VII. KEEP THE FORESTS KEEP THE FORESTS KEEP THE FORESTS!
The Kepong Round Table Conference on Dipterocarps

"Look, these are the modern trees", Kostermans remarked, pointing to some concrete piles lying near the Forest Research Institute. None of the participants could have missed the sad impression of a moonscape around Kuala Lumpur, which tells of the construction boom in Malaya. "In Thailand, timber production is nose-diving", said the Director General of Forestry over the dinner table, "in the Philippines, nose-diving!" In Malaya, where in the mid-1960's the government decided to convert the carefully managed forests into oil palm plantation, it has been discovered that no more timber may have been left by the mid-1980's. So it was none too soon to amass and review the available knowledge on Dipterocarpaceae with an eye on management of the timber resource. Naturally conservation, although not on the agenda, lurched constantly in the background and popped up at all sorts of points in the discussion.

The International Working Group on Dipterocarpaceae, which held its first Round Table conference at Paris in June 1977 (see the account in Flora Malesiana Bulletin 31, p. 3041-3047. 1978), assembled again from 27 June to 3 July 1980; organizers were Francis S.P. N g and S. K. Y a p. Participants numbered 56, from 8 countries; those from abroad were accommodated in the low-price FRI-hostel at Kepong, Selangor. Ms. Ming A n t h o n y sent her regrets from Strasbourg, where she was about to take her Ph.D. on a thesis about galls in this family; they occur only in Red meranti Shoreas. There were 11 more apologies, several from Japanese workers who had liked to come; Mr. Gen A r i h a r a was there anyway as an observer from the FAO Bangkok office. Several were enabled to come thanks to a UNESCO travel grant; without this, we would have missed some excellent contributions. Twenty-seven papers were delivered in 3 days, followed by 3 days of excursions. The organization was good; no one would have suspected that this was the FRI's first international meeting. It was opened by the Minister of Primary Industries, H. E. Dato Paul L e o n g Khee Seong, under whom Forestry resorts. Thereafter business started. Like in Paris, each session had a different chairman; that's why it was called a Round Table, although the large table in the conference room was actually U-shaped.

In Paris, emphasis had been on morphology and taxonomy; this time it was to be on physiology and ecology. In a brief keynote address, A s h t o n set forth the directions of future dipterocarp research:

- What is the trigger to flowering and how can it be stimulated?
- What opportunities exist for genetic improvement?
- How can clonal stock be produced for plantations?
- How about growing mixed stands, or monocultures?
- How to establish dipterocarps on waste land?

Inviolate conservation areas, he added, need to be identified and meticulously guarded as an integral part of land use policy.

J a c o b s, from Ashton's Flora Malesiana manuscript which is due for publication late in 1981 probably as a separate volume, had picked the

facts of the taxonomic and distributional framework, to give them in a couple of pages for the participants' information. A welcome supplement saw the light of this day, 27 June, since S m i t i n a n d, whose 60th birthday it was, had brought a number of copies of A manual of Dipterocarpaceae of Mainland South-East Asia, 133 p., illus. (1980); see the literature below. In his presented paper, S m i t i n a n d expounded silvicultural ecology. Five species, D. intricatus, D. obtusifolius, D. tuberculatus, S. obtusa and S. siamensis can be termed drought-loving; they fruit every year right after the annual fires, and the seedlings develop a hardy rootstock. Most of the silvicultural work in Thailand has been done on those species. The 'evergreen' ones play a more modest part.

Husband and wife C.V.S. & I.A.U.N. G u n a t i l l e k e from Ceylon presented a paper on Sinharaja, the last humid dipterocarp forest of the island, 21 by 7 km at 300-1050 m altitude, in which some 5000 ha of virgin forest remains. They measured 10,807 trees of 10 cm or thicker, and counted 184 species in 107 genera in 42 families, with a species endemism of 71%.

There was time to show a film, intended to promote the Sabah Timber Company, partner of the British firm Harrissons & Crossfield. We saw the carefulness by which the extraction operations are made as cheap as possible. Certainly the loggers are faced with technical difficulties, but these are overcome by the strength and good condition of their bodies and machinery. Thus we are made to believe that the firm contributes to progress. And while the loggers take their well-deserved rest and recuperation, we are told, the forest already starts regenerating.

