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Nomenclatural and classification history of *Acacia* (Leguminosae: Mimosoideae), and the implications of generic subdivision

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Summary

As currently defined *Acacia* is a cosmopolitan genus containing about 1 350 species; it is the second largest genus in the family Leguminosae. *Acacia* has had a complex nomenclatural history, although its circumscription has been relatively stable since a series of papers by Bentham (1840–1875). In 1986 Pedley proposed dividing the genus into three genera, *Acacia*, *Senegalia* (syn. *Acacia* subg. *Aculeiferum*) and *Racosperma* (syn. *Acacia* subg. *Phyllodineae*), and made 275 combinations in *Racosperma* to accommodate part of this change. Few have adopted Pedley's suggestion, but there is increasing evidence to suggest that *Acacia* should be subdivided. Evidence from several sources now suggests that at least five genera are involved in the complex, namely, those recognised by Pedley, except that *Senegalia* is viewed as comprising *Senegalia sens. str.*, *Acaciella* (syn. *Acacia* section *Filicinae*) and a new genus (based on taxa allied to *A. coulteri*). If *Acacia* is split in the way current evidence suggests, and names are applied in accordance with currently designated types, then over 1000 new combinations will be required, causing major disruption to nomenclature for this very large genus. Most of the species in commerce will require a name change. The consequences are examined, and two options provided for the future. The preferred option is to change the type species of genus *Acacia*, to minimise nomenclatural and economic impacts.

Introduction

The genus *Acacia* is the second largest in the family Leguminosae, with about 1350 species. It is distributed throughout tropical and warm temperate areas of the world, with the largest concentration of species in Australia (ca 957 species), and also with high numbers in the Americas (ca 185 species), Africa (144 species) and Asia (89 species), see Table 1. The genus has a long and convoluted history, with many genera being split or added to core *Acacia* over the last 250 years. The type of *Acacia* is generally considered to be *A. scorpioides* (L.) W. F. Wight (= *A. nilotica* (L.) Del., a species of tropical Africa and western Asia which is now naturalised in some other parts of the world, see Orchard & Maslin 2003). In the last 30 years considerable attention has been given to the phylogeny and the generic and infrageneric classification of *Acacia*, with the proposal by Pedley (1986) to subdivide *Acacia* into three genera having significant impact. Molecular and phylogenetic studies conducted since 1986 are lending considerable support for the fragmentation of *Acacia*, but not necessarily along the exact lines proposed by Pedley (see Maslin *et al.* 2003).

Such actions to divide *Acacia*, while desirable from the point of view of presenting a more defensible phylogeny, will have considerable nomenclatural, economic and pragmatic repercussions. More than 75% of the species in this very large genus may require a new name or new combination. Many of these species are of considerable economic, ecological or iconic importance. It can be anticipated that name changes on this scale will elicit commentary in the scientific, popular and semi-popular press, and it is inevitable that some of this comment will question the rationality of the taxonomic process. Therefore, it is important that the taxonomic data be sufficiently robust to support such changes, and if they are, then ways to minimise the nomenclatural impact of the change should be sought.

This paper seeks to provide the context for a better understanding of the issues associated with the fragmentation of *Acacia*. For this reason a history of the nomenclature and a synopsis of proposals relating to the phylogeny and classification of the genus is given below. A separate paper (Orchard & Maslin 2003) has presented a formal nomenclatural proposal designed to minimise inconvenience associated with splitting the genus.

History of the genus *Acacia*

Since *Acacia* was described in 1754 there have been almost 30 generic names applied to it. Appendix 1 gives the typification and synonymy of these generic names which are discussed in the following sections.

Original description of *Acacia*

Acacia was formally adopted by Miller (1754) in a paper which contained descriptions of 24 African and American species, but there was no attempt to divide these into groups. Miller's generic concepts were very broad, and it is not surprising, therefore, that a number of his species are no longer referable to *Acacia* in its current sense. Prior to Miller the name *Acacia* had been widely used in pre-Linnean literature (see Ross 1980). Linnaeus (1753) had placed most Mimosoids known to him in the genus *Mimosa* and of the 39 species that he treated, only six are currently recognised as belonging to that genus, 14 to *Acacia* and the remainder distributed across eleven different genera. Two of the species described by Linnaeus were *Mimosa scorpioides* and *Mimosa nilotica*; these taxa were subsequently transferred to *Acacia* and are now considered conspecific with *A. scorpioides* generally regarded as the type of the genus (see Orchard & Maslin 2003). Miller later adopted Linnaeus' broad concept of *Mimosa* and the name *Acacia* fell into disuse (Pedley 1987). Lamarck (1783) followed Linnaeus by including *Acacia* within *Mimosa*.

First Australian *Acacia* species

In 1768 Burman described '*Adiantum truncatum*' and '*Polypodium spinulosum*', perhaps the first plants from Australia ever collected by Europeans. The collections were probably made by members of the Vlaming expedition that visited the Perth region of Western Australia in 1697 (George 1971). The first is now known to be *Acacia truncata* (Burm. f.) Hoffmannsegg and the latter is *Synaphea spinulosa* (Burm.f.) Merr., a member of the Proteaceae.

Reappearance of the name *Acacia*

Around the beginning of the 19th century the name *Acacia* regained popular acceptance as a genus distinct from *Mimosa*, but its circumscription was unclear. For example, Willdenow (1806) referred 102 species to *Acacia* but 45 were later transferred to other genera, mainly *Prosopis* L. (8 spp.), *Albizia* Durazz. (7 spp.), *Mimosa* L. (6 spp.) and *Calliandra* Benth. (6 spp. – this genus was not formally described until 1840). Willdenow was among the first to attempt to draw up a system of classification for *Acacia*: he divided the species into six groups, each tersely described but not formally named or prefaced by any indication of rank. Candolle (1825) listed 258 species of *Acacia*, many of which were later transferred to other genera, mainly *Albizia* (12 spp.), *Calliandra* (13 spp.), *Mimosa* (16 spp.) and *Piptadenia* Benth. (12 spp.). Candolle referred most of the species to four described and formally named sections, placing the residue under "*Acaciae non satis notis*".

Early generic segregates of *Acacia*

Attempts were made between 1830 and 1850 to clarify the definition of *Acacia* through the description of segregate genera. During this period fourteen new genera were described and according to Pedley (1987) the fragmentation of *Acacia* would have resulted in taxonomic chaos had George Bentham not intervened (see below).

Phyllodoce

Both Willdenow (1806) and Candolle (1825) had created infrageneric categories to accommodate the Australian species with phyllodes (the bipinnate leaved species, including those from Australia, were placed in separate categories), as did Sprengel (1826) and Martius (1829 – see below). Brown (1814) had also recognised the distinctive foliar character of these species, and commented on their ubiquity in the Australian flora. In 1831 Link erected the genus *Phyllodoce* to accommodate these phyllodinous taxa. This is the first generic name created for species which are now referable to *Acacia* subgenus *Phyllodineae*, but *Phyllodoce* Link is illegitimate, being a later homonym of *Phyllodoce* Salisb. (1806).

