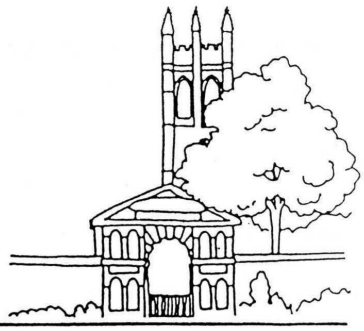
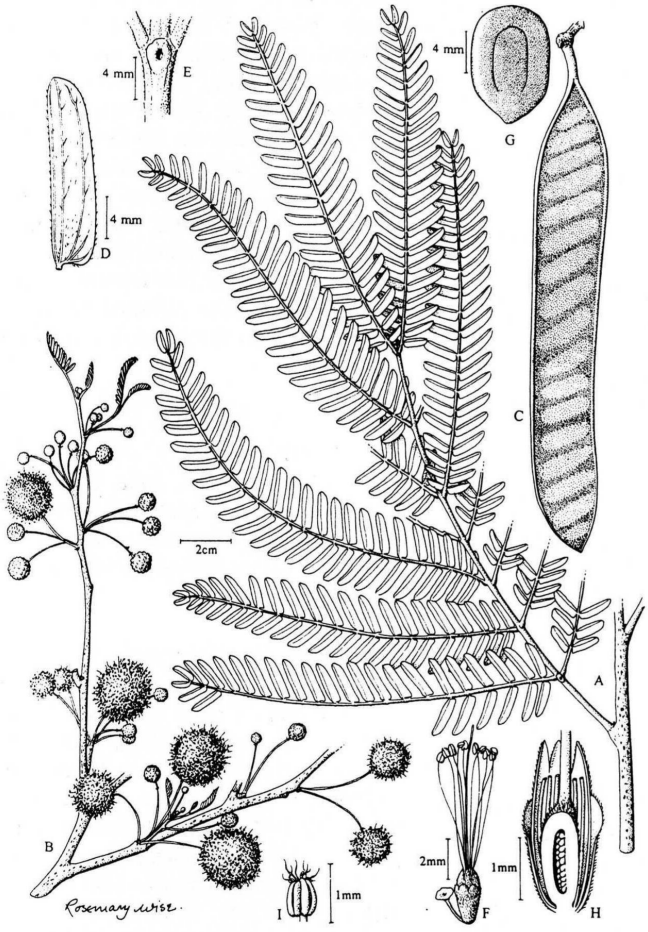
Oxford Plant Systematics



With news from Oxford University Herbaria (OXF and FHO), Department of Plant Sciences, Oxford

OPS 6 December 1998



Leucaena salvadorensis Standley ex Britton & Rose. Since 1928 the status of *L. salvadorensis* has been questioned by several authors. Excluding the type specimen, collected in 1924, only three botanical collections of *L. salvadorensis* were made prior to 1980. Since then, more intensive sampling across its restricted range in eastern El Salvador, southern Honduras and northern Nicaragua has clarified its status as a distinct species within the *L. shannonii* alliance. Sampling and species delimitation in *Leucaena* are discussed in the article on pages 4-6.

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Editorial

In the past year activities within the systematics group at Oxford Plant Sciences reflect the broad range of taxa being tackled using various data sets and approaches. The families being researched include; Acanthaceae (Bennett, Carine, -Moylan, Scotland), Cyperaceae (Starr), Fabaceae (Chikuni, Harris, Hughes), Lamiaceae (Steane, Scotland), Pinaceae (Lledo, Harris), Plumbaginaceae (Lledo), Rosaceae (Robinson). The range of research includes species delimitation, field work, taxonomic accounts, plant anatomy, monographs, DNA sequencing, systematic methodology and biodiversity studies. Field acivities this year have taken place in Africa, Honduras, Java, Mexico and Kazakhstan. Denis Filer updates his activities with the BRAHMS database on pages 13-14. It is exciting to see larger outputs being produced using BRAHMS including checklists for the Conifers and Mount Cameroon - also, the collaborative work with the Dutch Herbaria and the development of their integrated National Herbarium specimen database, the types now published on the internet. BRAHMS development continues apace. Alison Strugnell received a fellowship from the Winston Churchill Memorial Trust to carry out further research on the checklist of Mount Mulange, see pages 8-10. This year also sees the publication of two excellent pieces of work from botanists in the department. Rosemary Wise's book entitled *A Fragile Eden. Portraits of the Endemic Plants of the Granitic Seychelles* has been published by Princeton University Press. Colin Hughes's monograph of *Leucaena* has been awarded the prestigious De Candolle Prize from Geneva and is published in the Systematic Botany Monographs series.

Robert Scotland

News Items

Prize

The *De Candolle Prize* was awarded to **Colin Hughes** for his monograph of *Leucaena* by the Société de Physique et d'Histoire Naturelle, Geneva. Colin received his prize in Geneva in late Novemeber and presented a talk entitled *To be or not to be a botanical monographer?* to the Société which will be published in the *Archives de Science*.

Biodiversity work for DFID

William Hawthorne and **Colin Hughes** carried out two short pieces of work for DFID, the Department for International Development, on aspects of forest biodiversity during the year. In the Mexican State of Quintana Roo they completed a report - *The Bioquality of the Forests of Quintana Roo* -for the DFID-assisted Quintana Roo Forest Management Project, based in Chetumal. The report presents a preliminary assess-ment of the potential impacts of road building and forest logging on forest biodiversity. They also participated in the DFID *Linking Policy and Practice in Biodiversity* Project, compiling an Issues Paper entitled *Forests, Biodiversity and Livelihoods: Linking Policy and Practice.*

Jamie Gordon and William Hawthorne

Research continues on the DFID funded project: *Conservation through Use of Tree species Diversity in Fragmented Mesoamerican Dry Forests.* Research activities in the first year focussed on field work in southern Honduras and these data are now being analysed. Research in the second year of the project is concentrating in Oaxaca (Mexico). We look forward to an article in next year's issue outlining the aims and progress of the project.

Millennium grant

Robert Scotland received a millennium grant from the Public Understanding of Science fund administered by the British Association. The grant is to work with St. Ebbe's First School to buy plant presses, build an herbarium and teach the children some basic botany in the local nature reserve.

Publication of a *Festschrift* in memory of Frank White

Four of the former research students and associates of the late Dr. Frank White, Distinguished Research Curator of Oxford University Herbaria, have collaborated on a book inspired by their late colleague. It has now been published by the Royal Botanic Gardens Kew, 1998. The book by H.C.F. Hopkins, C.R. Huxley, C.M. Pannell, G.T. Prance and F. White is entitled *The Biological Monograph. The importance of field studies and functional syndromes for taxonomy and evolution of tropical plants.*

Rosemary Wise

Oxford Plant Systematics 2 contained an article by the departmental botanical illustrator Rosemary Wise on the Endemic Flora of the Granitic Seychelles, a project that had occupied her free time since 1985. The results of this study have now been published by Princeton University Press (1998) in a large format book containing comprehensive text and 80 colour plates of all the endemic flowering plants. It is entitled *A Fragile Eden. Portraits of the Endemic Plants of the Granitic Seychelles.* Plans are now being made to translate the book into Japanese.

Serena Marner was invited by the Director of the Royal Collection to the Private View of the Exhibition *Mark Catesby's Natural History of America : The Watercolours from the Royal Library, Windsor Castle* at the Queen's Gallery, Buckingham Palace on 28 October 1998. The exhibition will be running until 10 January 1999. Mark Catesby (1682-1749) was a naturalist and artist who studied the flora and fauna of Carolina, Florida and the Bahamas in the early 18th century. A large number of specimens collected by him are preserved in the Sherardian Herbarium of OXF.

Julie Hawkins

Congratulations to Dr. Julie Hawkins, a former research student at Plant Sciences, in being appointed University Lecturer in Systematics at the University of Reading.

News from the Xylarium

The latest version of the Department database 'PROSPECT' now has colour images of over 1100 timber species which have been scanned from samples in the xylarium. PROSPECT (**P**rogrammed **R**etrieval **O**f **S**pecies by the **P**roperty and **E**nd-use **C**lassification of their **T**imbers) is a computer database designed to provide information on timber species from all areas of the world. It has been developed at the Oxford Forestry Institute over the past 15 years.

Crowood Press will be publishing a book shortly on 100 timbers and their properties for wood users, using 300 colour images supplied from samples in the xylarium.

Ian Gourlay

Student progress

Jonathan Bennett (D.Phil., second year). A systematic study of *Strobilanthes* Blume (Acanthaceae) from Java. Supervised by Robert Scotland and Alan Paton (Kew). BBSRC studentship. *Strobilanthes s.l.* comprise a major part of the flora in the mountainous regions of Indonesia. A field trip to Java was recently undertaken during September and October, working in collaboration with botanists from Herbarium Bogoriense. Collections of eighteen species of *Strobilanthes*, and the allied genera *Sericocalyx* and *Hemigraphis* were made. Work is continuing on species delimitation and investigating species relationships using micromorpholical and molecular techniques.

Mark Carine (D.Phil.). Systematics of *Stenosiphonium* Nees in relation to *Strobilanthes* Blume (Acanthaceae). Supervised by Robert Scotland and Mark Chase (Kew). Work during the past year has focused on the use of morphological data to resolve species relationships in *Strobilanthes*. More generally, the utility of morphological data for investigating species relationships in species rich plant taxa has been evaluated, focusing on issues of resolution and accuracy.

Augustine Chikuni (D.Phil.). A taxonomic study of *Brachystegia* Benth. (Caesalpinioideae-Leguminosae). Supervised by Stephen Harris and Brian Schrire (Kew). The major objective of the project was to provide a revision of *Brachystegia* addressing, in particular, issues of generic and species delimitation and an assessment of hybridization within the genus. Morphology provided the major source of taxonomic data and was supplemented by molecular data (additivity of RAPD markers) to test hypotheses of hybridization. The research is now near completion and was sponsored by the Commonwealth Scholarship Commission.