K o s t e r m a n s, after two years in Ceylon, gave a talk off the cuff, and sent his text for the Proceedings later; both cover much the same ground. The forest area in Ceylon was halved after 1950; most is in the dry zone and this will be gone in the next 5 years. Plans provide for 12,134 sq.km of forest, 1/3 of it in national parks. Some 1590 sq.km is under rain forest; the famous Sinharaja Man And Biosphere Reserve has for a large part been badly logged. Cardamom cultivation on the forest floor, widely practiced, is disastrous as it destroys the seedlings, and reduces the life span of these 'skeleton forests' to that of the trees themselves. Nevertheless, some so-called foreign experts advised positively on this. Quite often such 'advisers' nowadays tell governments of rain forest countries what is thought they want to hear. We as scientists should by all means be honest, and not kindle false expectations. He also told about the too large plywood mill, installed by Rumanians, which now has to be fed on the remaining forest.

Most dipterocarp species in Ceylon have small areas, which owing to destruction are but approximately known. Water regime is the predominant ecological factor which influences natural occurrence. Fruit setting is precarious; dispersal apparently proceeds without animals and very slowly. A large part of the paper is devoted to taxonomic discussions: Kostermans holds it that Doona (from Sinhalese doon), with fleshy white inflorescences and twisted propeller-like fruits, should be kept apart from Shorea.

K u s w a t a Kartawinata reported on work N of Balikpapan, with 541

trees on a ha, 14 species of dipterocarps, a richness approaching that of Sabah forest. Koompassia excelsa is here regarded as an indicator for better soils, preferred by the shifting cultivator. T a n t r a reported on Dipterocarpus retusus forest in the SW. of Lombok. A comparison of soils between Bk. Mersing in Sarawak which is Tertiary basalt, and volcanic soils in Java and Bali reveals great similarity in dipterocarp population, the species being few and closely related; this may be more important than weather conditions.

Continuing our selection, we come to the paper by H a l l é & N g, on renewing processes in crowns through repetition of the tree's architectural model (called reiteration). The initial stage of tree growth obeys the inborn model (in Asian dipts mostly Model Roux, also Massart and Rauh; in Africa Troll occurs). Thereafter, through reiteration the crown becomes a colony of model repetitions; the start of this process also marks the end of the pole stage. Four classes of reiteration are distinguished; a) none at all, in Hopea acuminata, which therefore looks like a conifer, b) reiteration from plagiotropic branches in a lateral manner, which leads to many right angles in the branching pattern, like in Shorea mecistopteryx, c) ditto in an apical manner, resulting in an ogival shape of the crown, like in S. leprosula, d) a reversion from plagiotropy to orthotropy like in Dryobalanops aromatica. These lateral reiterations might be useful for vegetative propagation.

A fat paper by S a s a k i & M o r i on Growth Responses of Dipterocarp Seedlings to Light was in summary delivered by Ng. Direct light (in sunflecks, all-important to seedling growth), blue skylight, and reflected or filtered light, all differ in composition and make the subject a complex one, rendering extrapolations risky. Considerable unravelling is done in this paper, illustrated by many clear diagrams. The far-red parts of the spectrum are physiologically the most active, but are deficient in the forest understorey. Seedlings need moderate shade for optimal growth, but the best growth for each separate organ was attained at different shade levels. Shorea talura emerged from the experiments as a hardy, fast grower, ideal for plantations. And Y a p in a paper on seed storage found that this species is also exceptional in retaining its viability at 4° C for over 3 months. Most other species are far more sensitive, as M a u r y and company confirmed: seeds of D. humeratus remained viable 10 weeks after collection, but S. parvifolia perished in 4 weeks under all treatments.

It was one more reason to concentrate on vegetative propagation, which could make us independent from erratic fertility and precarious germination. Among those who made efforts in this field, S r i v a s t a v a seems to have achieved a breakthrough. In 4 species (3 genera) cuttings 15 cm long were taken from saplings and treated with IBA powder. Success was booked from 40% (in S. leprosula) to 100% (in S. bracteolata). Only saplings of a certain age supply the cuttings; twigs of adult trees are too hard, and humidity has to be controlled with utmost care.