Racosperma

In 1829 the name *Racosperma* appeared (under *Acacia*) in a seed list published by C.F.P. Martius. Although the name was based on *Acacia* section *Phyllodineae* DC. (1825) it cannot be considered as having been validly published at that time because the author himself did not accept it as representing a distinct genus. The 22 phyllodinous species included by Martius under *Racosperma* were all listed as *Acacia*; except for *A. heterophylla* from the Mascarenes, these names all referred to Australian taxa. Later, Martius (1835) again published the name *Racosperma*, citing it as "*Racosperma* Mart. (*Acacia* R. Br.)". It appeared in an alphabetically arranged seed list and was clearly accepted by the author as a distinct genus, although it was not accompanied by either a description or a diagnosis; Martius listed three species under this name, two of which had appeared in his 1829 publication. Pedley (1986) interpreted Martius' 1835 citation as representing a reference back to his 1829 account and through this as an indirect reference to the description of *Acacia* section *Phyllodineae* DC (1825). Pedley accepted this as validating *Racosperma* Mart. (1835) and cited the type as *Acacia penninervis*, one of the Australian phyllodinous species listed by Candolle, effectively lectotypifying it by that species. Pedley (1986, 1987a–d, 1988) subsequently described five new species of *Racosperma*, provided four new names in that genus, and effected 275 combinations based on taxa from *Acacia* subgenus *Phyllodineae*. (Only three other valid combinations under *Racosperma* had previously been made: see Martius 1835.)

However, an alternative and possibly more plausible interpretation of Martius' (1835) citation "*Racosperma* Mart. (*Acacia* R. Br.)" is that it represents an indirect reference back to *Acacia* sensu Robert Brown (1813 and/or 1814 – both these works were translated into German by Nees von Esenbeck in 1825 and would have been easily accessible to Martius). In 1813 Brown published a treatment of *Acacia* in Aiton's *Hortus Kewensis* where a short generic description was provided, followed by descriptions of 53 species; these species represented each of the currently recognised three subgenera of *Acacia* and were classified using the same informal system that Willdenow (1806) had introduced: the structure of the generic treatment and even the species order of the two closely coincide. Under this interpretation, the citation "*Racosperma* Mart. (*Acacia* R. Br.)" represents a statement of a generic name accepted by Martius and based on *Acacia* sensu Brown, which was fairly clearly *Acacia* sensu Willdenow (1806). It would then follow that the lectotype of *Racosperma* should have been chosen from among the 53 species recognised by Brown rather than from Candolle's species.

In Appendix 3 to Flinders Voyage to Terra Australis Brown (1814) briefly discussed the Australian phyllodinous species of *Acacia* which he said were referable to the first group recognised in that genus by Willdenow (1806), namely, 'Foliis simplicibus'; these species are referable to *Acacia* subgenus *Phyllodineae*.

In summary, while it seems clear that Martius (1835) achieved the validation of the name *Racosperma* by indirect reference to a previously effectively published name, the interpretation of which indirect reference is of some consequence to the typification of the name. If Pedley's 1986 argument is accepted, and the name is indirectly validated through Candolle (1825), then Pedley's lectotypification of *Racosperma* on *A. penninervis* must stand. However, if it is accepted that the indirect reference is to Brown (1813), then the lectotype needs to be selected from among the species included by Brown in that work. These did not include *A. penninervis*. This issue has no direct impact on the proposal to change the type of *Acacia*, and it will be addressed separately should the need arise.

Vachellia, Farnesia and Aldina

Wight & Arnott (1834) and Gasparrini (1838) described the monotypic American genera *Vachellia* and *Farnesia* (nom. illeg., superfluous), both of which were based on *Mimosa farnesiana*. Their reason for separating this taxon from *Acacia* was probably that it possessed a distinctive pod. These names are now considered synonymous with *Acacia* subg. *Acacia* (see discussion under Bentham below), although Kostermans (1980) did adopt the name *Vachellia farnesiana* for plants from Sri Lanka which are now regarded as *A. farnesiana*. Meyer (1836) also described a new genus seemingly allied to *A. farnesiana*, namely, *Aldina* (nom. illeg.).

Acacia dismembered – Rafinesque

An extreme case of splitting of *Acacia* was that of the eccentric Rafinesque (1838) who described seven genera with very brief descriptions. Two of these genera are now referable to *Acacia* subg. *Acacia* (*Gumifera* based on a species from Africa, and *Poponax* based on a species from America), one to *Acacia* subg. *Aculeiferum* (*Senegalia* based on a species from Africa) and four to *Acacia* subg. *Phyllodineae* (*Cuparilla*, *Drepaphyla*, *Hecatandra* and *Zigmalo*, based on species from Australia). *Senegalia* is the earliest generic name available for species currently referred to *Acacia* subg. *Aculeiferum* if this taxon is segregated from *Acacia*.

Chithonanthus* and *Tetracheilos

Lehmann (1848) described two new genera, *Chithonanthus* and *Tetracheilos*, to accommodate two unusual Western Australian species (*A. restiacea* and *A. tetragonocarpa*) that had previously been included in *Acacia*. These generic names are now considered synonymous with *Acacia* subg. *Phyllodineae*.

Bentham (1840–1875)

Because of the importance of Bentham to the development of the classification of *Acacia* a brief analysis of his work is warranted here. In a series of publications, commencing in 1840 and ending in 1875, Bentham undertook a number of studies that greatly clarified the definition and classification of *Acacia*. In 1840 Bentham (1840a) considered that *Acacia* had become an "unwieldy, ill-defined, and comparatively unnatural assemblage of plants". His intention was to clarify Willdenow's (1806) and Candolle's (1825) broad concepts of the genus by restricting the name *Acacia* to plants with infinite, free stamens, thus excluding species now referable to tribes Mimoseae and Ingeae (see Bentham 1840: 137 and 1840a). At this stage, however, Bentham (1840) followed Wight & Arnott (1834) in recognizing *Vachellia* (see above) as a distinct genus, noting that in the Americas it was easily distinguished from "true" *Acacia*, but in Africa the two genera seemed to run into one another. Bentham's concept of "true" *Acacia* encompassed species from Australia, Asia, Africa and the Americas and almost certainly included ones that are now referable to each of the three currently recognised subgenera, namely, subg. *Acacia*, subg. *Aculeiferum* and subg. *Phyllodineae*. He pragmatically argued that because the group containing the Australian species was "so very much the largest group" it would cause "infinitely less confusion" to apply the name *Acacia* to this group. Two years later Bentham (1842) decided that the pod character employed to segregate *Vachellia* was not a good generic attribute and furthermore was of "great inconvenience" because pods were rarely present on herbarium specimens. He therefore broadened his definition of *Acacia* to include *Vachellia farnesiana* and its allies. Thus, for the first time the generic limits of *Acacia* were clearly defined (and, in fact, have largely persisted until the present). Bentham not only considered that his re-defined *Acacia* was a more natural group than in previous schemes, it was more "clearly and easily defined". The six series that he recognised within *Acacia* were delimited primarily on foliage characters and the nature of the spines, with inflorescence characters being of less importance. Until recently these six series were accepted by most taxonomists as the primary divisions of the genus, although there has been some disagreement as to their rank. Ross (1973) provides further discussion of Bentham's 1842 classification.