Elizabeth Moylan (D.Phil., first year). Systematics of *Hemigraphis* Nees in relation to *Sericocalyx* Bremekamp and *Strobilanthes* Blume (Acanthaceae). Supervised by Robert Scotland (Oxford), Toby Pennington (Edinburgh) and Paula Rudall (Kew). Druce Scholarship. *Hemigraphis* comprises approximately 90 species with a distribution from peninsular India across Malaysia, Indonesia and Australia. Research will focus on species delimitation of *Hemigraphis* in the Philippines where approximately 25 species are thought to occur. Work began in January investigating macromorphological characters and micromorphological characters (scanning electron microscopy of pollen and seed morphology, anatomical sectioning of seeds and flowers) to help resolve species delimitation problems. Molecular trials are currently underway assessing the potential of herbarium material for DNA extraction. DNA sequence data will be used in conjunction with morphological data to clarify species and generic boundaries and resolve relationships between *Hemigraphis* and the closely related *Sericocalyx*. Molecular work will continue following collaborative fieldwork with the Philippine National Museum in February 1999.

Julian Starr (D.Phil, second year). A systematic study of *Uncinia* Pers. (Cyperaceae). Supervised by Stephen Harris and David Simpson (Kew). Commonwealth Scholarship. Work continues to define the limits between *Carex* and *Uncinia*, and to clarify the phylogenetic position of *Uncinia* within the *Cariceae*. Early results from internal transcribed spacer (ITS) sequences suggest that *Uncinia* is monophyletic, although relationships between genera in the *Cariceae* remain unclear. Molecular data also suggest that the subgeneric classification of *Uncinia* does not reflect phylogenetic relationships. Additional loci from both the chloroplast and nuclear genomes are currently being investigated for their potential to resolve generic and subgeneric relationships. Fieldwork in South America to collect living plants for cytological studies begins in January, 1999.

Recent publications

Abbott, R.J., Harris, S.A. & Lowe, A.J. (1997). Interspecific hybridisation and the origin of new plant taxa in Scotland. *Botanical Journal of Scotland* **49**: 247-256.

Bayer, R.J. & Starr, J.R. (1998). Tribal phylogeny of the Asteraceae based on two non-coding chloroplast sequences, the *trn*L intron and *trn*L/F intergenic spacer. *Annals of the Missouri Botanical Garden* **85**: 242-256.

Carine, M. & Scotland, R.W. (1998). Pollen morphology of *Strobilanthes* Blume (Acanthaceae). *Review of Palaeobotany and Palynology* **103**: 143-165.

Downing, Alison & Marner, Serena. (1998). The first moss to be collected in Australia? *Leucobryum candidum* - collected by William Dampier in 1699. *Journal of Bryology* **20**: 237-240.

Fay, M.F., Cameron, K.M., Prance, G.T., Lledó, M.D. & Chase, M.W. (1997). Familial relationships of *Rhabdodendron* (Rhabdodendraceae): plastid *rbc*L sequences indicate a Caryophyllid placement. *Kew Bulletin* **52**(4): 923-932.

Ford, B.A., Starr J.R., McQueen, D.A.R. & Naczi R.F.C. (1998). Relationships among species in *Carex* sect. *Phyllostachys* (Cyperaceae) based on allozyme divergence. *Plant Systematics and Evolution* **212**: 31-51.

Ford, B.A., McQueen, D.A.R., Starr, J.R. & Naczi, R.F.C. (1998). The impact of species-specific traits and phylogenetic relatedness on allozyme diversity in *Carex* sect. *Phyllostachys* (Cyperaceae). *Plant Systematics and Evolution* **212**: 13-29.

Hawkins, J.A., Hughes, C.E. & Scotland, R.W. (1997). Primary homology assessment, characters and character states. *Cladistics* **13**: 275-283.

Hughes, C.E. (1998). Monograph of *Leucaena* (Leguminosae: Mimosoideae). *Systematic Botany Monographs* **55**: 1-244.

Hughes, C.E. (1998). *Leucaena*. A Genetic Resources Handbook. Tropical Forestry Paper **37**. Oxford Forestry Institute. 274 pp. (also in Spanish - *Leucaena. Manual de Recursos Genéticos*).

Hughes, C.E. & Harris, S.A. (1998). A second spontaneous hybrid in the genus *Leucaena* (Leguminosae: Mimosoideae). *Plant Systematics and Evolution* **212**: 53-77.

Ibrahim, A.M., Fagg, C.W. & Harris, S.A. (1997). Seed and seedling variation amongst provenances in *Faidherbia albida*. *Forest Ecology and Management* **97**: 197-205.

Kanashiro, M. Harris, S.A. & Simons, A. (1997). RAPD diversity in Brazil nut (*Bertholletia excelsa* Humb. and Bonpl., Lecythidaceae). *Silvae Genetica* **46**: 219-223.

Lledó, M.D., Crespo, M.B., Cameron, K.M., Fay, M.F. & Chase, M.W. (1998). Systematics of Plumbaginaceae based upon

cladistic analysis of *rbc*L sequence data. *Systematic Botany* **23**(1): 21-29.

Lledó, M.D. & Crespo, M.B. (1998). El género *Limonium* Mill. (Plumbaginaceae) en la Comunidad Valencia: taxonomía y conservación. *Ed. Generalitat Valenciana. Valencia, Spain.* 186 pp.

Milton, S.J., Gourlay, I.D. & Dean, W.R.J. (1997). Shrub growth and demography in arid Karoo, South Africa: inference from wood rings. *Journal of Arid Environments* **37**: 487-496.

Myburg, H. & Harris, S.A. (1997). Genetic variation across the natural distribution of the south east Asian pine, *Pinus kesiya* Royle ex Gordon (Pinaceae). *Silvae Genetica* **46**: 295-301.

Ratnam, W., Leong, L.S., Clyde, M.M., Lan, L.A., Mohammed, F., Harris, S.A., Jong, K. & Hamid, Z.A. (1998). Genetics and reproductive biology of two dipterocarp tree species. In See, L.S., May, D.Y., Gauld, I.D. and Bishop, J. *Conservation management and development of forest products*: 160-168. Forest Research Institute Malaysia, Kuala Lumpar.

Scotland, R.W. (1998). One new and one rediscovered species of *Strobilanthes* (Acanthaceae). *Botanical Journal of the Linnean Society* **128**: 203-210.

Steane, D.A., Scotland, R.W., Mabberley, D.J., Wagstaff, S.J., Reeves, P.A. & Olmstead, R.G. (1997). Phylogenetic relationships of *Clerodendrum s.l.* (Lamiaceae) inferred from chloroplast DNA. *Systematic botany* **22**(2): 229-243.

Wise, Rosemary. (1998). *A Fragile Eden.* Portraits of the Endemic Plants of the Granitic Seychelles. Princeton University Press.

Expeditions and visits

Mark Carine presented a paper, with **Robert Scotland**, at the Pollen and Spores 1998: Morphology and Biology Conference held in July at the Royal Botanic Gardens Kew. The title of the paper was 'Pollen character distribution in *Strobilanthes* Blume *s.l.* (Acanthaceae) from Southern India and Sri Lanka'. In September, Mark gave a talk at the 17th meeting of the Willi Hennig Society held at the University of Sao Paulo, Brazil, entitled '68 taxa and 32 characters: resolving species relationships using morphological data'.

Denis Filer visited the Bangladesh National Herbarium (Dhaka), UPR (Mayaguez, Puerto Rico), Rijksherbarium (Leiden, Netherlands), Vadense herbarium (Wageningen, Netherlands), CPATU (Belém, Brasil), INPA (Manaus, Brazil) and the East African Herbarium (NMK, Nairobi, Kenya), working with BRAHMS projects.

Ian Gourlay attended the 'Third Native Elm Workshop' on 30 April 1998 at the Royal Geographical Society, London.

Stephen Harris attended a meeting of the Ecological Genetics Group in St. Andrews in April 1998 and undertook a collection expedition, with Drs. **Barrie Juniper** and **Julian Robinson**, to Kazakhstan for three weeks in late August and early September 1998.

M. Dolores Lledó presented an invited lecture for the IX OPTIMA (Organization for the Phyto-Taxonomic Investigation of the Mediterranean Area) meeting in Paris (May 1998) entitled "Is *Limonium* monophyletic ? evidence from plastid DNA sequence data and morphology".

Serena Marner attended a B.S.B.I. lecture and field meeting in May in commemoration of George Claridge Druce (1850-1932, founder of the Druce Herbarium of OXF) at Nene College, Northampton. One day was devoted to lectures about Druce's contemporary Northamptonshire naturalists and the second day included visits to Druce's birthplace, the shop where he undertook his apprenticeship as a chemist in Northampton and an invitation to tea with his Godson Mr. Anthony Jeyes. There was a small exhibition of Druce memorabilia at Holly Lodge, Boughton.

Robert Scotland presented an invited talk at Hennig XVII in Brazil entitled 'Taxic homology and three-taxon statement analysis'.

Rosemary Wise was invited to join an expedition from the Royal Botanic Gardens Kew to Irian Jaya. The first two visits were made this year to collect plants from sea level to 3400 m. Rosemary has been commissioned to paint twelve plates for Curtis Botanical Magazine and a series of twelve posters depicting typical plants from different vegetation zones.

Monograph of *Leucaena* Benth. (Mimosoideae - Leguminosae)

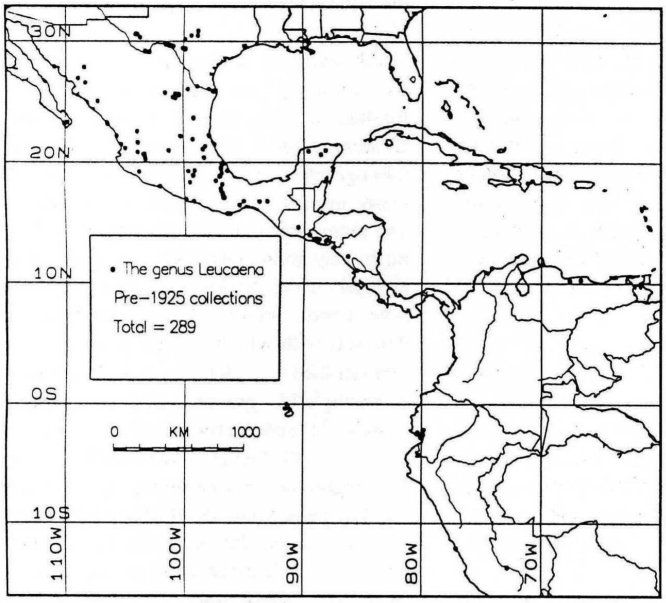
This year saw the publication of two papers on the systematics of the economically important Neotropical woody legume genus *Leucaena* - a *Taxonomic Monograph* and a *Genetic Resources Handbook.* These are the main outputs from a series of research projects funded by the Forestry Research Programme of the Department for International Development of the UK Government between 1990 and 1996.