Flushing and flowering were the topics of N g 's paper. He carefully analysed the flush patterns, in line with Hallé Oldeman Tomlinson, and their consequences for vegetative growth, especially the self-pruning so

important to obtain a long clear bole. He remembered that it was commonly thought that near the equator dipterocarps flower erratically, until Burgess (Mal. Forester 35: 103-122. 1972) established that there is always some ('sporadic') flowering; it starts in April and continues into May. Ng worked out the Kepong Flowering Index for Dipterocarps, i.e. the percentage of trees in a monitored population that flower for not the first time. In this case 86 trees in 53 species were closely watched the year round from 1972. The percentage carrying at least some flowers (there may be very few indeed) amounted in 1972 11.6%, and in the ensuing years 23.3%, 17.4%, 5.8%, 90.7%, 12.8%, 4.7%, 24.4%, 31.4%. Ng suspects the trigger of all flowering to be light rather than water stress; this tallies with "the sudden break at the end of the wet season, in January or February and this is usually the most pronounced climatic change in the year", as Holttum in 1940 already observed. Returning to flush, of which in Malaya there are two outbreaks a year, connected with rainfall and also with litter fall, it was expressed as a desideratum to set up a range of recording stations: one in Thailand, one in the very North of Malaya and one, most important, on the equator, i.e. in Indonesia.

Another long-standing mystery on which a light was cast, is pollination. Bees have been known as pollinators in Thailand, and in Neobalanocarpus, but the mass flowerings give rise to a notion that there must also be mass pollinators, notably insects which are always in supply and can multiply explosively; to attain this, they must be small. A p p a n a h & C h a n found just that. The 6 Shorea (Mutica) species they studied flower one after another, and for a couple of weeks each. At dusk, when the flowers open and emanate their strong fragrance, thrips land on them. They feed on the succulent petal tissue and on pollen. Minute oil drops make the grains stick on their body. When next morning the corollas, with their adnate stamens, are shed, the thrips inside land with them on the forest floor. Reproduction is fast. Towards dusk, they fly up, in spirals, and when there is some wind (never strong), they are blown sideways, to land in the flowers of another tree, where they preen the pollen grains off themselves. The paper gives so many facts in close and careful reasoning, that the authors seem really to have clinched the matter. They note resemblances between the flowers of Shorea and those of Calluna and Erica (Ericaceae) where thrips pollination was established previously: the flowers are nodding, actinomorphic, with somewhat succulent petals and horn-like connectives.

B e c k e r reported on observations about insect damage in seedlings. Those of S. maxwelliana suffer less, and from fewer insect species, than S. leprosula and S. acuminata, owing to its tougher leaves with more essential oils. The 3 species contain alkaloids, phenolics, saponins, and tannin, but the concentrations differ with age, and it is supposed that while S. maxwelliana concentrates on protecting its young seedlings, the other two spend more effort on fast growth in a gap. His wife, Marina W o n g, who had studied the effect of a large pulse of dipterocarp seedlings on non-dipts (notably Labisia, Myrsinaceae), found that such effects are most keenly felt on poor soils. The low soil fertility in Malaya may account for the poor undergrowth.

Mycorrhiza, another crucial topic for silviculture, was discussed by S h a m s u d d i n. Of the two recognized types, the endomycorrhiza seems to be ubiquitous, while ectomycorrhiza seems restricted to a few families, dipts among them, of which 40 species were studied. The feeder roots concentrate in the top layer, lack root hairs, and are surrounded by a mantle of hyphae resembling cotton wool, ramifying into the soil. There seems to be an increase of mycorrhiza uphill. Infection is airborne, common and fast; mycorrhiza growth is quick, but inoculation may give young plants a better start.

From the commercial sector, ITCI (better known as Weyerhaeuser) was represented by Mr. Purnomo Amidjojo, who delivered M i l l e r 's paper on Growth and yield after logging in East Kalimantan (where the firm has a 6000 sq.km concession W of the road Balikpapan-Samarinda). The company, who makes a point of complying with all the rules and agreements, and of taking a long-term view*, established permanent plots in 1972, and from 1976 systematically collected data. What emerges from the tables presented is that "the wide variation in stand growth rates emphasized the difficulty of defining management regimes for specific areas of the concession that have received varying degrees of logging intensity and are on different slope positions, soil types, etc."

Speaking of logging, A b d u l h a d i e.a. from work at Lempake near Samarinda, revealed that with the extraction of 7 trees/ha about 40% of the residual trees suffered damage, especially those of 10-20 cm Ø. Logging left about 30% of the ground bare and damaged, with a lower degree of water permeability. Secondary species, of which 51 were counted, dominated the regrowth.

Concern about 'Management and Conservation' was aptly worded by Lukito D a r y a d i, Director of the Indonesian Conservation Service PPA. He called upon the Working Group for advice on how to establish small genetic resource conservation areas within timber concessions in Kalimantan, and made a job offer for 3 years worth $ 140,000, for which the Working Group was requested to nominate a person.