In 1864 Bentham produced a monumental work, the Leguminosae in *Flora Australiensis*. In his introduction to the account of *Acacia* he discussed at length the extreme variation in pod and seed characters and concluded that these could not be employed to construct a meaningful infrageneric classification. Instead, his classification was based chiefly on foliage and inflorescence attributes. However, in using these characters Bentham considered that the [relatively low] rank of series was the most appropriate for grouping the species. His scheme recognised two 'divisions', *Phyllodineae* (with 8 series which accommodated mostly phyllodinous species) and *Bipinnatae* (with 3 series which covered bipinnate-leaved species).

In his final classification of *Acacia* Bentham (1875) reiterated that the genus appeared a natural one distinguishable from the remainder of the mimosoids by its indefinite free stamens. He again stressed his unwillingness to recognise infrageneric taxa at a high rank and therefore reduced his 8 series of 'division' *Phyllodineae* to sub-series under series *Phyllodineae*. The bipinnate-leaved species were grouped into 5 series, 2 of which were not known to occur in Australia.

In summary the following may be said of Bentham in relation to the classification of *Acacia*.

1. In the years 1840–1875 Bentham undertook a number of major revisions of *Acacia*. During this period he refined previous definitions of the genus by moving away from pod characters to those of the stamens. His final definition based on indefinite, free stamens persists to the present.
2. While Bentham sought to establish natural infrageneric groups within *Acacia* he considered that these groups should be recognizable by easily observed characters i.e. inflorescence and foliage (pods being rarely present on herbarium gatherings).
3. Except for his early recognition of *Vachellia* (defined by pod characters) he did not divide *Acacia* into multiple genera. On the contrary, with the progression of time he tended to reduce the rank applied to many of his infrageneric segregates.
4. In his final (1875) classification he gave equal rank to groups containing phyllodinous species (i.e. series *Phyllodineae*) and bipinnate-leaved species, i.e. series *Vulgares*, *Filicinae*, *Gummiferae*, *Pulchellae* and *Botrycephalae*.

New Asian, African and American genera recognised (1911–1940)

Between 1911 and 1940 fifteen new Asian and American genera were segregated from *Acacia*. However, except for *Faidherbia*, none is currently accepted.

Delaporteia

Gagnepain (1911) described *Delaporteia* to accommodate a single species from Laos which was segregated from *Acacia* on the basis of a small gland present at the top of the anther. Three species of *Delaporteia* were ultimately described but these are now regarded as conspecific with *Acacia* subgenus *Acacia* (fide Guinet 1981 and Nielsen 1981).

Phytomorula

This taxon was described by Kofoid (1914) for what he believed to be a new genus of protophyte (protista) that was found in a reservoir in Berkeley in 1912; the "organism" however, is a 16-grained polyad of *Acacia* pollen and Pedley (1986) referred *Phytomorula* to *Racosperma* (*Acacia* subg. *Phyllodineae*).

Pithecodendron* and *Manganaroa

Spegazzini (1923) described the monotypic Argentinian genus *Pithecodendron*, a name that is now considered synonymous with *Acacia* subg. *Acacia* (Spegazzini's taxon was based on a cultivated plant of the African species, *A. horrida*, fide Burkart 1939). In the same publication Spegazzini described *Manganaroa* for several Argentinian species formerly included in *Acacia*. As with *Delaporteia* this genus was characterized by a gland at the top of the anther, but this was subsequently shown not to be a reliable generic character and *Manganaroa* was placed in synonymy under *Acacia* (subg. *Aculeiferum*) by Cialdella (1984) and *Senegalia* by Pedley (1986).

Nimiria

Craib (1927) described the genus *Nimiria* from Thailand. This name is now considered synonymous with *Acacia* subg. *Acacia* (fide Hutchinson 1964, Nielsen 1981).

Britton and Rose - North American genera

Britton & Rose (1928) presented a radical treatment of *Acacia* for the *Flora of North America*. Based on pod characters the species were distributed among eleven genera, eight of which were described as new. One of these new genera (*Acaciella*) is now referred to *Acacia* subg. *Aculeiferum* while the other seven (*Acaciopsis*, *Bahamia*, *Fishlockia*, *FerAcacia*, *Lucaya*, *Myrmecodendron* and *Tauroceras*) are currently referred to *Acacia* subg. *Acacia*. After Rose's death in 1934 Britton & Rose's treatment was ignored (Pedley 1987) and most of their genera were rejected, with species being transferred back to *Acacia* where necessary.

Dugandia

Britton & Killip (1936) described the monotypic genus *Dugandia* from Colombia; this species is included in *Acacia* by Vassal (1981); Guinet (1981) suggested that it is referable to subgenus *Aculeiferum*.

Faidherbia

Chevalier (1934) transferred an African species, *Acacia albida*, to a monotypic genus, *Faidherbia*, and in recent times there has been considerable discussion as to its taxonomic status. Ross (1979) summarised evidence indicating that this taxon is not closely related to the other African species of *Acacia* and Vassal (1981) treated it as a monotypic genus within tribe Acacieae (however, Polhill 1994 placed it in tribe Ingeae). The results of immunological studies by Brain (1987, 1990) the cladistic analyses of Chappill & Maslin (1995) and recent molecular studies (see Maslin *et al.* 2003 for summary) confirm that this taxon should be removed from *Acacia*.

Recent high-level classifications of *Acacia* (1969-1986)

The first formal change to Bentham's long-standing classification of *Acacia* was that of Vassal (1972), a scheme that was based in part on previous palynological studies by Guinet (1969), and which subsequently assisted in providing the conceptual framework for Pedley's (1986) subdivision of the genus.

Guinet (1969)

Based on pollen analysis of almost 250 species Guinet (1969) proposed an informal classification of *Acacia* in which three groups were recognized: Group 1 (comprising Bentham's series *Filicinae* and *Vulgares*), Group 2 (comprising series *Phyllodineae*, *Botrycephalae* and *Pulchellae*) and Group 3 (comprising series *Gummiferae*). Groups 1 and 2 were shown to have affinities with one another while group 3 stood apart. Guinet suggested that each of the three groups could be recognised as distinct genera but he did not present a formal classification of them. In fact, in many of his numerous subsequent publications on *Acacia* Guinet followed Vassal (1972) in treating these groups as subgenera, namely, subg. *Aculeiferum* (Group 1), subg. *Phyllodineae* (Group 2) and subg. *Acacia* (Group 3). However, in 1990 Guinet viewed *Acacia* as comprising two main groups, namely, subg. *Acacia* (pollen colpi porate, exine columellar) and the combined subgenera *Aculeiferum* and *Phyllodineae* (pollen porate or extraporate, exine granular, i.e. not possessing columellae). Although Guinet hinted that these groups might represent distinct genera he did not formally advocate splitting *Acacia*.

