Zeitschrift: Archives des sciences et compte rendu des séances de la Société
Herausgeber: Société de Physique et d'Histoire Naturelle de Genève
Band: 51 (1998)
Heft: 3

Artikel: To be or not to be a botanical monographer?
Autor: Hughes, Colin E.
DOI: https://doi.org/10.5169/seals-740163

Archs Sci. Genève	Vol. 51	Fasc. 3	pp. 353-357	Décembre 1998

TO BE OR NOT TO BE A BOTANICAL MONOGRAPHER ?

BY

Colin E. HUGHES*

Modem botanical monographs combine descriptive alpha taxonomy with systematic analysis of species relationships. The results of a systematic study are presented in an efficiently retrievable taxonomic account and often in a variety of complementary 'user-friendly' publications and databases. My monographic research on the economically important Neotropical legume genus *Leucaena* (Hughes, 1998a) has focused on three principal 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 the sort of 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 and Rose, 1928) to as few as ten (Brewbaker and Ito, 1980). So why are there such discrepencies? Are they 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* – could indeed 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 Table 1 and Maps 1 and 2 which document the distribution of botanical collections through time and space. There has been a 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.

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 are now clearly apparent. Lacking a rangewide picture, this limited set of variable speci-

* Department of Plant Sciences, University of Oxford, South Park Road, Oxford OX1 3RB, United Kingdom.

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 x
L. lanceolata (Mexico)	40	294	7 x
L. shannonii alliance (Central America)	11	241	22 x
All *Leucaena* (Guatemala only)	3	128	42 x

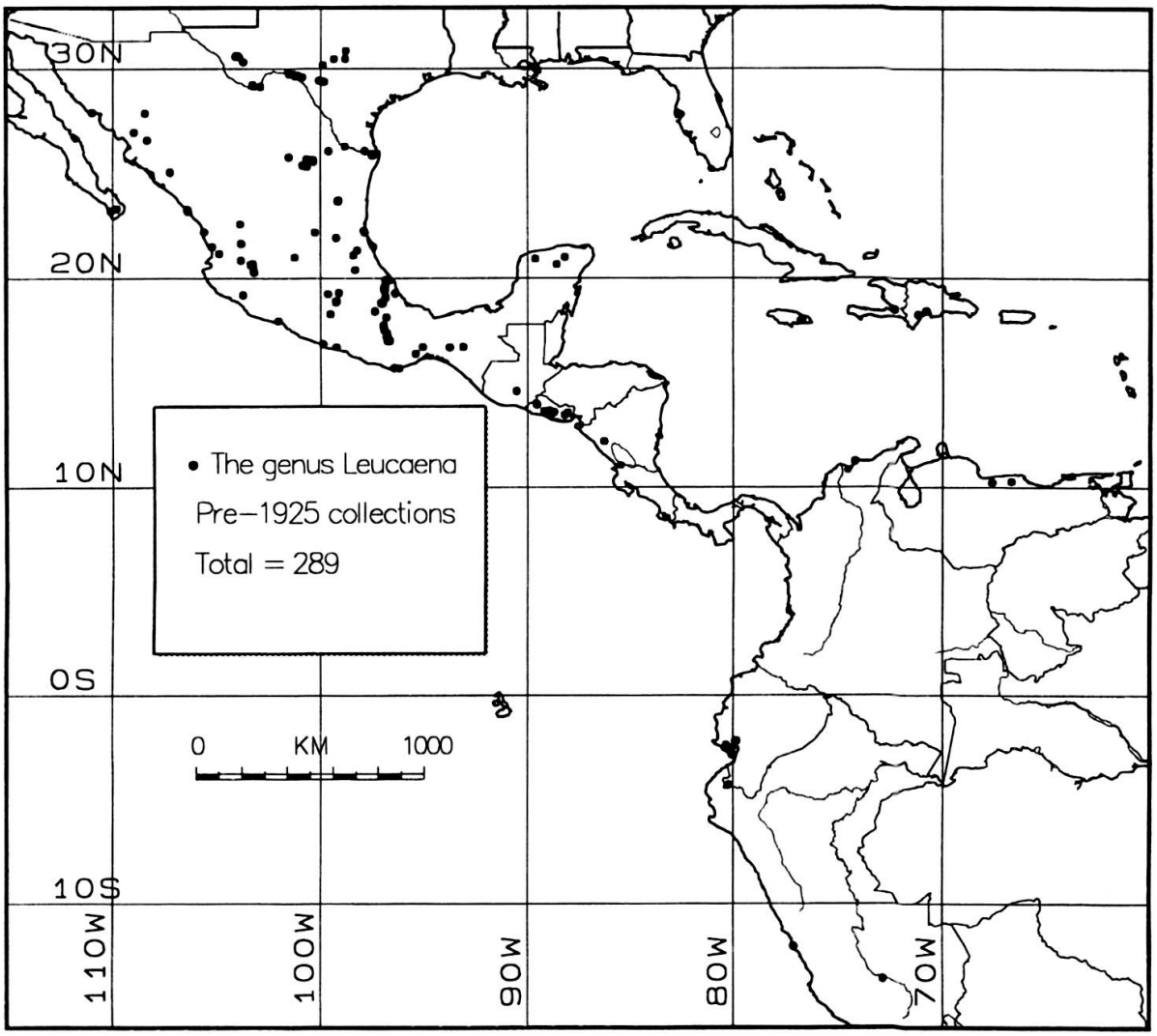
mens were pigeon-holed, in some cases virtually as species. Secondly, a set of clearly distinct more narrowly-restricted species were missed altogether and remained undiscovered until more intensive sampling was carried out, mainly in the last two decades. These contrary trends mean that while 16 of 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.