Discussions were animated and fruitful. We give some one-sentence samples. Marquesia was reported from true rain forest in Gabon. A branch of Stemonoporus moonii from Ceylon was shown, the tip densely covered with medium-sized, young, drooping leaves. Dipterocarpus zeylanicus is common in Ceylon, and planted as a wayside tree in Indo-China, has fairly rough wood and may be useful for chipping. Of D. hasseltii (the Lombok one) the fruits have medicinal value and this may be why trees are saved from cutting. Sunflecks are an essential source of light to seedlings, although apparently they can resist darkness for two months. Many dipts in everwet zones seem quite capable of hybridization. In dry regions, regeneration from stump is not unusual. Apomixis still presents problems; in S. macroptera it may partly replace pollination: this species is the

* Meanwhile, we have learned that most of the expatriate staff of the firm has been replaced by Indonesians, that there has been a cutback in investment, and that as a consequence reforestation and research on the above lands are in jeopardy.

first to flower, when thrips population may still be meagre. It was agreed that much more needs to be invested in practical means of vegetative propagation. As far as we know, this works only in evergreen species, of which the sucker shoots are needed. Success may be influenced by starch content in the inner bark. Considerable pessimism was expressed about the future of forestry in Malaya. After a silvicultural system was worked out for Red Meranti Lowland Forests in Malaya, the Government allowed these to be converted into oil palm and rubber.* Now the Hill Dipterocarp Forests come up for exploitation, and we are unable to regenerate them.

Had Ming A n t h o n y been present, the discussion would probably have had one more dimension, in view of her work on growth induced from outside, namely by action of gall insects. She cultivated in vitro leaf fragments of Shorea curtisii (with a portion of midrib in them) and obtained root growth. This was expounded in her thesis, first article, p. 10-11; see the Literature list.

The last session, presided over by A s h t o n, affirmed that the Working Group should remain an informal, flexible group of scientists, although it was held that a more official organization would have attracted more participants from the Philippines, and we could have learned more about their dipterocarp centre at Bislig in Mindanao (Fl. Males. Bull. 33: 3417. 1980). (The Secretary sent out circulars in a similar manner to dipterocarpologists in the Philippines as elsewhere. Two Filipinas did attend, but as at the time they were with BIOTROP, Bogor, they were listed as from Indonesia.) Dr. S a l l e h bin Moh. Nur, Director of the FRI and host to the conference, expressed his willingness to extend the facilities at Kepong towards further study of the dipterocarps, as a centre, while affirming the value of regional work and of international participation. This seems indeed a wise and natural thing to do. Although elsewhere in the dipterocarp region somewhat local feelings and ambitions may live, the Kepong institute is most favourably situated, with the longest research record and the finest herbarium. And more herbarium space is being created: when in August I came back, the concrete piles had been driven in to form its foundation!

A suggestion was made to take as a new theme: management of dipterocarp forest, with research aspects; however, since this is already under study in various quarters, it was felt that the Working Group has most to contribute as biologists. A great majority (32 yes, 2 no, 3 blank) was in favour of holding another meeting, along the general lines of this one, within a few years; as a location, the Philippines was favoured by 12, Thailand by 8.

* A revealing report on these conversions is Forest Development, Peninsular Malaysia, v + 119 p., 10 maps (FO: DP/MAL/75/012, Terminal Report, of United Nations Development Programme, Kuala Lumpur 1978). In detail, it shows that outside the national parks next to no primary lowland forest (i.e. below 300 m) is scheduled to remain intact. In my opinion, if the Malaysia Government has any sense, it will freeze all conversion, and conserve any bit of forest left. The present course is, indeed, nose-diving.

In response to D a r y a d i 's request to nominate a worker for dipterocarp reserves in Kalimantan, Jacobs was commissioned to handle this matter in consultation with a few members*. As Secretary, he was replaced by Dr. Géma M a u r y, Ecologie, 4 Avenue du Petit Château, 91800 Brunoy, France, who will serve till the next meeting inclusive.

The hospitality of the Forest Research Institute — which happened to occupy its present buildings just for half a century — will long be remembered. There was a barbecue at the Director's house, two lunches in the Arboretum, and a dinner at the Yasmin Restaurant in Kuala Lumpur, followed by Malayan dances with eventually the participants joining in. In the hostel in the Arboretum, the participants from abroad found a simple but pleasant accommodation, and the cordial atmosphere was enhanced by the simultaneous birthdays of Ashton, Kostermans, and Maury, all on the 1st of July.