Vassal (1972)

In 1972 Vassal proposed a new classification of *Acacia* based chiefly on information derived from his study of seeds, seedlings and stipules, and also taking into account Guinet's palynological data. This scheme was the first formal re-arrangement of Bentham's long-established classification of the genus. Vassal recognised three subgenera, subg. *Acacia*, subg. *Aculeiferum* and subg. *Heterophyllum* (= subg. *Phyllodineae*) and seven sections (see Table 2). The three subgenera broadly corresponded to groupings of Bentham's (1875) six series which, according to Ross (1981), was fortunate, because most of the characters on which Vassal's classification was based are not obvious from the gross morphology of conventional herbarium specimens.

Johnson (1973)

Johnson (1973) used multivariate statistical methods based predominantly on Queensland species to derive a hypothetical scheme for classifying *Acacia*. He did not describe any new infrageneric groups but simply suggested certain re-arrangements of Bentham's classification. Pedley (see below) adopted part of Johnson's scheme in proposing his classifications.

Guinet and Vassal (1978)

In this publication Guinet and Vassal assessed the phylogeny and classification of *Acacia* by examining a range of morphological, ontogenetic, pollen, chromosome and biochemical attributes. Insofar as classification is concerned this study did not suggest any change to Vassal's (1972) scheme.

Pedley (1978, 1986)

In 1986 Pedley re-assessed the classification of *Acacia* and proposed that the genus be divided into three genera, *Acacia*, *Senegalia* and *Racosperma*. The relationship between Pedley's (1986) classification, his earlier (1978) scheme and those of Vassal (1972), Bentham (1875) and Maslin *et al.* (2003) are shown in Table 2. Pedley's (1986) scheme was an important development in the classification of *Acacia*.

Prior to his 1978 classification Pedley had described and discussed a number of Australian species of *Acacia*. These taxa were sometimes not referred to any infrageneric group (e.g. Pedley 1964), sometimes they were included in Bentham's groups but without rank indicated (e.g. Pedley 1974), sometimes they were referred to informally re-defined Bentham groups (e.g. Pedley 1972) and sometimes they were referred to Vassal's (1972) groups (e.g. Pedley 1975). This illustrates the problems confronting Pedley (and other taxonomists working at that time) concerning the inadequacies of the then existing infrageneric classification of *Acacia*. His 1978 classification was therefore welcomed as incorporating the best aspects of Bentham's and Vassal's previous classifications into a single, usable scheme. In this work Pedley (1978) followed Vassal (1972) in recognizing 3 subgenera and a number of sections. The sections largely corresponded to groupings of Bentham's (1842, 1864, 1875) series and subseries. Pedley used mainly vegetative and inflorescence characters to define his infrageneric groups, but he took into account information derived from previous studies of pollen (e.g. Guinet 1969), seed and seedling ontogeny (Vassal 1972), free amino acids in seeds (Evans *et al.* 1977) and flavonoids of bark and wood (Tindale & Roux 1969).

According to Pedley (1987) he had by about 1972 become convinced that subgenus *Acacia* (= Series *Gummiferae*) warranted recognition as a distinct genus. Although this change was not made in his 1978 classification he did informally advocate, in 1981, that *Acacia* be divided into two genera, namely, *Acacia* and genus "Z". The latter is a reference to *Zigmaloba* Rafinesque, and would have comprised the combined subgenera *Aculeiferum* and *Phyllodineae*. In this 1981 article Pedley acknowledged that

"whether or not *Acacia* should be split is partly a philosophical question." In 1983 Pedley foreshadowed his most recent (1986) classification by stating that three genera would be recognised within *Acacia*. The genera were named *Acacia*, *Senegalia* and *Racosperma*, but not defined. In 1986 Pedley formally recognised *Acacia*, *Senegalia* and *Racosperma* which corresponded to Vassal's (1972) *Acacia* subg. *Acacia*, subg. *Aculeiferum* and subg. *Phyllodineae*¹ respectively. Although generic descriptions were not given, a key to the genera was provided, along with generic synonymy and typification and some new combinations were made under *Racosperma* and *Senegalia*.

Reaction to Pedley's division of *Acacia*

Pedley's 1986 classification was not widely adopted by either the botanical or non-botanical community. Indeed, apart from his own publications (Pedley 1987a–d, 1988) there appear to be few others that have adopted the name *Racosperma*. The only papers known to us are Khasa (1993), Khasa & Bousquet (1994) and (1995), Khasa *et al.* (1994a), (1994b), (1995a) and (1995b), Quoirin *et al.* (1997), Carvalho *et al.* (1999) and Takemori *et al.* (2000). These are outweighed, many times over (far too many to list here), by papers adopting the name *Acacia*, including many in which the *Racosperma* combinations are cited in synonymy. Perhaps the most influential of these are the recently published 2-volume account of *Acacia* in *Flora of Australia* (Orchard & Wilson 2001) and the accompanying electronic equivalent, *WATTLE Acacias of Australia* (Maslin 2001a). As already noted above (under *Racosperma*) there are about 290 names available in *Racosperma*; this number represents about a quarter of the currently recognized taxa in *Acacia* subg. *Phyllodineae*. We have been unable to find any papers in refereed journals where the name *Senegalia* has been adopted. About 90 names are currently available under *Senegalia* (most provided by Britton & Rose 1928), but it is probable that over 100 additional combinations will be required when this genus is reinstated.

The main reasons for not accepting Pedley's generic classification are outlined in Maslin (1987, 1988). Prior to these publications a meeting of the International Group for the Study of Mimosoideae in Berlin had expressed reservations concerning Pedley's proposal (Maslin 1987). Of primary concern was the widespread nomenclatural disruption that would ensue from splitting this large cosmopolitan genus. Although it was generally recognised that *Acacia sens. lat.* was probably polyphyletic (at least to the extent that subg. *Acacia* differed significantly from the other two subgenera in a number of morphological, palynological, biochemical and other characters) it was not clear how many genera should be recognised, or how these might relate to other groups within the related tribes Ingeae and Mimoseae. The evidence presented by Pedley to substantiate his three-way split of the genus was considered inconclusive and/or incomplete. Questions relating to the possibility of generic rank for section *Filicinae* were raised. Concerns were also expressed that the name *Racosperma* might be invalid. For these reasons it was considered imprudent to accept the division of *Acacia* as proposed by Pedley. There was a call for more study to acquire critical information upon which informed decisions could be made concerning the generic status of *Acacia*, and in particular, for broad-based comparative studies of *Acacia* that included genera from tribes Ingeae and Mimoseae. Pedley defended his 1986 classification in two papers (Pedley 1987e, 1989).