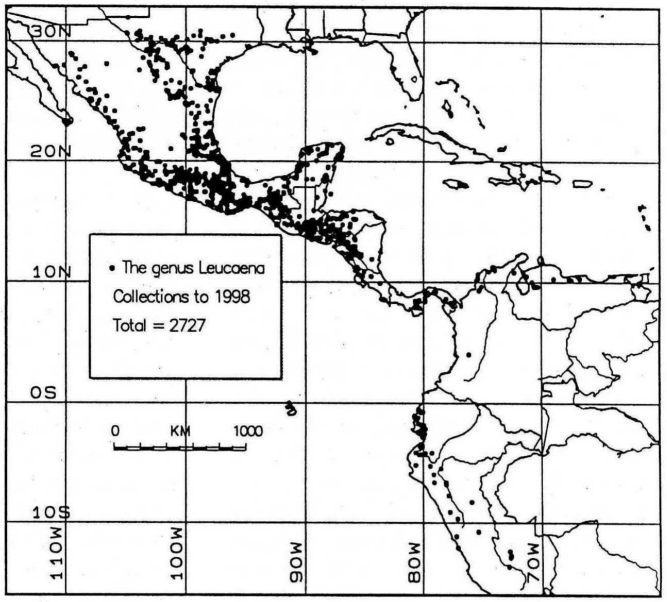
My research on *Leucaena* has focused on three main systematic problems - species delimitation (including detection of hybrids), analysis of sister group relationships amongst the genera of the informal *Leucaena* and *Dichrostachys* groups, and analysis of species relationships. These exemplify some of the problems commonly faced by monographers of tropical plant groups more generally.

Species delimitation has been the main source of recent taxonomic confusion in *Leucaena* with no clear answer to the fundamental question - *how many species are there?* Indeed, the number of species has varied from as many as 39 (Britton & Rose's *1928 North American Flora* treatment) to as few as ten (Brewbaker & Ito's 1980 *Leucaena Research Reports* synopsis). So why is this? Is it due to the whims of 'lumpers' and 'splitters' simply viewing species in different ways? Given the recent flurry of renewed interest in, and discussion about species concepts, one might imagine that disagreement about - *what is a species* - might be the cause of this variation. However, for *Leucaena*, as with many tropical plant groups, confusion over the delimitation of species is due, not to application of different species concepts by different authors, but to the simple facts of *sampling*, and the related issue of *data.*

Sampling of *Leucaena* is illustrated in the adjacent figures and Table 1 (see page 5) which document the distribution of *Leucaena* collections through time and space. There has been an 10-fold increase in the overall number of botanical collections between 1925, when Britton and Rose compiled their 1928 account with 39 species, and 1998 when I compiled my account which recognizes 22 species. This increase has been even more pronounced in Central America (22-fold) than in Mexico, where early botanical collectors were more active.

Sampling of *Leucaena*: pre-1925 & present day





Number of botanical collections of *Leucaena* 1783-1998

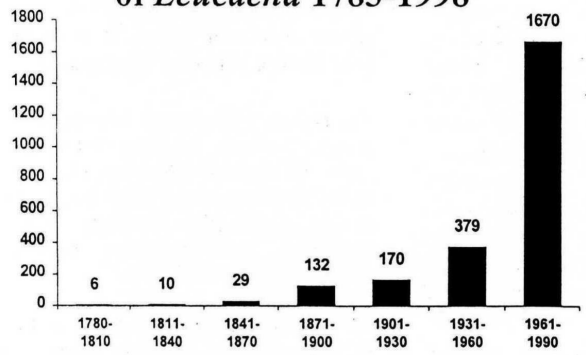
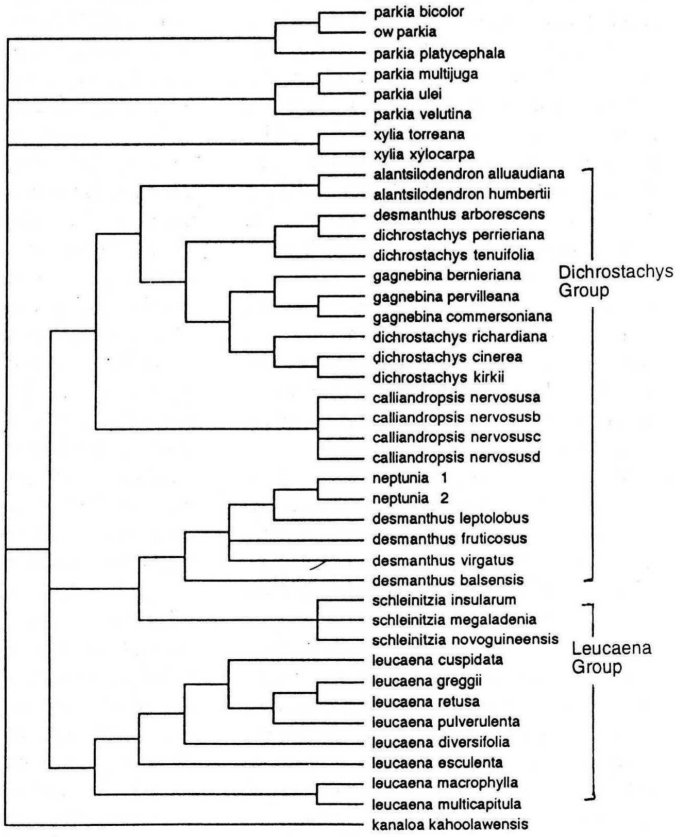


Table 1. Increase in botanical collections of *Leucaena* 1925-1998

	Botanical Collections		
	pre-1925 (Britton & Rose, 1928)	to 1998 (Hughes, 1998)	Factor
All *Leucaena*	289	2727	10×
L. lanceolata (Mexico)	40	294	7×
L. shannonii alliance (Central America)	11	241	22×
All *Leucaena* (Guatemala only)	3	128	42×

Generic Relationships

Strict consensus tree of 32 equally parsimonious cladograms obtained from parsimony analysis of sister group relationships of the genera of the informal *Leucaena* and *Dichrostachys* groups.



The outcomes of sparse sampling for the delimitation of species of *Leucaena* have been twofold. Firstly, for widely distributed species which are morphologically variable, sparse sampling failed to detect the continuities and overlaps in quantitative characters among populations, and variation in some qualitative characters within populations, that is now clearly apparent. Lacking a rangewide picture, variable specimens were pigeon-holed, in some cases virtually as species. Secondly, a set of clearly distinct more narrowly-restricted species were missed altogether and remained undiscovered until more intensive sampling was carried out, mainly in the last two decades. These contrary trends mean that while 16 of the 39 species recognized by Britton & Rose in 1928 are now treated as conspecific, 5 new species, several new infraspecific taxa and two hybrid species have been discovered and named in the last decade. It is hardly surprising that different workers examining radically different samples come up with different answers.

The systematic analyses of generic and species relationships presented in the monograph well illustrate the dilemmas of how to undertake such analyses in the absence of either complete species inventories or a well corroborated hypothesis of sister group relationships. Incomplete discovery and inaccurate delimitation of species have also had important implications for assembly of morphological data for analysis of species and higher-level sister group relationships of *Leucaena*. For example, the discovery, in 1955, and recent confirmation of *Leucaena multicapitula*, as a species distinct from *L. trichodes* and *L. macrophylla*, based on SEM study of pollen and anthers revealed a more diverse spectrum of pollen types and anther apicula within *Leucaena* than was previously documented. Anthers and pollen are important characters for understanding generic and species relationships.

There has been only limited disagreement over the generic boundaries of *Leucaena*. However, there has been considerable uncertainty over sister group relationships of the genera of the informal *Leucaena* and *Dichrostachys* groups. My generic analysis (see Figure) shows no support for these groups, nor the hypothesis that the Pacific genus *Schleinitzia* is the sister group of *Leucaena*. However, it fails to resolve unambiguously what that sister group is. As with many tropical plant groups the search for sister groups to well established monophyletic groups is one of accretion. Fortunately for *Leucaena*, this is not a problem for the species-level analysis. The monophyly of *Leucaena* is supported and different combinations of outgroups imply only minor differences in species relationships.

Grimes (*Australian Systematic Botany, 1998*) recently restated the case for botanical monographs as essential precursors to floras. However, it is not only - *monographs before the floras* - but also *before all other scientific and applied outputs*. A monograph is like a brimming reservoir that can be tapped to produce a steady stream of other useful outputs, such as flora accounts and more 'user-friendly' identification guides and manuals. Monographs must also precede most modern biogeographical and evolutionary investigation. Finally, a monograph provides important foundations, in the form of a taxonomic backbone upon which to locate accurately all the applied information about species which underpins their rational utilization, domestication and conservation.

Applied, 'user-friendly' outputs are important for *Leucaena*. Species of *Leucaena* are of considerable economic, subsistence and conservation importance. Most foresters and agronomists who work in the tropics will, at some point, have set eyes on a *Leucaena* tree. In the majority of cases they will have observed a tree of one of a handful of genetically uniform varieties of one species, *Leucaena leucocephala*. It is a ubiquitous, small, seedy tree that occurs in most tropical countries. Whether that tree is viewed as a valuable asset providing basic products to smallholder farmers, as a salvation for sloping lands, as the 'alfalfa of the tropics' to commercial beef producers, or cursed as an undesirable alien weed depends on the perspective of the observer. Species of *Leucaena* are currently the focus of a considerable international programme of applied research on aspects of their agronomy, silviculture, agrisilviculture, genetic resources and domestication, artificial and spontaneous hybridization, product qualities, pest resistances, *Rhizobium* affinities, bruchid beetle host specificities and biocontrol. However, few applied researchers are fully aware of the diversity of species which exists within the genus.

To meet these needs, a 'user-friendly' account of *Leucaena* in the form of a *Genetic Resources Handbook* has also been published this year to complement the monograph and document what is known about diversity within *Leucaena* for a wider audience. It includes chapters on systematics, species characteristics, ethnobotany and indigenous domestication, hybrids, germplasm collections, seed collection, processing, storage and pretreatment, conservation, domestication, identification, and a series of species accounts. In addition, a *Leucaena* database has been compiled using the BRAHMS software (see article on page 13).

