Malaysia (FRIM), Kepong, 52109 Kuala Lumpur, Malaysia. Tel. 603-6342633; Fax 603-6367753; E-mail <razak@frim.gov.my>

Tree Flora of Sabah & Sarawak 3 — Work on the *Aquifoliaceae* (S. Andrews, K), *Cunoniaceae* (H. Keng, SING), *Hernandiaceae* (L.G. Saw, KEP), *Myristicaceae* (W.J.J.O. de Wilde, L), *Oleaceae* (R. Kiew, UPM), *Sapotaceae* (P.P.K. Chai, P.C. Yii, A.P. Abang Mohtar, A. Julaihi, M. Mohizah & S. Teo, SAR, Ms. A. Noorsiha, KEP, and Mr. J.T. Pereira, SAN) and 15 other families, together with c. 343 species is progressing well. The volume is scheduled to be published by the end of 1997.

Whitten, T., R.E. Soeriaatmadja & S.A. Afiff. 1996. **The ecology of Java and Bali.** The ecology of Indonesia series 2: xxiv, 969 pp., illus. Periplus Editions (HK) Ltd. ISBN 962-593-072-8. UK £ 50.00.

MacKinnon, K., G. Hatta, H. Halim & A. Mangalik. **The ecology of Kalimantan.** The ecology of Indonesia series 3: xxiv, 802 pp., illus. Periplus Editions (HK) Ltd. ISBN 0-945971-73-7. UK £ 50.00.

Extremely thorough accounts of these most important islands of Malesia. A must for all biologists concerned with the area. Much general information of tropical rain forest and its flora, fauna, and use by man.