Given the radically different samples available to them, it is hardly surprising that different authors have delimited different numbers of species over the last 70 years. As sampling intensifies, the species inventory is becoming more complete and increasingly accurately delimited.

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 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 shows no support for these groups, nor the hypothesis that the Pacific genus *Schleinitzia* is the sister group of *Leucaena*. However, it fails to unambiguously resolve what that sister

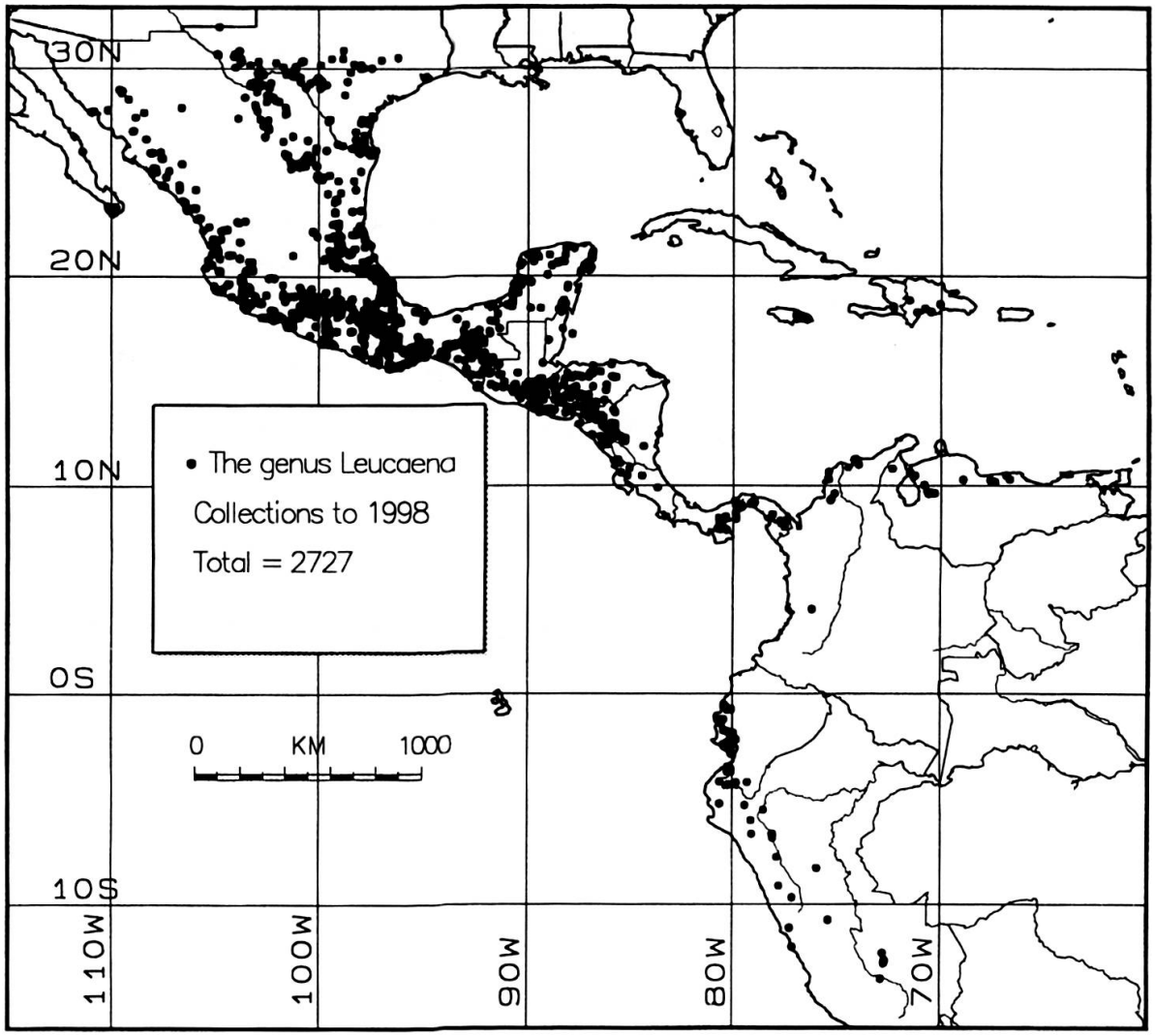
Map 1



group is. As with many tropical plant groups the search for sister groups to well established monophyletic groups is one of accretion and iteration. 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 (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. There is much discussion these days about

Map 2



conservation of biodiversity. Without monographs and monographers there is no one to define or identify the species which constitute the diversity to be conserved.

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 and bruchid beetle host specificities. 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* (Hughes, 1998b) has also been published 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.