Although not widely acclaimed as such, and certainly not recognised as such by funding bodies, this is without doubt a *Golden Age* for tropical botanical monography. The species inventory for many groups is now much more complete and increasingly accurately delimited based on hugely more intensive recent sampling, at least in the Neotropics. This is coupled with a proliferation of new data types and data sets with which we can analyse species relationships, identify well-supported monophyletic groups, and continue to search for sister groups which inform us about higher-level relationships and biogeography. Furthermore, the management of large volumes of botanical (particularly specimen) data can now be efficiently handled and distributed by use of computer databases streamlining the production of monographs and other secondary outputs such as flora treatments. However, perhaps most important of all, the demand from both pure and applied science for accurate systematic data for tropical plant groups is greater than ever before. It is an exciting time to be a botanical monographer.

The *Leucaena* monograph is published by the American Society of Plant Taxonomists and copies are available (US orders $32.00, non-US orders $34.00 includes postage) from: *Systematic Botany Monographs, University of Michigan Herbarium, North University Building, Ann Arbor, MI 48109-1057, USA.*

The *Handbook*, published in the Oxford Forestry Institute, Tropical Forestry Paper series is available in English and Spanish **FREE** from the author to institutions in developing countries, as part of the UK Department For International Development Forestry Research Programme's policy of disseminating research results as widely as possible. For institutions and individuals in developed countries, the price is £20 plus handling and postage, with a 50% discount for students.

Colin Hughes

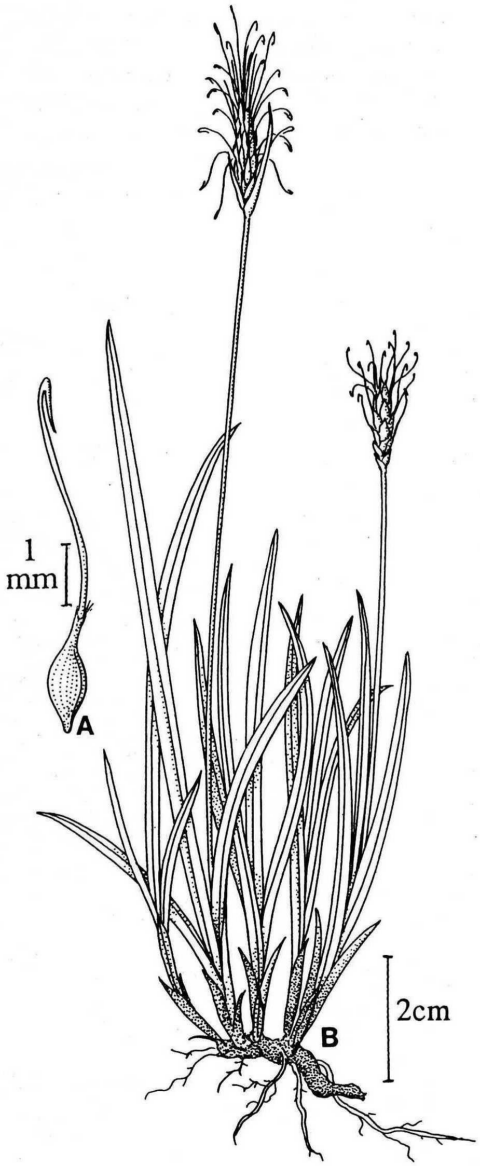
The systematics of *Uncinia* (Cyperaceae) and its phylogenetic relationships within tribe *Cariceae*

The genus *Uncinia* Pers. is a group of 60 to 70 species of perennial herbs that is distributed primarily in the temperate and alpine habitats of Malesia, New Zealand and Australia, and in the montane and cooler regions of Central and South America (Hamlin, 1959). The genus is distinguished from other Cyperaceae Juss. genera by uniformly androgynous spikes, and most importantly, by female spikelets where a hook is formed at the end of a greatly extended, sterile secondary axis (rachilla) via a retrorse, inrolled scale (Reznicek, 1990; Fig. 1). The hook can act as a dispersal mechanism on mammals and birds, and it has been used to explain the distribution of a small number of wide-ranging species in a genus that is characterized by narrow species ranges and regional endemism (Hamlin, 1959).

Uncinia is one of six genera (*Kobresia* Willd., *Schoenoxiphium* Nees, *Uncinia*, *Cymophyllus* Mack., *Carex* L., *Vesicarex* Steyerm.) currently placed in the *Cariceae* Kunth *ex* Dumort., a taxonomically complex tribe in the Cyperaceae characterized by consistently unisexual flowers and by the female flowers being subtended by a sac-like structure of prophyllar origin termed a utricle. Although the tribe may be easily circumscribed, floral reduction, uniform vegetative morphology and anatomy, and repeated parallelisms and reversals have obscured phylogenetic relationships and have blurred generic limits (Reznicek, 1990).

Most generic circumscription problems in the *Cariceae* are intimately associated with the limits of the enormous (c. 2000 spp.) genus *Carex*. Traditionally, *Carex* has been subdivided into four subgenera (*Primocarex* Kük., *Carex*, *Vignea* (P. Beauv. *ex* Lestib. f.) Peterm., *Indocarex* Baillon) that are believed to represent the major lineages in the genus (Kükenthal, 1909). These subgenera represent a very heterogeneous group of plants, ranging from the highly reduced members of subg. *Primocarex* and *Carex* (as few as 10 flowers) that have a "kobresioid" or "uncinoid" appearance, to the highly compound members of subg. *Indocarex* (as many as thousands of flowers) that resemble the genus *Schoenoxiphium*. This extraordinary range of morphological variation has given rise to the identification of numerous "transitional species" near the morphological extremes of *Carex* that have caused taxonomists either to merge genera or to transfer species in an attempt to clarify generic limits and understand phylogenetic relationships (Reznicek, 1990). None of these arrangements has been satisfactory. Indeed, some such as that suggested by Nelmes (1952) would have made morphological recognition of the genera impossible.

Controversy regarding the limits between *Uncinia* and *Carex* is centred around two highly unusual species: *Carex microglochin* Wahl. (= *Uncinia microglochin* Spreng.) which has an exsert but unhooked rachilla, and *C. kingii* (Boott) Reznicek (= *Uncinia kingii* Boott) which has an exsert but only weakly hooked rachilla. For many authors these species demonstrated an indisputable link between *Uncinia* species with exsert and strongly hooked rachillae, and the species of *Carex* subgenus *Primocarex* where the rachilla is either vestigial or absent. Whilst some authors used this presumptive transition series to hypothesize an uncinoid origin for many species in *Carex* subg. *Primocarex*, others used it as evidence that *Uncinia* had evolved from within *Carex*, that *Carex* itself had been derived from within *Uncinia*, or simply that *Carex* and *Uncinia* should be merged (see Reznicek 1990, and references cited therein). However, based on anatomical studies of the inflorescence and rachilla, recent authors have not only questioned the transitory position of *C. microglochin* and *C. kingii*, but even the common belief that *Carex* and *Uncinia* are closely related (Reznicek, 1990).



Uncinia ecaudorensis G.A. Wheeler & Goetghebeur (*S. Laegaard* 54497A, AAU; drawn from the holotype). A. Female spikelet with hooked rachilla arising from utricle. B. Habit.

Morphologically and anatomically *Uncinia* is relatively homogenous. Purely qualitative characters are few, and most species are defined by a combination of quantitative characters such as leaf width and utricle length (Hamlin, 1959). Despite the apparent lack of macromorphological features, other characters such as DNA sequences and achene micromorphology, which have proven useful in other members of the tribe and family, have not been assayed for *Uncinia*. The only major cytological study of the genus has found that all New Zealand *Uncinia* species have mitotic counts of 88 (Beuzenberg, 1970), except for members of section *Uncinia* series *Macrolepidae* Hamlin (2n = 94, 96). This group not only shares hispid utricles with the South American section *Platyandrae* C. B. Clarke, but has a similar chromosome number to the only member of the *Platyandrae* that has been counted (*U. phleoides* (Cav.) Pers., 2n = 96). Except for early revisions by Clarke (1883) and Kükenthal (1909), and a conspectus by Hamlin (1958), all previous treatments of *Uncinia* have been regional. No phylogenetic studies using modern cladistic techniques have been performed; all previous discussions of relationships and evolution within the genus have been purely speculative.

Recent molecular studies in the Cyperaceae have focused on either tribal level relationships, the relationships of genera within the *Cariceae*, or on species relationships within *Carex*. However,

because of the scope of these studies, only a cursory attempt could be made to deal with the circumscriptional problems posed by "transitional" species within the tribe, or to investigate phylogeny within the smaller satellite genera of *Carex*, such as *Uncinia*. My research will use both conventional characters (morphology, chromosome counts, achene micromorphology) and DNA sequence data to help clarify the limits between *Carex* and *Uncinia*, and to reclassify *Uncinia* based on phylogenetic principles.

Preliminary results from a phylogenetic reconstruction of 60 internal transcribed spacer (ITS) sequences representing all six genera currently recognised in the *Cariceae* indicate that *Uncinia* is monophyletic. However, on the basis of ITS sequences from 14 species of *Uncinia* it would appear that the present classification of the genus, as proposed by Hamlin (1958, 1959), does not reflect phylogenetic relationships. Additional taxa and sequences from both the chloroplast and nuclear genomes are currently being added to the data set in order to further test these hypotheses.