The Arboretum itself, around the F R I, was interesting enough, especially the tall kapur trees, Dryobalanops. They have a clearly visible point of inversion, where the big branches start their development, and the crown divides into re-iterating sub-crowns. This point — which marks the transition from pole to mature tree — may be as much as 30 m above the ground. Also the remarkable phenomenon of 'crown shyness' was well visible: between crowns of conspecific neighbouring trees, or even between sub-crowns of the same tree, a space remains open 1-2 feet wide. Ng, who wrote a brief paper on it in Nature Malaysiana 2 (1977, April) 34-37, with a few fine photographs, thinks that the crown tips are able to "sense, by the balance of light and shade, that an obstruction is near". But nothing seems yet to be known for certain.

Three more days were devoted to excursions. These gave us a fine view on the oil palm and rubber estates which cover the country to such an extent that plots of the famous Regenerating Forest under the Malayan System are now few and far between; Merlinau and Senaling Inas Sample Plot 27 were visited. The trip ended in Pasoh, the well-known reserve (see the special issue of the Malayan Nature Journal 30, 2. 1978), where Becker & Wong, alas, were about to leave the research station, for a stay in the United States.

It was arranged that a presentation of forest officers from the States in Malaya would come, for a talk on conservation. (In Malaya, the States have a great autonomy in their land use, and are far less inclined to conserve their resources than the Federal Government is.) In a few spontaneous talks, dipterocarpologists expounded the value of the forests in Malaya for minor products and other non-timber purposes. And in the visitors' book in the Pasoh Station, Kostermans wrote down three times: KEEP THE FORESTS!

* On behalf of the Working Group, after deliberation and enquiry, an American was nominated. However, those in charge of the WWF project Indonesia nominated an Indonesian and, notwithstanding arguments on the part of the Working Group, let their choice prevail.

The Proceedings of the Second Round Table are in preparation. They will appear in the Malaysian Forester, as Volume 34 parts 2-3 combined, about September 1981. The price will be c. Mal.$ 15; place orders with the Business Manager, Malaysian Forester, Forest Research Institute, Kepong, Selangor, Malaysia.

Here follows an account of dipterocarp literature published after the First Round Table: (no editor indicated, actually G.MAURY-LECHON) *Diptérocarpacées / Taxonomie-Phylogénie-Ecologie / Paris 14-17 juin 1977*. Mém. Mus. Hist. Nat. (Paris) B 26, 162 p. (dated 1979, publ. March 1980)*. Quarto size, paper cover.

Account of the First Round Table, containing 18 papers and 4 summaries of discussions, also signed. To most papers (except the very short ones) summaries in English and French are added. We list all items, with an occasional note.

ASHTON,P.S. *The generic concept adopted for recent revisions with Dipterocarpoideae*, p. 128-138, 4 tables, 1 fig. Includes historical notes.

ASHTON,P.S. *Phylogenetic speculations on Dipterocarpaceae*, p. 145-149, 1 tab. Both inside and outside the family. In a postscript, editor disagrees with Ashton's interpretation of her data on pollen and fruits.

ASHTON,P.S. *Final discussion*, p. 159-162. Critical taxa, aspects, problem areas, collaboration.

AWASTHI,N. *Fossil Dipterocarpaceae*, p. 151.

BRAZIER,J.D. *Classifying the Dipterocarpaceae: the wood technologist's view*, p. 76-80 + 12 phot. + 1 tab.

HALLÉ,F. *Premières donnés architecturales sur les Diptérocarpaceae*, p. 20-34, fig. 1-11 + 12-14. Species assigned to model; reiteration, crown shyness.

JONG,K. *Morphological problems and ecological aspects*, p. 157-158. Summary of discussion.

JONG,K. & A.KAUR, *A cytotaxonomic view of the Dipterocarpaceae with some comments on polyploidy and apomixis*, p. 41-49 + 3 fig.

KOENIGUER,J.C. *Remarque sur les fossiles eurafricains de Diptérocarpaceae*, p. 150.

MAGUIRE,B. *Pakaraimaea dipterocarpacea*, p. 19. Mention of his paper in Taxon 26 (1977) 341-385.

MAURY-LECHON,G. *Conséquences taxonomiques de l'étude des caractères des fruit-germinations, embryons et plantules des Diptérocarpacées*, p. 81-106, 16 fig., 20 tab. An imbricate and a valvate group informally proposed.