Recent evidence for splitting *Acacia*

Since the publication of Pedley's 1986 paper a number of morphological and molecular studies have been undertaken that have further explored the phylogeny and classification of *Acacia*. These studies included not only species of *Acacia sens. lat.* and *Faidherbia* (tribe Acacieae) but also representatives from the related tribes Ingeae and Mimoseae. As discussed by Maslin *et al.* (2003) the results of this work have enabled the generic status of *Acacia* to be reassessed and the following is a summary of the conclusions reached.

The recent molecular and cladistic studies of Chappill & Maslin (1995), Miller & Bayer (2000, 2001 & 2003), Robinson & Harris (2000), Clarke *et al.* (2000) and Luckow *et al.* (in press) have demonstrated that *Acacia*, as currently defined, is polyphyletic. These same data sources also confirm that *Acacia* subg. *Acacia* and *Acacia* subg. *Phyllodineae* are each monophyletic. However, neither the morphological data of Chappill & Maslin (1995) nor the molecular evidence provides significant support for the monophyly of subg. *Aculeiferum*. This may be due, in part at least, to disparate sampling strategies employed in the various studies and, more particularly, to the dearth of phylogenetically useful information on account of the relatively few species that have been studied. Nevertheless, current evidence indicates that within subg. *Aculeiferum sens. lat.* there are at least three distinct monophyletic lineages, namely, section *Filicinae*, the '*Acacia coulteri*' group and the remainder of the subgenus which is now referred to as subg. *Aculeiferum sens. str.* It is not impossible that further sampling of subg. *Aculeiferum* may reveal yet other unique lineages within this group.

¹Vassal used the illegitimate name, *Heterophyllum* for this subgenus

As noted by Maslin *et al.* (2003) the above studies do not agree on the sister relationship of the five monophyletic groups that comprise *Acacia sens. lat.* (these differences are graphically represented by Figure 1 in Maslin *et al.* 2003). Reasons for the disparate results include the sampling strategies employed by the studies and by their choices of out-group taxa. Nevertheless, the five lineages have been shown to be clearly monophyletic in all recent morphological and molecular studies of the group (Maslin *et al.* 2003). The most comprehensive study of the Mimosoideae (Luckow *et al.* in press) indicated high levels of bootstrap support for the principal clades, namely, subg. *Acacia* [bs = 99%], subg. *Aculeiferum sens. str.* [bs = 99%] and subg. *Phyllodineae* [bs=84%].

A cladogram representing an overview of the most recent chloroplast DNA sequence data of Miller and Bayer (2000, 2001 and 2003) and Luckow *et al.* (in press) is presented in Fig. 1. This cladogram clearly shows *Acacia sens. lat.* as being polyphyletic, subg. *Acacia* being nested within tribe Mimoseae with subg. *Aculeiferum sens. str.* sister to a polytomy containing subg. *Phyllodineae*, section *Filicinae*, the ‘*Acacia coulteri*’ group, *Faidherbia albida* and certain Ingeae taxa.

Current generic status of *Acacia sens. lat.*

Based on the recent molecular and phylogenetic results, and from considering previous morphological, biochemical and other evidence (see Pedley 1986, Maslin 1988), it is clear that the genus *Acacia*, as currently defined is polyphyletic and cannot be sustained as a single genus. These data also now confirm that both subg. *Acacia* and subg. *Phyllodineae* are monophyletic. Pedley (1986) treated these two groups as distinct genera, named *Acacia* and *Racosperma* respectively, and there is now sufficient justification to accept this rank for them (Maslin *et al.* 2003), but not necessarily these generic names (see below). Pedley (1986) also recognised a third genus, *Senegalia*, which was based on *Acacia* subg. *Aculeiferum sens. lat.* However, as already noted the recent data does not provide significant support for the monophyly of this group. Instead, current evidence indicates that subg. *Aculeiferum sens. lat.* comprises at least three distinct monophyletic lineages, namely, *Acacia* subg. *Aculeiferum* section *Filicinae*, the ‘*Acacia coulteri*’ group and the remainder of the subgenus (referred to here as *Acacia* subg. *Aculeiferum sens. str.*). At the rank of genus these taxa are known as *Acaciella*, *Acacia* gen. nov. (Genus ‘X’) and *Senegalia* respectively. Although it is possible to recognise *Acacia* subg. *Aculeiferum sens. lat.* as a paraphyletic (or possibly polyphyletic) genus, it is considered by Maslin *et al.* (2003) best to treat each of these three major monophyletic lineages as separate genera, thereby providing a more precise taxonomy that better reflects known evolutionary relationships. Although further study is needed to resolve the relationships of the five genera this does not negate their validity as monophyletic groups and it does not preclude treating them as separate genera (see Maslin *et al.* 2003, for discussion).

A synopsis of the five genera follows and for the purpose of these discussions the generic names used are those applicable by the application of currently designated types (see below for further discussion concerning the application of generic names). Table 3 provides details of the main distinguishing features of these five taxa.

Acacia sens. str.

A cosmopolitan genus containing about 161 species (Table 1) of which about 60 species occur in the Americas, 73 species in Africa (including Madagascar), 36 species in Asia (including about 15 species that occur also in Africa) and 7 species in Australia. The distribution of this genus is shown in Figure 1 of Maslin *et al.* (2003).

All recent studies have shown *Acacia sens. str.* to be monophyletic and clearly distinct from the other taxa of *Acacia sens. lat.* Luckow *et al.* (in press) shows *Acacia sens. str.* to be nested deeply within tribe Mimoseae, a relationship also suggested by Guinet (1990) based on pollen data.

In their cp RFLP study of *Acacia*, Robinson & Harris (2000) found *Acacia sens. str.* and *Senegalia* (represented by *Acacia* subg. *Acacia* and *Acacia* subg. *Aculeiferum* respectively) to be sister taxa. However, as discussed by Maslin *et al.* (2003) it is critical to note the lack of bootstrap and jackknife support for this *Acacia/Aculeiferum* clade, and also the small sampling of taxa in the outgroup tribe Mimoseae (i.e. one species). Other studies such as those of Luckow *et al.* (in press) which are based on a more comprehensive sampling of tribe Mimoseae do not find the sister relationship of subg. *Acacia* and subg. *Aculeiferum*.

Senegalia

A cosmopolitan genus containing 203 species (Table 1) of which 97 species (plus about 20 undescribed species) occur in the Americas, 69 species occur in Africa (including Madagascar), 43 species in Asia (including 7 species that occur also in Africa) and 2 species in Australia (including one that extends to Asia).

The exclusion of *Acaciella* (syn. *Acacia* subg. *Aculeiferum* sect. *Filicinae*) and Genus X (syn. the '*Acacia coulteri*' group) from *Acacia* subg. *Aculeiferum sens. lat.* leaves a remaining core group, *Senegalia* (syn. *Acacia* subg. *Aculeiferum sens. str.*). *Senegalia* has been shown to be monophyletic in all cladistic studies, and is supported by strong bootstrap values (bs = 99% in Luckow *et al.* in press). Detailed study of this group has been somewhat limited and future work may reveal monophyletic lineages within it that warrant recognition.