Although not widely acclaimed as such, and certainly not recognised as such by funding bodies, I believe this may come to be seen as 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 examine species relationships, identify well-supported monophyletic groups and continue to search for their sister groups. These studies inform us about higher-level relationships and biogeography. Furthermore, the management (and distribution) of large volumes of botanical (particularly specimen) data can now be efficiently handled by use of computer databases streamlining the production of monographs and other outputs. 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 indeed an exciting time to be a botanical monographer.

ACKNOWLEDGEMENTS

I thank Robert Scotland for teaching me what systematics is and for his on-going support and encouragement, the Forestry Research Programme of the Department for International Development of the UK Government which funded taxonomic research on *Leucaena* through a series of research projects between 1990 and 1996, and Christiane Anderson, University of Michigan for her help and guidance with my monograph and for putting it forward for consideration for the de Candolle Prize.

REFERENCES

BREWBAKER, J.L. & ITO, G.M. 1980. Taxonomic studies of the genus *Leucaena*. *Leucaena Research Reports* 1: 41-42.

BRITTON, N.L. & ROSE, J.N. 1928. Mimosaceae. *North American Flora* 23: 121-131.

GRIMES, J.W. 1998. Before the Floras – Monographs. *Australian Systematic Botany* 11: 243-249.

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

HUGHES, C.E. 1998b. *Leucaena*. A Genetic Resources Handbook. Tropical Forestry Paper 37. Oxford Forestry Institute. 247 pp. (also in Spanish - *Leucaena. Manual de Recursos Genéticos*).