MAURY-LECHON,G. *Interprétation phylogénique des caractères des pollens, fruits-germinations, embryons et plantules des Diptérocarpacées*, p. 139-144 + 49 fig. Microscopical characters. Like the former an extract from author's thesis, reviewed on *pages 3253-3254*.

* Price: 250 French Francs. Orders to Service des Publications du Muséum, 38 Rue G. Saint Hilaire, 75005 Paris, France. Payments to CCP Paris 9062--62Y, Bibliothèque Centrale du Muséum, same address.

MAURY-LECHON,G. & J.F.PONGE, *Utilisation de l'analyse multifactorelle des correspondances pour l'étude des caractères des fruit-germinations, embryons et plantules de Diptérocarpacées*, p. 107-127, 8 fig. Mathematical analysis of some character correlations.

MEIJER,W. *Taxonomic studies in the genus Dipterocarpus*, p. 50-56, 3 tab. Reflexions on characters.

MULLER,J. *Pollen size in Dipterocarpaceae*, p. 35-40. Related to flower size; many samples.

MULLER,J. *Summary of fossil Dipterocarpaceae*, p. 156. Brief discussion.

OURISSON,G. *Chimie-taxonomie des Diptérocarpacées*, p. 57-66, many formulas. On p. 66-67 notes on Pakaraimaea and Monotes.

PARAMESWARAN,N. *Relationships of the family Dipterocarpaceae*, p. 155. Summary of discussion.

PARAMESWARAN,N. & H.GOTTWALD, *Problematic taxa in the Dipterocarpaceae. Their anatomy and taxonomy*, p. 69-75 + 6 fig. Seven cases discussed; no taxonomic alterations.

SMITINAND,T. *Present classification of Dipterocarpaceae from Thailand and Indochina*, p. 11-13. List of alterations that were made.

VIDAL,J.E. *Ecologie et répartition géographique des Diptérocarpacées indochinoises*, p. 14-18, 1 tab. Species discussed and occurrences tabulated.

WHITMORE,T.C. *Bark morphology and taxonomy of the Dipterocarpaceae*, p. 68. Summary of earlier work.

O t h e r p u b l i c a t i o n s :

ANTHONY,Ming (1974) *Cécidogenèse comparée de deux galles de Coccides (Gallacoccus anthonyae Beardsley et Gallacoccus secundus Beardsley) développées sur le Shorea curtisii Dyer ex King (Diptérocarpaceae)*. Marcellia 38: 99-144, 23 fig.

Anatomy of development of a modified bud, and of a cone-like modified shoot. English summary given.

ANTHONY,M. (1977) *Morphological and anatomical comparison of normal and cecidial shoots in Shorea curtisii Dyer ex King*. Marcellia 40: 181-192, 35 fig.

The insects induce transformation to short-shoots, which differ in physiological state from the long-shoots. Their apex retains its juvenile functioning. Discovery of two long, narrow bud scales curved like a helmet, and early caducous.

ANTHONY,M. (1980) *Etude des bourgeonnements epiphylles determinés par l'action d'eriococcides cécidogènes chez les Diptérocarpacées du genre Shorea* (thesis, Strasbourg); mimeo.

Contains 7 separate papers on galls in Shorea. The first paper bears a rather similar title; it deals with the formation of two types of gall on leaves, of importance for vegetative propagation, as noted above. The others are published and reproduced, or in press and in typescript form. They followed a general paper by this author on galls of Singapore Island, *Contribution to the knowledge of cecidia of Singapore*, Gard. Bull. 27 (1974) 17-65, 18 fig. + 13 pl.

ANTHONY,M. (1980) *Comparative study of the rates of organogenesis of normal and cecidial shoots in Shorea curtisii Dyer ex King (Dipterocarpa-*

ceae). Flora 169: 365-375, 14 fig.

Normal buds failed in vitro; the apex of the cone-like gall is capable of further growth.

ANTHONY,M. (1980) *Effet du Gallacoccus secundus Beardsley (Eriococcidae) et de sa galle en bourgeon epiphylle sur les bourgeons de la plantule du Shorea curtisii Dyer ex King (Diptérocarpaceae).* Bull. Soc. Bot. Fr. 127 Actual.: 47-56, 3 pl.

Gall infection near the terminal bud of a seedling inhibits it.

ANTHONY,M. (in press) on bud galls in Asian dipterocarps, their distribution and implications. Bot. J. Linn. Soc. Lond.