Acaciella

A genus comprising 15 species (Table 1) extending from south-central U.S.A. south to Argentina, with the highest concentration of species in Mexico (L. Rico Arce, pers. comm.).

The results of recent molecular studies suggest that the relationships of this genus are equivocal and this is due, at least in part, to the fact that very few species have been studied. However, according to Pedley (1987e), the morphological and chemical attributes of sect. *Filicinae* suggest that it could well be treated as a distinct genus and a similar view was expressed by Guinet (in Maslin 1987). Maslin *et al.* (2003) consider it appropriate to treat this group as a distinct genus.

Genus 'X' ('*Acacia coulteri*' group)

A genus comprising 13 species (Table 1) extending from Arizona (southern U.S.A.) south through Mexico to Costa Rica. Currently there is no generic name available for this taxon. The group was recently monographed by Jawad *et al.* (2000) and segregated from *Acacia* subg. *Aculeiferum* on account of the plants lacking prickles, never having a liane habit, and other characters (see Table 3).

While sampling of the '*Acacia coulteri*' group has been limited, recent molecular work reveals evidence of early divergence of this group from subg. *Aculeiferum sens. str.* Cladistic analyses based on molecular and morphological data suggest that the '*Acacia coulteri*' group is of more ancient origin than other species of *Acacia* sect. *Aculeiferum sens. lat.* (fide Clarke *et al.* 2000, Class & Seigler, unpublished, papers cited in Jawad *loc. cit.*).

Racosperma

This group of 960 species is largely confined to Australia (Table 1). Within Australia there are 948 described species with an estimated 100 or so yet to be described. Nineteen species of *Racosperma* occur outside Australia (fide Pedley 1975, plus *A. pubirhachis* from Papua New Guinea) of which 7 are found in the Pacific region, 10 in Asia (including 7 that occur also in Australia) and 2 in Madagascar and the Mascarene Is. off the east coast of Africa (Note: Pedley 1975 lists *A. heterophylla* and *A. xiphoclada* from this region but Du Puy & Villiers 2001 consider these represent a single species, *A. heterophylla*).

Although *Racosperma* is monophyletic, its relationships seem equivocal. Chloroplast and nuclear DNA evidence support a non-monophyletic tribe Ingeae as sister to this genus (Miller & Bayer 2000 & 2001, Luckow *et al.* in press, Robinson & Harris 2000). This strong evidence contradicts previous notions by Pedley (1986) and Chappill & Maslin (1995) that the sister group of *Racosperma* is subg. *Aculeiferum sens. lat.*

Nomenclatural implications

The fragmentation of *Acacia*, the second largest genus in the family Leguminosae, will cause considerable nomenclatural disruption globally. This problem was recognised over 150 years ago by Bentham (1840, 1840a). Living in a less rule-bound world, Bentham suggested adoption of a pragmatic solution: retain the name *Acacia* for the largest (Australian) group. Since then we have seen adoption of an increasingly rigid, but internationally accepted, International Code of Botanical Nomenclature, in which application of names is set by designation of types. In *Acacia*, the (lecto)type is an African species (*A. scorpioides*, =*A. nilotica*), and the Code provides that under the rules, if *Acacia* is dismantled, then the name *Acacia* follows the type. The consequence would be that the name *Acacia* would be applied to a group comprise only about 160 species, and the remaining

1190+ species (and hundreds of infra-specific taxa) would need new generic names, these being *Racosperma*, *Senegalia*, *Acaciella* and Genus 'X' (the '*Acacia coulteri*' group). The only way to ameliorate this disruption is by acceptance of a proposal to the international botanical nomenclature committees and the Nomenclature Sessions of the International Botanical Congress (IBC) to conserve *Acacia* with a new type.

Should this happen? The IBC in Yokohama in 1993 greatly expanded the conservation provisions of the code. Since then Article 14 has stated "In order to avoid disadvantageous changes in the nomenclature of families, genera and species entailed by the strict application of the rules, especially of the principle of priority...this Code provides... lists of names that are conserved (nomina conservanda) and must be retained as useful exceptions." Article 14.9 provides that "A name may be conserved with a different type from that designated by the author or determined by application of the Code..." and provides an example (*Protea*) in which a name was conserved by changing its type. The question is therefore not whether conservation is possible to conserve the name *Acacia* with a new type that would preserve usage for the greatest number of taxa, but whether it is disadvantageous not to do so.

Below we explore the consequences of i) proceeding with the many name changes that will inevitably result following the publication of the (several) forthcoming papers, through the regular adherence of the ICBN rules, or ii) of legislating a change of type (also following the rules of the Code).

Option 1. Apply names in accordance with their currently designated types²

The primary consequences would be:

A name change to *Racosperma* would be required for the 960 species currently ascribed to *Acacia* subg. *Phyllodineae*. Within Australia 948 spp. + 124 infraspecific taxa would need new names, representing c. 99% of the Australian *Acacia* flora. There are currently about 290 names available for these taxa in *Racosperma*. This is by far the largest vascular plant genus in Australia where it is virtually ubiquitous, ecologically dominant in many areas (especially arid and semi-arid regions), features in very many floristic and ecological papers written over 2 centuries, features strongly in folklore and traditions, and one species (*A. pycnantha*) is legislated as the national flower. Australia would have, in addition, 7 species of *Acacia sens. str.* and 2 of *Senegalia*.

In Asia, Africa, the Americas and Australia 203 species would require a name change to *Senegalia* to accommodate species currently ascribed to *Acacia* subg. *Aculeiferum sens. str.* Some of these grow sympatrically with *Acacia sens. str.* and it might be expected that in many areas some confusion would reign for a substantial time, while users determine which *Acacias* are 'real' *Acacia* and which are *Senegalia*. In Africa this sympatry is illustrated, for example, in Acocks (1988: 46, fig. 30) where the *A. erioloba* and *A. hebeclada* (*Acacia*) are photographed with *A. mellifera* (*Senegalia*) as components of Kalahari Thornveld vegetation. Similar sympatric occurrences of the two genera occur in the Americas (D. Seigler, pers. comm.). There are, however, areas on both continents where one genus occurs exclusively (J. Ross and D. Seigler, pers. comm.).

In the Americas, about 60 species would remain as *Acacia s.str.*, 97 would become *Senegalia*, 13 would become Genus 'X' (the '*Acacia coulteri*' group) and 15 would become *Acaciella* (to accommodate species currently ascribed to *Acacia* subg. *Aculeiferum* sect. *Filicinae*).