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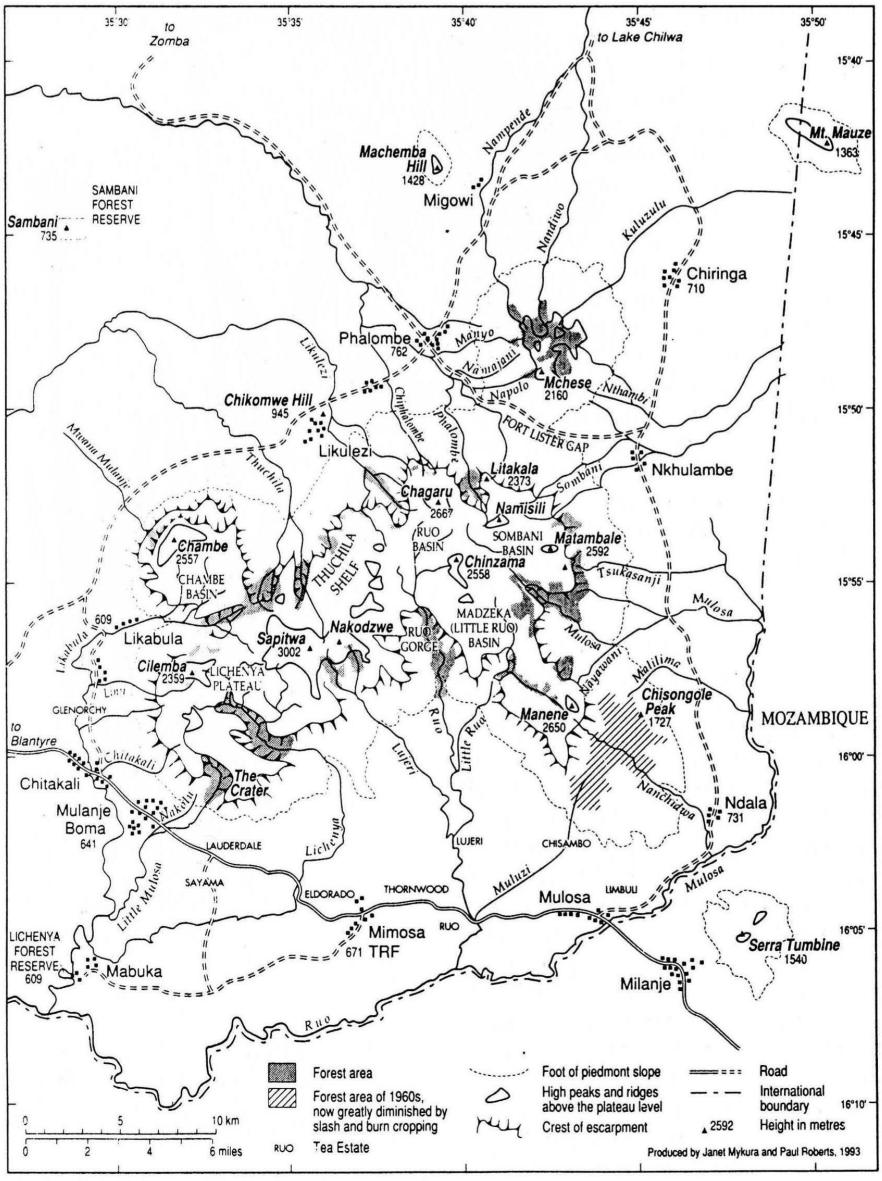
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Julian Starr

Visit to Mt. Mulanje, Malawi

As work on the check-list of the flora of Mt. Mulanje progressed (Strugnell 1997) and reached a stage where I was becoming familiar with the flora, it seemed that a visit to the mountain would be useful to familiarise myself further with the vegetation and the Chapman collecting localities. By a very fortunate coincidence, one of the categories chosen by the Winston Churchill Memorial Trust for 1998 Fellows fitted very well my work situation and the study I was engaged in. I was delighted therefore to be awarded a Churchill Trust Travelling Fellowship to visit Mt. Mulanje. The ideal time of year from the climate and flora point of view would have been May but plans were not sufficiently advanced by then so the next best time of late August/ September was chosen. In Malawi this is the end of the cool, dry period entering the hotter, dry months of September - November. Although much of the vegetation is dry and some herbaceous plants e.g. most orchids, *Kniphofia* and *Streptocarpus* species were not in flower at that time, it was possible to get around the mountain without difficulty as the rivers and streams were at a low point which proved useful as several of the bridges were broken. I decided to make 3 trips up the mountain from different points and was interested to find and photograph as many of the endemic plants as possible. Although it is not possible at this stage to give an accurate figure, the level of endemism on Mulanje is probably about 5%, further swelled by a number of 'restricted-range' species. I was particularly pleased to make

MULANJE MASSIF



contact and visit the National Herbarium of Malawi (MAL) at Zomba. The Acting Officer-in-Charge, Mr. Dickson Kamundi, made me very welcome and made it possible for two herbarium staff to accompany me on each trip. Augustine Salubeni and Cecilia Maliwichi joined me for the first trip to the Likabula Valley and Lichenya Plateau and the third trip to the Sombani and Ruo Basins. Edwin Kathumba and Aubrey Kalonga-Banda accompanied me to the Ruo Gorge, the Crater and the Chisongele forest area approached through the tea estates on the south (wetter) side of the mountain. Mt. Mulanje is a designated Forest Reserve and a collecting permit had to be obtained from the Forest Research Institute of Malawi in Zomba before we set off.

Mt. Mulanje is the highest massif in southern tropical Africa rising from the surrounding plains at 600m and reaching 3002m at its highest point (Sapitwa). It is situated in southern Malawi near the Mozambique border between latitudes 15°47' - 16°03'S and longitudes 35°30' - 35°45'E. The main plateaux range between 1800 and 2100m from which rise several peaks. To the north, Mchese Mt. (2160m) forms a satellite separated from the main massif by the Fort Lister Gap. It is very much less visited than the Mulanje massif because there is no easy access nor hut accommodation. The massif itself is uninhabited apart from the occasional forestry accommodation and temporary sawyers camps. Villages and cultivated plots on the plains surround the mountain on the north, west and east sides and are virtually bereft of trees. Tea estates are found at the base and on the lower slopes in the south. Further descriptions of Mulanje, its flora and social, environmental and economic factors can be found in Chapman 1994a and 1994b.

The Likabula Valley and Lichenya Plateau

Augustine, Cecilia and I stayed for 4 nights at the C.C.A.P. mission chalets in the Likabula Valley before the rest of the party joined us for the climb to Lichenya Plateau. We spent three days investigating the boulder strewn miombo woodland on the lower slopes dominated by *Brachystegia* species. Here we witnessed women from the villages surrounding the mountain, collecting bundles of firewood (dead and fallen branches, permitted by the forestry department for a small charge) and pine and cedar planks being head-loaded down from Chambe plateau to the Likabula forestry depot by a succession of young men. Large patches of the understorey and herb layer had been recently burnt. Here we saw two of the 4 *Aloe* species to be found on the mountain (*A. chabaudii* and *A. swynnertonii*, this latter name still to be verified), in fruit but unfortunately not in flower. Baboons were seen in the *Brachystegia* trees. They were feeding on the seeds of *Brachystegia boehmii*, discarding the pods and leaves on the ground below the tree.

Once porters had been enlisted to carry our supplies, a party of 8 of us set off up the 'milk run' path to Lichenya Plateau on the west side of the massif. We stayed 4 nights in the newly rebuilt Lichenya forestry hut (roofed with Mulanje Cedar shingles), the former hut having been burnt down 3 years previously.

Montane grassland forms the main vegetation with some areas of scrub of *Helichrysum* spp., *Anisopappus kirkii* (Compositae) and *Hypericum revolutum* (Guttiferae). The plateau is dissected by deep river valleys containing evergreen forest. Large tracts of the grassland had recently been severely burnt. The fleshy-leaved *Helichrysum nitens*, the small plants of the tree fern *Blechnum tabulare* and the grass tussocks appear to be well adapted to burning and were already sprouting from protected growing points. All the *Xerophyta splendens* (Velloziaceae) trunks were smooth and charred but virtually all displayed tufts of spiky leaves at the ends of the branches and seemed none the worse for the scorching. The practice of early controlled burning carried out in earlier years seems to have been reduced if not abandoned so that much of the burning is now caused by fires started by poachers flushing out small rodents. These fires usually get out of control, affect large areas and can take place later in the dry season. The Mulanje grassland flora is probably sufficiently adapted to cope with this although it is a different matter if the fires reach the patches of evergreen forest but the effect on the fauna could be devastating.

The end of our time on the Lichenya Plateau coincided with a late spell of Chiperone weather. This is cold air laden with mist drifting over from the Mozambique Channel which can last for several days. Indeed the day we left Lichenya to walk over the saddle towards the 'knife-edge' and Chambe, it was extremely cold, wet and windy. It was a relief to descend to slightly lower altitudes to get below the cloud and to dry out a little. In this section of the mountain, previously burnt areas of grassland were resprouting. *Buddleia salviifolia* (Loganiaceae) was in full flower, as were *Gerbera ambigua* (Compositae), *Becium grandiflorum* (Labiatae), *Wahlenbergia capillacea* ssp. *tenuior* (Campanulaceae) and *Hypoxis dregei* (Hypoxidaceae). There was one plant of the endemic *Berkheya johnstoniana* (Compositae) in flower. Huge bulbs of *Drimia robusta* (Liliaceae) only partially covered by soil were dotted around in patches, some sporting tall pale inflorescences. The 'knife-edge', once heavily clothed by evergreen *Widdringtonia* (Cedar) forest has now only a thin cover of poor-looking trees under which is a dense shrub layer. However the endemic small shrub, *Cleome densifolia* (Capparidaceae) was in full flower - the only place we saw it - as was the brilliant orange-flowered *Tecomaria capensis* spp. *nyassae* (Bignoniaceae) and the shrub, *Hibiscus burtt-davyi* (Malvaceae). Before descending to Likabula again via the steep Chapaluka path through *Brachystegia* woodland, we made our way through dense stands of *Pinus patula*, a Central American pine originally introduced in trial plots, small plantations and as a nurse crop for Mulanje Cedar (*Widdringtonia whytei*, Cupressaceae) in the 1940s. It has now become a problem as an invasive plant and its regeneration is encouraged by burning. The ground below the pines was ankle deep in long, dead pine needles which were slippery to walk on downhill and which smothered all other plant life. The self-sown pines formed dense stands obliterating all light to the ground.

The Himalayan Raspberry (*Rubus ellipticus*), whose fruit is attractive to birds, is another introduced species that has become invasive and chokes the natural vegetation. It was evident sprouting up in many places on the way up and on the plateau.

The Ruo Gorge

A short sortie was made up the Ruo Gorge. We reached the beginning of the climb through the Lujeri Tea Estate. The rainfall on this side of the mountain is higher and consequently evergreen forest clothes the side of the mountain virtually up to 2000m. The big Ruo River was spectacular but negotiable and it was a long hard slog up the steep forest path. Underfoot was damp soil, tree roots or rocks covered in moss making sure footholds difficult. The *Widdringtonia* forest at the top was sparse and poor. Where trees had been chopped down the characteristic perfume pervaded the air in the vicinity of the remains of the tree. Here an understorey of shrubs flourished - *Mimulopsis solmsii* (Acanth-

aceae), in the more heavily shaded parts but only occasionally in flower anywhere, and *Helichrysum* spp. and *Senecio* spp. in the more open areas. It at least afforded a good view of the Ruo River as it spilt over the edge at 2000m in a spectacular ribbon-like waterfall. As we emerged from the forest, quite abruptly the vegetation turned to shrubby grassland/heathland. The views at that altitude were well worth the effort and the little Minunu Hut where we stayed was surrounded by splendid rocky peaks. It was up here that we saw the only plant of *Dierama formosum* (Iridaceae) and *Protea caffra* ssp. *nyasae* (endemic) in flower. At these altitudes the endemic *Helichrysum whyteanum* (Compositae) is common as is the brilliant blue *Lobelia blantyrensis* (Campanulaceae). After only 2 nights we descended by the same path and during the next 2 days visited the Crater via the Esperanza Tea Estate and, on the S.E. corner, climbed up the valley of the River Phwera from Limbuli Tea Estate. Mid-altitude *Newtonia* forest occurs in both these areas but has virtually disappeared through illegal slash and burn agriculture up to 1500m in the Phwera valley (part of the Chisongole forest).