ANTHONY,M. (in press) *Etude préliminaire sur le developpement des bourgeons végétatifs des plantules du Shorea curtisii Dyer ex King (Diptérocarpaceae).* Bull. Soc. Bot. Fr.

The endogenous rhythm that governs growth results from competition between the maturing leaves and the meristem that produced them.

ASHTON,P.S. (1978) *The biological and ecological basis for the utilisation of dipterocarps.* Papers 8th World Forestry Congress (Jakarta 1978) FQL 26-16; 14 p., 1 phot. Reviewed on *pages 3216-3217.*

ASHTON,P.S. (1980) *Dipterocarpaceae.* In Rev. Handb. Fl. Ceylon ed. New Delhi 1: 364-423. Text newly set from ditto, ed. Peradenyia 1 (1977) 166-196.

CHAN,H.T. & S.APPANAH (1980) *Reproductive biology of some Malaysian dipterocarps/I: flowering biology.* Malays. Forester 43: 132-143, 2 fig., 1 tab.

Stages of flowering and synchronization in 6 Shorea sp., flower construction, pollen, stigma receptivity, thrips pollination.

GAN,Y. et al. (1977, Sept. 22) *Genetic variation in wild populations of rain-forest trees.* Nature 269: 323-325.

Chemical analysis by electrophoresis of Xerospermum (Sapindaceae) and Shorea.

HAYNES,E. (1980) *Dipterocarps Part 1 / Covering literature abstracted from 1939 to 1972,* 121 + 3 p.; ditto *Part 2 /* the same *from 1973 to 1979,* 121 + 3 p. (both April 1980). Commonwealth Agricultural Buraux, Slough SL2 3BN, England. Paper, £ 11 and £ 8.80 respectively in England, plus 10% postage abroad.

Covers all aspects of the family in the Old World, in 22 categories. Together, Biology, Vegetation types Ecology Geography Reserves, Anatomy Taxonomy Identification, Chemistry, Soil Litter Water relations Runoff, Silviculture and Management amount to 438 entries out of 1078 in Part 1 (printed from Forestry Abstracts) and 169 entries out of 508 in Part 2 (offset from typescript). The remainder is devoted to wood technological subjects. There is some emphasis on India and sal, Shorea robusta. Dutch titles are accurately copied. Extensive, knowledgeable, well-worded summaries are given. Missing are some papers by Anderson, Anthony, van Slooten. But what a gold mine!

KAUR,A. et al. (1978, Feb. 2) *Apomixis may be widespread among trees of the climax rain forest.* Nature 271: 440-442.

Proven in Shorea agami, S. ovalis, S. sericea, strongly suspected in Hopea latifolia, H. odorata, H. subalata, and in S. macroptera and S. resinosa. Cytological data given, also of other species, all in Malaya.

KOSTERMANS,A.J.G.H. (1980) *Notes on Ceylonese plants I.* Landbouwhogeschool Wageningen Misc. Pap. 19: 205-230, 5 fig.

On p. 207-219 a description of 5 new sp., Stemonoporus angustisepalus, S. bullatus, S. gracilis, S. kanneliyensis, S. latisepalus, with notes on others in this genus; disagreements with Ashton.

LIU,Lun-hui & You-de YU (1980) *Study of the Shorea forest and its phytocoenological characters in western Yunnan.* Acta Bot. Yunn. 2: 451-458, 1 fig., 3 tab.

Below 600 m in Jie-Yang valley, 24°40' N 97°34' E the forest (profile given) contains Dipterocarpus pilosus and D. turbinatus. Several other species are listed. In Chinese; English summary on p. 458.

MAGUIRE,B. & P.S.ASHTON (1980) *Pakaraimaea dipterocarpacea II.* Taxon 29: 225-231, 2 fig.

More localities, ovary and seed dissected, place in Tiliaceae denied but T. and D. may be one family.

MAURY,G. (1979) *Intéret systématique et phylogénique des caractères juvéniles (germination, embryon, mûr plantules) chez les Diptérocarpacées.* Bull. Soc. Bot. Fr. 126 Actual.: 13-21.

Discussion, no formal taxonomic proposals.

MO,Sin-li (1980) *A new species of Vatica from Guangxi (Dipterocarpaceae).* Acta Phytotax. Sin. 18: 232-233, 1 fig.

V. guangxiensis from S. China, Kwangsi, Napo. Resembles V. odorata but leaves 6-17 by 1.6-4 cm, with 15-20(-25) nerves. In Chinese, Latin descr.