The gender to be assigned to the name *Racosperma* is also an issue. Botanical tradition is that *Racosperma* is neuter (see Pedley 1986, and those papers which have taken up his combinations in this genus), although Martius treated it as feminine. Traditional usage is that - sperma is neuter, and it seems that this must apply in this case also. Accordingly, if the name *Racosperma* is adopted then most existing species and infraspecific terminations will have to change also. For example, *Acacia pulchella* will become *Racosperma pulchellum*, *Acacia axillaris* will become *Racosperma axillare*, and so on. This will add very substantially to the cost of herbaria and other institutions having to update records because it will not be a simple 'global replace' of *Acacia* to *Racosperma*, each taxon will have to be considered individually. Furthermore, a potential source of confusion will be introduced, through those (non-classically aware) who interpret *Racosperma* as feminine and try to match the termination accordingly. Thus *Racosperma angustum* will be the correct form of the name of the species, but inevitably many will "correct" this to *Racosperma angusta*. This will be repeated across nearly 1000 new combinations.

²Or for Genus 'X', type to be designated.

Option 2. Retypify *Acacia* with an Australian type from *Acacia* subg. *Phyllodineae*

The main consequences would be:

All of the Australian taxa (excluding 7 which would become *Vachellia*, and 2 which would become *Senegalia*) would remain as *Acacia*. Over 1000 name changes would be avoided.

In Asia, Africa, the Americas and Australia 203 species would require a name change to *Senegalia*. This is exactly the same as for Option 1.

In Asia, Africa, Australia and the Americas about 161 species would require a name change to *Vachellia*, which is the earliest legitimate generic name for species currently ascribed to *Acacia* subg. *Acacia*. Thus in Africa, for example, all *Acacia* species would change their name, about half to *Vachellia* and about half to *Senegalia*. This would be no more confusing (and perhaps less so) than having only half of them change as would happen under Option 1.

In the Americas, about 60 species would become *Vachellia*, 97 would become *Senegalia*, 13 would become Genus 'X' (the '*Acacia coulteri*' group) and 15 would become *Acaciella*. The consequences for this region are thus no less disruptive than Option 1, and again as in Africa this might be less confusing, doing away with the name *Acacia* completely.

Economic implications

The implications of a name change for the "Australian group", *Acacia* subg. *Phyllodineae*, extend far beyond those impacting on just taxonomists. Unlike the non-Australian members of subg. *Acacia*, the Australian species of subg. *Phyllodineae* are very extensively utilised both commercially and socially in many parts of the world where they are used primarily for timber, pulpwood, fuelwood, tannin, human food, stock fodder and environmental amelioration (see McDonald *et al.* 2001 and Midgley & Turnbull, 2003 for recent reviews; Midgley *et al.* 2003 provide an excellent review of the commercial significance and potential of tropical Australian *Acacias* in Asia). An indication of the scope of interest in the utilisation of these Australian species is seen in Appendix 2 which lists the 71 countries that have received seed lots for research purposes from 157 taxa of *Acacia* subg. *Phyllodineae*; this seed was distributed over the past 10 years by the Australian Tree Seed Centre (CSIRO, Forestry and Forest Products, Canberra).

Australian *Acacias* are grown in over 70 countries around the world, where they currently cover around two million hectares in plantations (Maslin & McDonald 1996), and in some areas, especially Asia, the commercial plantings are increasing rapidly (Midgley *et al.* 2003). The most important species of commerce are the following.

Acacia mearnsii is regarded by Roux *et al.* (2000) as "...the most profitable forestry species in South Africa...". In South Africa this species is grown for tannin production or for industrial woods (which are exported as wood chips or used locally to produce dissolving pulp for rayon and tea bag manufacture etc). *Acacia mearnsii* plantations cover c. 300 000 ha in South Africa, Brazil, China and Vietnam (Wiersum 1991, Turnbull *et al.* 1998a) and the global value of tannin and wood chips derived from this species is in the order of US\$571 million (S. Midgley, pers. comm.).

Tropical Australian *Acacias* such as *A. mangium*, *A. auriculiformis* and *A. crassicarpa* are becoming increasingly important as a source of industrial wood in parts of the world, especially the Asia region. Currently these species cover about 1.5 m ha in plantations in Asia and have a present-day value of about US\$900 million from pulp alone; this could increase to US\$1.9 billion by 2010 if production targets are met and prices maintained (Midgley *et al.* 2003). Currently about 1.9 million tonnes of tropical *Acacia* pulp are produced and used internationally but this is expected to exceed 4 million tonnes annually by 2010 (Midgley *et al.* 2003). Although this is only a small part of the current annual world pulp production of 179 million tonnes it does represent a significant new commodity for the Asian region (S. Midgley, pers. comm.). Existing plantations of *A. mangium* occupy over 900 000 ha in Indonesia and Malaysia and has potential in parts of Africa and South America (Turnbull *et al.* 1998a, Midgley & Turnbull 2003, Midgley *et al.* 2003), *A. crassicarpa* occupies about 100 000 ha in Indonesia and Vietnam (Thomson 1994, Turnbull *et al.* 1998a, Midgley 2000, Midgley *et al.* 2003) and *A. auriculiformis* occupies about 50 000 ha in China (Midgley & Turnbull 2003).

Apart from the above four species there are a number of others Australian *Acacias* that have commercial relevance. For example, *A. melanoxylon* is grown as a high quality cabinet timber in plantations in New Zealand, South Africa and Chile, as well as Australia (Nielsen *et al.* 1998). Plantation timber is also obtained from *A. celsa* and *A. peregrinalis* in the Australia-Asia-Pacific region (McDonald & Maslin 2000). *Acacia decurrens* is planted in Indonesia for tannin production, used in sizing fibreboard (Prayitno 1982).

Other species of Australian *Acacia* are grown abroad for a variety of purposes. *Acacia saligna* is the most extensively utilised of these where it is being increasingly planted in agroforestry systems, principally for fodder production and soil conservation (see Midgley & Turnbull 2003 and Maslin & McDonald in press for summaries). *Acacia saligna* presently covers over 500 000 ha in North Africa, the Middle East, West Asia and Chile (Turnbull *et al.* 1998a). On a smaller scale, *A. ampliceps*, *A. maconochieana* and *A. stenophylla* are planted on highly alkaline, saline soils in Pakistan and Thailand as a source of fuelwood (Marcar *et al.* 1991). Similarly, *A. stenophylla* is grown for multipurpose utilisation (honey, fodder, fuelwood, wood) and *A. victoriae* for fodder in North Africa and the Middle East, and *A. auriculiformis* for environmental restoration around endangered Coco-de-mer plams on Curieuse Island in Seychelles (L. Thomson pers. comm.). Although planted on a relatively small scale and of low commercial value, *A. colei* appears suitable as a human food supplement, especially in sub-saharan Africa and *A. elachantha*, *A. thomsonii* and *A. tumida* also have some potential in this regard (Thomson 1992, Harwood 1994, Harwood *et al.* 1999, Midgley & Turnbull 2003).