Helichrysum whyteanum Britten
with brilliant white papery bracts, tinged pink. Leaves slightly revolute; dark green; glabrous on upper surface; dense white woolly indumentum on under surface and stems.

The Sombani and Ruo Basins

The third trip, ascending from the north side of the mountain from the Fort Lister Gap, took us up to the Sombani Plateau. The path rose steeply through *Brachystegia* woodland for over half the climb - the ground in several areas was still smouldering from recent burning. The *Brachystegia* trees, although singed, seemed to be reasonably unscathed but the shrubby *Protea gaguedi* and the small *Faurea rochetiana* (Proteaceae), which was in fruit at this time, were badly scorched and possibly dead. In the Sombani basin large patches of regenerating *Pinus patula* were evident. Only the odd young tree had been seen at the top of the Ruo River Valley the week before. Plants of *Lactuca lasiorhiza* (Compositae), only 5cm high with bright pink showy flowers and a pyrophyte of montane grassland, were growing on bare ground on the path side or at the edge of burnt grassland. It was only seen here in two patches either side of the Sombani Hut. Between the Sombani and Ruo Basins, an area burnt about two months previously, a variety of herbaceous plants were flowering on bare ground amongst the sprouting grass and bracken - *Knowltonia transvaalensis* (Ranunculaceae), *Gerbera ambigua* and *Gerbera viridifolia* (Compositae), *Eriosema ?shirensis* (Leguminosae: Papilionioideae) 5cm high, *Cyrtanthus welwitschii* (Amaryllidaceae), *Hypoxis dregei* (Hypoxidaceae), *Moraea schimperi* (Iridaceae) and *Valeriana capensis* (Valerianaceae) as well as 2 or 3 plants which need further identification. In a relic patch of Cedar forest near Chinzama Hut in the Ruo Basin we found two *Geranium* species, probably *G. mlanjense* (endemic) and *G. arabicum* (Geraniaceae). *Xerophyta splendens* (endemic) plants were flowering prolifically on the hillside on the west side of the Ruo Basin, the only part of the mountain where this was the case but apparently this patchy flowering is not unusual. At altitudes of about 2300m on Nanderlanda Col we found the brilliant blue-flowered terrestrial orchid, *Herschelianthe baurii*, and the yellow *Albuca melleri* (Liliaceae) not seen elsewhere in full flower.

Another feature of my visit to Mulanje was the chance to meet people involved with the Mount Mulanje Conservation Trust - a body set up in 1991 "to formulate and implement conservation measures in which plants, animals, water and other resources will be integrated on a sustainable utilization basis". I also was able to meet DFID workers involved with setting up conservation and community based projects that the MMCT will take over.

The success of the trip was due to the assistance of several people but outstandingly to Mr. David Cornelius, a retired Forestry Officer still residing in Malawi.

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Alison Strugnell

Faurea (Proteaceae) with special reference to the species found in Malawi

Proteaceae in Africa is best known by the genus *Protea* with its perhaps more spectacular inflorescences of flowers arranged in dense heads surrounded by an involucre of often brightly coloured bracts. A large number of *Protea* species occur in the Cape region of South Africa. *Protea* was described in 1771 by Linneaus; it took a further 76 years before *Faurea* was recognised.

Faurea is a genus of about 15 species occurring in Africa and Madagascar. Four of the species are to be found in South Africa, five in Angola, eight in the Flora Zambesiaca area, while six occur in Tropical East Africa and two in Madagascar, with a few other species elsewhere in Africa. They are all evergreen trees and shrubs. The flowers are arranged in dense spikes or racemes which are mostly borne terminally on leafy branchlets, but are occasionally axillary. The 4-merous perianth is petaloid and this splits into two major lobes at anthesis releasing the persistent style. One lobe of the perianth remains free almost to the base and consists of a single segment, while the other three segments remain united almost to the apex and curl back to reveal the anthers. The ovary, and subsequently the fruit, is clothed with hairs. The mature fruit is a globose nut. The species are commonly known as the Beechwoods in Southern Africa.

Faurea was described in 1847 by William Henry Harvey. He chose the name as a tribute to the memory of his friend William Caldwell Faure (1822-1844); together they had spent many hours botanizing on excursions in the Cape. Mr. Faure was a soldier and said to be a 'young and ardent botanist of much promise'. Unfortunately soon after he was called up to military service in India he caught cholera from which he nearly died, he recovered from this but was then shot and killed while on his way to join his regiment. His full potential as a botanist was sadly never realized.

Harvey described *F. saligna* Harv. from specimens collected by Burke and Zeyher from Magaliesberg, South Africa. The species is distinguished by its normally long narrow glaucous green, mostly entirely glabrous, distinctly petiolate leaves clustered at the ends of erect-spreading branchlets giving the whole tree a willow-like appearance (see illustration on page 12). *F. saligna* usually occurs in *Brachystegia* woodland or in grassland with scattered trees at altitudes of between 700 - 1800 m; it is a Zambezian woodland species (according to F. White, 1983).

When I began this study, it became clear that several different species of *Faurea* were being confused with *F. saligna*, the name being applied to the majority of the specimens not having broad hairy leaves! Two evergreen forest species, *F. delevoyi* De Wild. and *F. wentzeliana* Engl., were dismissed as being *F. saligna* despite their differing ecology. Both species however had been described early this century. *F. arborea* Engl., found at the edges of dry montane forest, in montane grassland or in ericaceous scrub in tropical East Africa, had also been confused with *F. saligna* by various authors. Herbarium material of all these species can sometimes be quite difficult to distinguish, especially in the absence of inflorescences. However, once field work in Malawi had been undertaken, the differences between *F. saligna*, *F. delevoyi* and *F. wentzeliana* became more obvious in all respects, even for vegetative characters alone and it also became easier to identify herbarium material. A combination of characters are now taken into consideration before determination. This necessitated the publication of a paper to establish the correct names of the species to help future workers in the area (Marner 1989).

Three evergreen forest species of *Faurea* occur in Malawi. Two of the species, *F. racemosa* Farmar and *F. wentzeliana* are Afromontane endemics. *F. racemosa* is only known from southern Malawi and Mt. Namuli in neighbouring Mozambique. *F. wentzeliana* has a somewhat wider distribution in the forests of southwestern Tanzania, Zaire, Rwanda, Burundi and northern Malawi. *F. delevoyi*, a Zambezian forest species, is found in riverine forests up to 2000 m.

In the field, *F. delevoyi* is recognisable by its sessile or subsessile, glossy, non-glaucous, bright green leaves which almost always bear a few long weak hairs towards the base on the lower surface. Its yellow-green flowers in erect spikes are characteristic of the species. The bright green glossy leaves of *F. wentzeliana* with undulate margins and conspicuous red venation are striking features in the living plant and help to distinguish it from *F. saligna* and *F. delevoyi*. The rusty pubescence on the infloresence and its rather small and slender flower buds are also distinctive features of *F. wentzeliana*. *F. racemosa* is immediately distinguishable from these other species in having pedicellate flowers with a reddish perianth, whitish in bud. Possibly the best way of indicating the differences between these species is by a series of illustrations rather than lengthy descriptions. These will appear in a forthcoming account in Flora Zambesiaca.

The identifications of species of *Faurea* with pedicellate flowers had also caused difficulties. *F. racemosa* from Mt. Mulanje in southern Malawi being confused with the Madagascan species, *F. forficuliflora* Baker. These two species were further confused with another species restricted to the Chimanimani and Inyanga Mountain ranges of Mozambique and Zimbabwe, now named *F. rubriflora* Marner. *F. forficuliflora* shows a considerable range in variation of leaf and floral characters, some plants having sessile flowers, whilst both *F. racemosa* and *F. rubriflora*, with much more restricted distributions, show little variation and are readily distinguishable from each other. *F. rubriflora* has striking red flowers in a robust spike, the perianth being twice as long as the perianth in *F. racemosa*.

Faurea rochetiana (A. Rich.) Pic. Serm. is the most widespread member of the genus and is found from Nigeria and Ethiopia, south to Angola and South Africa. It is a Sudanozambezian woodland species (White 1983). In the past it has been more widely known by the name of *F. speciosa* Welw.; unfortunately this name has had to be put into synonymy. As a consequence of the nature of the distribution of the species, it shows a great deal of variation with respect to various characters, namely leaf width, flower length and degree of pubescence, especially on the undersurface of the leaves. However, *F. rochetiana* is usually readily distinguished in the field by its normally broad leathery leaves, its stout and sturdy inflorescences with persistent styles projecting at right-angles to the inflorescence-axis. The flowers are typically about 2 cm. long, approximately double the length of flowers of *F. saligna, F. delevoyi, F. wentzeliana* and *F. racemosa* already mentioned.

Specimens of *F. rochetiana* from the type locality in Ethiopia have almost glabrous leaves. However some extremely hairy variants are found in Malawi, Zambia and Tanzania, and elsewhere less extreme variants occur. Plants with distinctly silvery hairy leaves and inflorescences found in woodland on the Nyika Plateau Malawi are an example of this infraspecific variation. Further work needs to be undertaken to assess the distribution of this variation

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Faurea saligna Harv. - **A**, flowering spike and leaves, from *Chapman* 912; **B**, flowers, from *Vigne* 4875. *Faurea racemosa* Farmar - **C**, infructescence and leaves, from *Brass* 16640 & *Marner* 26. Drawn by Rosemary Wise.

before the taxonomic status of the variants can be determined. This would include field work.