MORI,T. (1980) *Physiological studies on some dipterocarp species of Peninsular Malaysia as a basis for artificial regeneration.* FRI Kepong Res. Pamph. 78, iv + 76 p., fig., tab. Mimeo.

Contains four papers, a. Light requirement of seedlings of four species (D. oblongifolius, H. helferi, S. assamica, V. odorata); b. Effect of starch reserves on survival and growth of dipterocarp transplants with special reference to bare-root planting; c. Estimation of light conditions on forest floor by fish-eye photographs; d. Effect of storage temperature on longevity of some dipterocarp seeds.

NG,F.S.P. (1978) *Strategies of establishment in Malayan rain forest trees.* In P.B.Tomlinson & M.H.Zimmermann (ed.), Tropical trees as living systems, p. 129-162, 9 fig.

Germination types of dipterocarps and others. See also *pages 3254-3255.*

NG,F.S.P. (1980) *Gregarious flowering of dipterocarps in Kepong 1976.* Malays.Forester 40: 126-137.

SASAKI,S. et al. (1979) *Some observations on unusual flowering and fruiting of Dipterocarps.* Malays. Forester 42: 38-45.

Covers 4 years in Malaya. See the critical note by F.S.P.Ng in vol. 43 (1980) 128-131, 1 fig.

SASAKI,S. (1980) *Growth and storage of bare-root planting stock of dipterocarps with particular reference to Shorea talura.* Malays. Forester 43: 144-160, 7 fig.

Nursery tips. Seedlings of this species can be propagated vegetatively. Hopea odorata also promising.

SMITINAND,T. et al. (1980) *The manual of Dipterocarpaceae of mainland South-East Asia,* 133 p., 15 fig., 6 pl., 5 tab. (Royal Forest Department, Bangkok 9, Thailand). Price unknown, probably inexpensive.

Covers Burma, Thailand, Laos, Cambodia, and Vietnam, and deals with 76 sp. in 8 genera, of which the distribution and wood properties are tabulated. After brief notes on ecology and characters, keys are given, also under the genera, after Symington. Under the species is given: nomenclature, area, ecology, vernacular names, field description, drawing of leaf and fruit. New is Shorea siamensis var. tomentosa (Craib, formerly under Pentacme suavis) Smitinand, on p. 67. Notes on silviculture and utilization are given. References 67.

Comparison with the forthcoming Flora Malesiana text will reveal some minor differences. Neobalanocarpus is here still called Balanocarpus; Cotylelobium melanoxylon is now C. lanceolatum and includes C. malayanum; Hopea avellanea is reduced to H. pierrei and H. siamensis to H. pedicellata. Ranges of several species can be extended in both publications. The paper by J.E.Vidal, Mém. Mus. Hist. Nat. (Paris) B 26 (1980) 14-18, is to be checked against this.

Very useful, worth having. Biographical note and portrait of Smitinand on the back flap.

SOMEGO,M. (1978) *Cytogenetical study of Dipterocarpaceae*. Malays. Forester 41: 358-366.

Counts of 39 sp. made in Malaya. In Parashorea 2n = 14, in Upuna 2 = 22. Perhaps x = 10 is derived from x = 7; both may occur in Hopea.

WOON,C. & H.KENG (dated 1979, received 1980) *Observations on stamens of the Dipterocarpaceae*. Gard. Bull. 32: 1-55, 31 fig., 1 pl., 2 diagr.

From dried specimens, 45 sp. in 13 genera, purely descriptive. Evolutionary trends discussed.

WYATT-SMITH,J. (1979) *Management research of Philippine dipterocarp forest*, xii + 144 p., 4 fig., 15 tab. (FAO, Rome, project FO: DP/PHI/72/006, working paper 14).

Reviewed on *pages 3416-3417*.

Postscript: An unknown dipterocarpologist at the time was Mr. J. M. F u n d t e r, Hinkeloord, Foulkesweg 64, Wageningen, The Netherlands. He is a wood technologist, who just completed a book entitled *Trade and local names of the dipterocarp woods and timbers from South East Asia*; this will be published by PUDOC, Box 4, Wageningen, early in 1981. It is a reference work which covers the whole dipterocarp area east of Africa and aims at completeness. In the preparation, the author consulted Ashton's FM manuscript for the botanical names. Besides the names, it lists durability class and volume weight, by country since differences are known to occur. Hereafter, Mr. Fundter intends to prepare a work on the wood anatomical properties of the dipterocarps.

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