This paper was first prepared as a poster for the Frank White Memorial Symposium on *Floral Diversity in Africa and Madagascar* which took place in the Department of Plant Sciences, University of Oxford in September 1996. I shall always remain indebted to the late Dr. Frank White who supervised this project and encouraged me, and who arranged for me to go on a field trip to Malawi in 1986. Field work not only bought the whole project alive but was essential for understanding the species involved in the study area. For their hospitality and guidance in Malawi I am very grateful to Jim & Betty Chapman, Eric and Isobyl la Croix, and David & Iris Cornelius. I hope to conclude this study by producing a monograph of the genus.

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Serena Marner

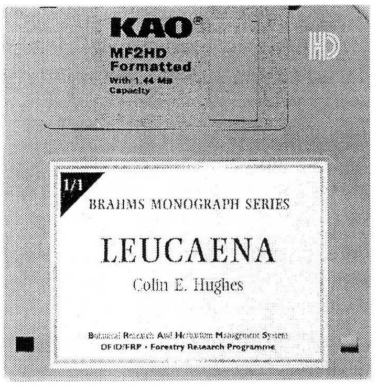
BRAHMS database

Version 4.6 networked

The development of BRAHMS has continued this year in preparation for the transfer to Windows. Version 4.6 is now fully 'networkable' - users can access a single, centrally administered database with full read-write access from separate workstations across Novel, Windows 95 and NT. A range of administrative functions have been added extending password control and network monitoring. External files (*e.g.* large gazetteers) can also be shared. Network functions are being further optimised for Version 5.0 - with client-server links to SQL Server databases.

BRAHMS Monograph Series

A series of data sets based on completed monographs are now being compiled into a standard format for electronic distribution, initially to herbaria in Latin America, as part of a new *BRAHMS Monograph Series.*



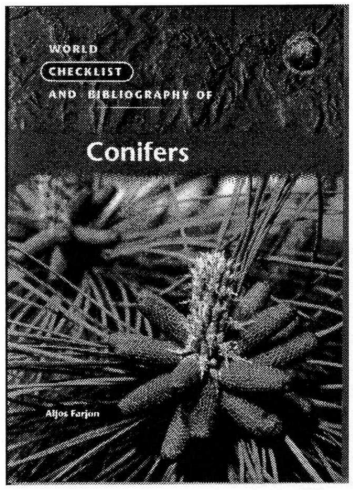
Initially, disks are being prepared for *Calliandra, Inga, Leucaena, Parkinsonia* and *Pinus*. The disks include full nomenclatural detail (name status, synonymy, types, *etc.*), species descriptions and specimen data as available. The data sets can be installed directly under BRAHMS 4.6 as independent databases, or downloaded into more general flat-file formats. As one part of a four month DFID Forestry Research Programme project, software is being prepared to optimise the curation potential of these data sets by offering a range of functions to check and update names and specimens in local herbarium databases.

Dutch Types on-line from Leiden

A searchable database of type collections held in the major Dutch herbaria (Amsterdam, Leiden, Utrecht and Wageningen) went on-line on the internet in October. Data entry of over 55,000 types has been underway for *c.*2 years into BRAHMS Rapid Data Entry files designed for the task. Associated collections (wood, spirit, illustrations, *etc.*) have also been entered. All specimens have been barcoded and have high resolution images. The BRAHMS 4.6 database has been connected to the internet by third party software written by ETI. *See http://rulrhb.leidenuniv.nl/ - type catalogue.*

Kew Conifer database

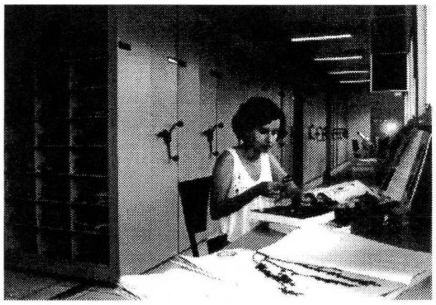
At RBG Kew, Aljos Farjon is pressing ahead developing a world-wide taxonomic database of conifers using BRAHMS 4.6. In the first project phase, a comprehensive taxonomic checklist of conifers was completed. The *World Checklist and Bibliography of Conifers*, published at Kew this year, includes over 4000 validly published names (*c.*800 accepted taxa in 69 genera) with generic and species level synonymy, species distribution summaries, habit, conservation status and synonym indexes. The data were assembled and formatted by the BRAHMS Reporter then exported to MS Word for final editing.



The checklist is now being used as a taxonomic framework for the genus by genus entry of data from conifer specimens - mainly from those held at Kew but also from representative specimens held at other herbaria.

Herbário IAN - Embrapa Amazônia Oriental, Brazil

The Herbário IAN based at CPATU, Belém, Pará is the main focus of BRAHMS database work in North Brazil. The herbarium, with *c.*165,000 specimens and related botanical materials, houses a wealth of information on the flora of this region of Amazônia and has excellent facilities.



A range of database projects are now underway, some dealing with general curation (*e.g.* loans management), others with checklisting (*e.g.* Moju Forest Reserve and Aquatic plants of Pará) and other monitoring specific groups of plants including the commercially important legume, mahogany and Brazil nut families. The herbarium is also assisting with the construction of an up-to-date species list for foresters in the Amazônian state of Pará. The type collections, already entered, are being published on the CPATU web page (http://www.cpatu.embrapa.br/ botanica. html). Towards the end of last year, the curator, Regina Célia V. Martins, organised a BRAHMS training course for botanists from IAN, INPA, the Museu Goeldi and the Instituto Amapaense de Pesquisa in Macapá.

Loan management: immediate benefits

The entry of specimen loans is an incentive to databasing large collections and provides a realistic way to making a start with this often daunting task, at the same time doing something of immediate practical benefit. To use the BRAHMS herbarium transactions module, you do not need to have a fully databased herbarium - the benefits start immediately. Furthermore, the module provides a logical platform to record incoming determinations - as specimens return from loan, determinations can be quickly updated and fed into the main database. The completion of the BRAHMS herbarium transactions module (for loans, exchanges, gifts, *etc.*), has been carried out in collaboration with the Rijksherbarium in Leiden. Outgoing specimens are entered into Rapid Data Entry files, assuming not already stored, then imported to BRAHMS and auto-linked to the relevant transaction number. All specimens and associated materials are barcoded - thus automating loan returns.

Mount Cameroon Plant Species Conservation Checklist

Over the past 4 years, Stuart Cable and colleagues at the Royal Botanic Gardens

Kew have been gradually building up a comprehensive BRAHMS database for South West Cameroon. The primary focus has been Mount Cameroon and one of the fruits of the work is the production of The Mount Cameroon Plant Species Conservation Checklist shortly to be published by RBG Kew. The checklist, formatted by the BRAHMS Reporter, includes over 2,500 species and 10,000 specimen citations. Each species account includes references and synonymy, habit, habitat and distribution notes, phenology, altitude range and conservation status. Specimen data were compiled from recent collections by the Mount Cameroon Project and Kew's Earthwatch funded expeditions, citations in the Flora of West Tropical Africa and specimens in the cupboards at Kew.

The database and checklist provide an essential infrastructure for a broad range of practical applications including herbarium curation at the Limbe Botanic Garden Herbarium and the National Herbarium of Cameroon in Yaounde, and quantitative biodiversity work through the link to TREMA (Tree Management and Mapping software). The database for South West Cameroon has formed the foundation for a National Plant Species Database for Cameroon which is being compiled at the National Herbarium with funding from the Global Environmental Facility of the World Bank.

Workshops

BRAHMS training workshops were held in 1998 at the Bangladesh National Herbarium (Dhaka), UPR (Mayaguez, Puerto Rico), the East African Herbarium (Nairobi, Kenya) and at INPA with the Kew Herbarium Techniques course (Manaus, Brazil).

BRAHMS 5.0 for Windows

BRAHMS Version 5.0 for Windows is now under development - modules from a prototype version have been circulated for comment. The new system is based on Microsoft Visual FoxPro 6.0, tapping into the wizardry on offer there. Version 5.0 is fully networkable and SQL commands provide fast data retrieval. Data storage flexibility has been further increased by the addition of user-designed 'linked data files'. For example, with species, detailed information on chromosomes and close-up flower pictures could be added. Data from Version 4.0 and upwards are easily imported to the new Windows system.

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Herbaria

The history of the Herbaria in the Department of Plant Sciences is closely linked to that of the Oxford University Botanic Garden, the oldest in the United Kingdom founded by Henry Danvers in 1621, and the development of British botany. The Oxford University Herbaria comprise two separate herbaria: the Fielding-Druce Herbarium (OXF; that of the former School of Botany including several historic collections: Bobart; Morison; Sherard; Dillenius; Du Bois; Sibthorp) and the Daubeny Herbarium (FHO; the former Forest Herbarium of the Oxford Forestry Institute). The total comprises some 600,000 specimens plus associated collections, for example dry fruits and spirit-preserved fruits and flowers.

Following the recommendations of an external review of systematics research and teaching in Oxford in 1992 the roles of the various herbarium collections were redefined. The Forest Herbarium was renamed the Daubeny Herbarium (FHO). The Fielding Herbarium of OXF (the general collection of the former Botany School) was closed to further accessions, other than those accessions already accepted but not yet incorporated. The Druce collection (British herbarium) of OXF still accepts elite specimens of British material. The Daubeny Herbarium changed its role from exclusively woody material to become the general collection of the Department of Plant Sciences and accepts high quality material from all families, but with an emphasis on existing strengths and research interests of the Department according to a detailed acquisitions policy.

The importance of the Oxford University Herbaria as an internationally important biological collection was reaffirmed by the external review. As historic collections they were recognised as important national and international resources which should be available for scholars and the general public in perpetuity. In addition the collection represents an important catalogue of the changing biodiversity of the UK and those countries that Britain has been linked with over the past 350 years. Since 1992 significant improvements have been made in procedures for loaning and receiving material, record keeping and accessibility of the collections to the public. In 1995 the Herbaria received Full Museum Registration from the Museums and Galleries Commission (MGC). The security of the collections has also been increased through the installation of a security system, whilst safety in the collection has been enhanced through the implementation of a biological screening programme for mercury in key staff working with the collections and the installation of extractor fans to prevent the accumulation of mercury vapour.

Stephen Harris

Visitors

During the academic year from October 1997 to the end of September 1998, 85 people visited the herbaria. We were delighted to welcome those who had visited before and very pleased to welcome new visitors from Britain and abroad, from as far afield as Brazil, U.S.A. and Australia.

Fielding-Druce (OXF)

Loans

During the period from 1 October 1997 to 30 September 1998, a total of 1074 sheets were sent out on loan from the OXF collections. These loans included the following genera and families: *Bocagea*, Annonaceae; *Asarum*, Aristolochiaceae; *Chaptalia, Ichthyothere*, Asteraceae; *Erophila*, Brassicaceae; *Chara, Tolypella*, Characeae; *Carex, Schoenoplectus*; Cyperaceae; *Macleania, Psammisia*, Ericaceae; *Schultesia*, Gentianaceae; mixed genera and species, Gramineae; *Scutellaria*, Labiatae; *Bauhinia*, Leguminosae: Caesalpinioideae; *Phaseolus*, Leguminosae: Papilionioideae; *Cuphea*, Lythraceae; *Habenaria*, Orchidaceae; *Passiflora*, Passifloraceae; *Crumenaria, Gouania, Reissekia*, Rhamnaceae; plus the following genera of bryophytes *Bryum, Entodon, Fissidens, Hookeria, Pylaisiobryum* and several miscellaneous lichens. The borrowing institutions included AK, BH, BM, CGE, FLAS, H, IPA, K, KE, LP, MNE, MU, NMW, NY, RB, RNG, SPF, UB and UEC. 813 specimens were returned from loan during the same period. Approximately 6% of the returned specimens are types.

The Druce Herbarium

During the year 230 specimens were accessed and incorporated into the collections. This included a number of grasses presented by T.B. Ryves O.B.E. and a number of miscellaneous species collected by Mr. R.C. Palmer. To coincide with the launch of the new *Flora of Oxfordshire* by J. Killick, A.R. Perry & S.R.J. Woodell

(1998), 174 specimens collected by H.J.M. Bowen in Oxfordshire in the 1950's & 1960's, some of which had been cited in the Flora, were accessed and incorporated.

The historic herbaria of OXF

Many visitors came to study and research specific material within the historic collections, particularly from the Sherardian, Morisonian and Dillenian 'Historia Muscorum' herbaria. Those collections of specific interest this year included specimens of *Triticum* from the Morison Herbarium being researched by Laura Morrison from Oregan State University and bryophytes in the Dillenian Herbarium being the focus of research by Ray & Barbara Stotler from Southern Illinois University. There was again interest in the collections of William Dampier. Kingsley Dixon from Kings Park and Botanic Garden Perth, Western Australia came to see Dampier's Australian material. A group of Brazilain visitors had a keen interest in the George Marcgrave specimens collected from Brazil in 1638. Others included Richard Lester from Birmingham University re-searching *Solanum* from various collections, Lady Jean O'Neill researching the collections of Peter Collinson, Sherardian Herbarium, and Mark & Elaine Trenear with an interest in early material of *Dianthus* from the Sherardian & Du Bois collections.

Notes on some recent rediscoveries in OXF

Additions to the Dillenian Herbarium of *Hortus Elthamensis*:

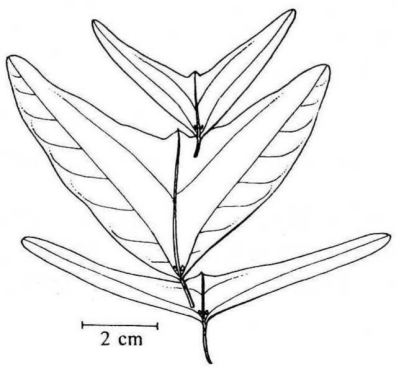
While searching through the Sherardian Herbarium (containing mostly pre-Linnean material) earlier this year, a specimen of *Passiflora vespertilio* L. was discovered bearing the label "*Granadilla bicornis, flore candido, filamentis intortis. Hort Elth. 1. 164. T. 137. f. 164.*" It therefore seemed likely that the specimen could belong in the Dillenian Collection relating to the latter's *Hortus Elthamensis* (Dillenius, 1732). On checking Druce & Vines *The Dillenian Herbaria. An account of the Dillenian Collections in the Herbarium of the University of Oxford* (1907), it was apparent that they had not found a specimen of the species corresponding to the appropriate plate in Dillenius (1732). The name on the specimen found however matched the name given to the species by Dillenius and bears leaves and a flower which are the same as those illustrated by him. Linneaus cites the Dillenian material under *P. vespertilio* in *Species Plantarum* (1753: 957). There seemed no doubt that this was the missing sheet from the Dillenian Herbarium and it has now been placed in the collection relating to the *Hortus Elthamensis*. Unfortunately it is not included in the microfiche edition of the Herbaria made in 1995 by IDC.

P. vespertilio L. is known to occur in Trinidad, the Guianas, Surinam, the lower Amazon region of Brazil, and just reaches into Peru and Bolivia. Dillenius gave its origin as American. The species has quite a distinctive leaf shape, being much broader than long with divaricate lobes. In the Department's copy of *Hortus Elthamensis*, which is hand-coloured by Dillenius, the outer petals of the flower are coloured pale green and the corona filaments are white.

A specimen of *Linaria genistifolia* (L.) Miller originally labelled "*Linaria vareigata Genistae tinctoriae folio. H. Elth.*" was also unearthed from the Sherardian collection. This sheet again bears the same name as a specimen described in *Hortus Elthamensis* and in Druce & Vines's account of the Dillenian Herbaria corresponding to Vol. 1. 201 T. 164. f. 200. Although a specimen of this already exists in the herbarium of the *Hortus Elthamensis*, the said specimen bears a label stating "duplicate" and the recently discovered specimen therefore appears to be the original matching the name. The left-hand plant on the sheet is a good match to the illustration by Dillenius. The flowers are depicted as yellow with red spurs.

Another specimen found in the Sherardian Herbarium which may also be attributed to the Hortus Elthamensis collection is *Eucomis regia* (*Fritillaria regia* L.) corresponding to T. 92-3. f. 108-9 "*Corona Regalis Lilii folio crenato*". The specimen consists of leaves and an inflorescence which match well to the illustration of such a splendid plant. The sheet is numbered 288.

Serena Marner



Leaves of *Passiflora vespertilio* L.

Daubeny (FHO)

Accessions

New accessions included specimens of *Aglaia* (Meliaceae) for Dr. Caroline Pannell for her work on the *Flora of Sabah and Sarawak* and specimens collected in Ghana by Dr. C. Jongkind of WAG, who is collaborating with Dr. William Hawthorne of this department on producing field guides to the lianes and shrubs of Ghana.

Loans

There was a huge turnover of loan material this year reflecting the end of some postgraduate studies and the beginning of others. All the *Brillantaisia* (Acanthaceae) was returned on the completion of Dr. Karen Sidwell's study. Other Acanthaceae - *Strobilanthes* for Jonathan Bennett and *Hemigraphis* for Elizabeth Moylan - both working with Dr. Robert Scotland, was received as well as Cyperaceae (*Uncinia* and *Carex*) for Julian Starr who is working with Dr. Stephen Harris. *Aglaia* for Dr. Caroline Pannell and *Rubus ulmifolius* for an undergraduate project were also received on loan.

A large number of specimens of Neotropical Ebenaceae were sent as outgoing loans.

Distribution of Duplicates

Dr. Colin Hughes's collection of *Leucaena* and other woody legumes from Central America were distributed to interested herbaria as well as Central American *Cordia* (Boraginaceae) collected by J.W. Stead and B.T. Styles.

Curation

Parts of the collection continued to be curated as material was incorporated, returned from loan or new accounts were published. The main sections involved this year were African *Ixora* (Rubiaceae), *Brillantaisia* (Acanthaceae), African Apocynaceae and South American Ebenaceae as well as adjustments to the genera of the Neotropical Leguminosae.

The overhaul of the spirit and carpological collections continued this year and is well on the way to completion. A student was employed for a short time in the long vacation to curate the extensive Meliaceae carpological collection. A database of both these ancillary collections is being prepared.

Alison Strugnell

EXHIBITION AT THE BODLEIAN LIBRARY, OXFORD

Bodleian Library Exhibition Room, Broad Street, Oxford OX1 3BG



The *Flora Graeca* Story

Oxford's finest botanical treasure

*19 JULY - 25 SEPTEMBER 1999**

Open Monday-Friday 9.30am-4.45pm
Saturday 9.30am-12.30pm
admission free

Based on collections held at the
Plant Sciences Library, University of Oxford
Illustrated catalogue by
Prof. Dr. H. Walter Lack, Freie Universität, Berlin
author of
The Flora Graeca Story: Sibthorp, Bauer, and Hawkins in the Levant: OUP, 1999

The flowers of Greece and the Eastern Mediterranean region have never been better or more extensively portrayed than in the 10 monumental volumes of Sibthorp and Smith's *Flora Graeca*; the plates by the illustrator Ferdinand Bauer are masterpieces of accurate botanical drawing. Bauer's paintings have been described as superior to anything of their kind in existence then, and the work has become one of the most valuable treasures of the University of Oxford.

This exhibition is an historical account of the incredible journeys made by 3 brilliant men - John Sibthorp (Sherardian Professor of Botany at Oxford), John Hawkins (geological scholar and collector of antiquities) and the natural history illustrator Ferdinand Bauer in a Grand Tour of the Ottoman Empire. Their goal was to search for the medicinal plants described by Dioscorides many centuries earlier and their efforts were crystallized in the Flora Graeca - described by one reviewer as the most beautiful flora in the world.

Where did they travel? What did they bring home?
How did Bauer record colours? How was it published?

A remarkable story is unravelled through original diaries, letters, drawings, herbarium specimens and lavishly printed material. The classical and botanical background to the journey is explained to set the scene. The three young, enthusiastic and highly qualified travellers in the late 18th century encountered many perils, including malaria, pirates, an earthquake, and swarms of locusts. The hero Sibthorp died at the early age of 38, exhausted from his travels.

However, they brought home a vast harvest - herbarium specimens, seeds, bulbs, fishes preserved in spirit, stuffed birds, and hundreds of sketches. The energetic Bauer took 6 years to produce finished water-colours from the sketches, creating a pictorial record of breathtaking quality and quantity. Only the botanical part was published; the profits of Sibthorp's Oxfordshire estate were used after his death to cover the huge cost. Just 25 subscribers bought the first edition, which took 52 years to complete.

This visually stunning exhibition will be of interest to botanists, horticulturists, historians, artists and anyone interested in the scientific and historical exploration of Greece, Cyprus and Turkey or accomplished illustrations of natural history.

* As there are major building works at the Bodleian Library in summer 1999 these dates are subject to confirmation: before travelling please telephone 01865 275082 or check the web page http://www.bodley.ox.ac.uk/dept/pubs/exhibitions/

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