Within Australia many *Acacias* are now widely cultivated, forming an integral part of the nursery trade and the horticulture industry, e.g., almost 600 species are listed in Elliot & Jones (1982). They are also used extensively for revegetation and in landscape amelioration programs. Land degradation due to increasing salinity is one of the most serious environmental problems currently in Australia; the use of *Acacia* species (primarily for woody biomass production) in large-scale commercial plantings as a treatment of salinity are under investigation (Maslin & McDonald, in press). *Acacia acuminata* is currently under trial in Western Australia for its suitability as a host for commercial, on-farm production of Sandalwood (*Santalum spicatum*) (Radomiljac *et al.* 1998, Brand *et al.* 1999, Maslin *et al.* 1999). *Acacia* seed as a human food is a rapidly growing but still small-scale industry in Australia (Hele 2002, Olsen 2002); 47 species were recently identified as having some potential for planting in the southern semi-arid regions for this purpose with *A. victoriae* appearing to be the most promising (Maslin *et al.* 1998).

A number of Australian *Acacia* species (including *A. saligna*, *A. cyclops*, *A. melanoxydon*, *A. dealbata* and *A. mearnsii*) are woody weeds, especially in South Africa, Portugal and China, as well as within Australia. In this context there is a substantial literature under the name *Acacia* (see, for example, New 1984, Stirton 1978, Whibley & Symon 1992, and Boland *et al.* 1984).

Large scale name changes would not only burden the above industries and activities with large overhead costs, but would also take considerable time and effort to effect. It is also apparent that any generic name change involving the species of subgenus *Phyllodineae* will impact on a much larger audience than that in just Australia.

Economically important species are far fewer in the groups other than subgenus *Phyllodineae*. The most important commercial non-Australian species is *A. senegal* from which gum arabic is derived. In any new classification of *Acacia sens. lat.* this species will be referred to the genus *Senegalia* (syn. *Acacia* subg. *Aculeiferum*). There is some economic utilisation of a few species of subg. *Acacia*, for example, *A. farnesiana* (in the perfume industry), *A. nilotica* (especially as a fuelwood, see National Academy of Sciences 1980) and *A. seyal* (as an inferior substitute for gum arabic).

Arguments in support of Option 2

The dismemberment of *Acacia sens. lat.* seems inevitable, and considerable nomenclatural turmoil will result. We believe it makes considerable sense to minimise change to the nomenclature of this very well-known group by adopting Option 2 above, for the following main reasons:

1. It results in far fewer name changes worldwide.
2. The name *Acacia* is retained for the largest group.
3. It causes least disturbance to the large international trade and industries built upon Australian *Acacia* species.
4. In areas (Africa, Asia, Americas) where species of *Acacia* subg. *Acacia* and *Acacia* subg. *Aculeiferum* co-occur in large numbers, it may be less confusing (or certainly no more confusing) if all taxa change their names simultaneously, rather than just half. That is, *Acacia* as a formal generic name would disappear from these areas, but the common name *Acacias* could obviously continue to be used informally for the whole complex.
5. It avoids creating confusion associated with gender through the adoption of the name *Racosperma*.

For this reason, a formal proposal to conserve *Acacia* Mill. with a new type is presented in a separate paper (Orchard & Maslin 2003).

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Figure 1. Simplified strict consensus cladogram based on chloroplast DNA sequence data

This simplified overview tree showing relationships of the five major monophyletic lineages (genera) within *Acacia sens. lat.* was prepared using data from Miller & Bayer (2000, 2001, 2003) and Luckow *et al.* (in press), and was originally published as Figure 1A in Maslin *et al.* (2003).

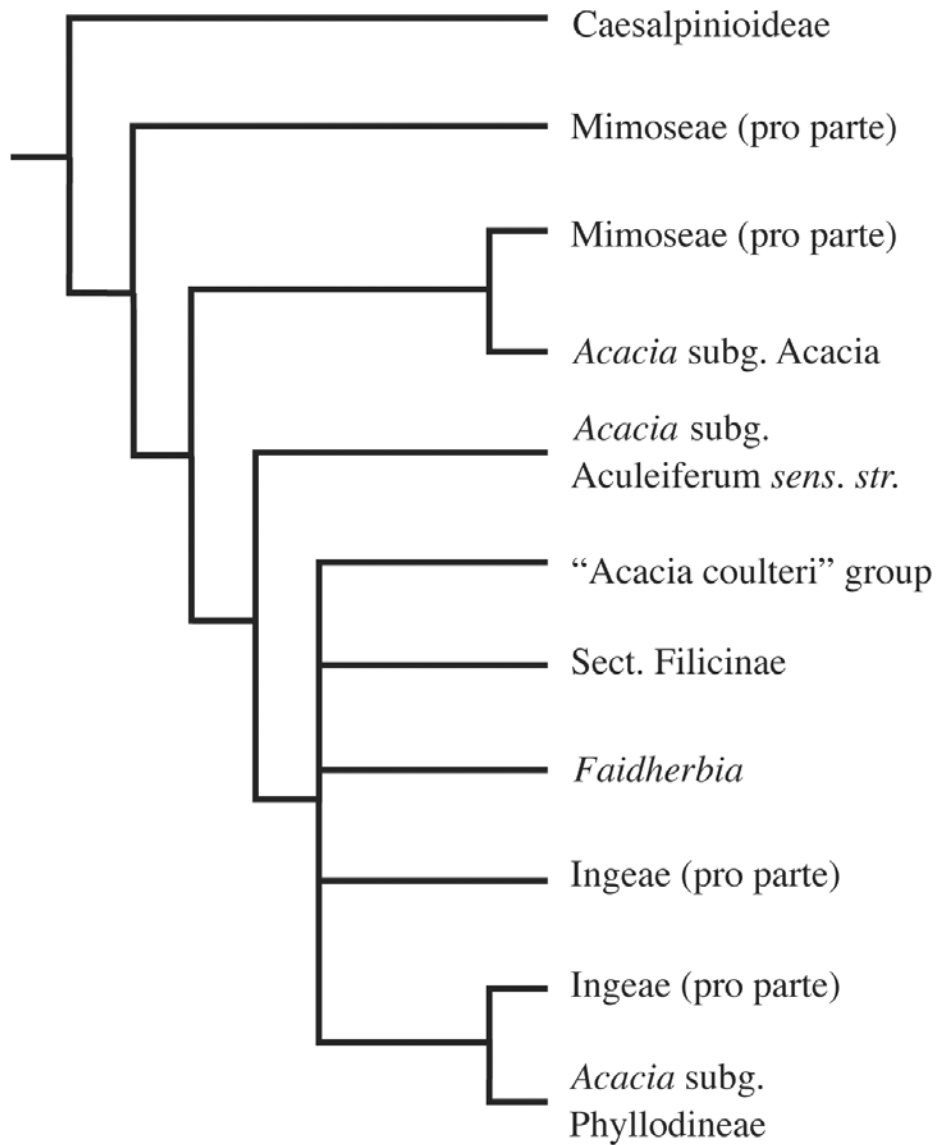


Table 1. Numbers of described species of *Acacia sens. lat.* worldwide.

This table was originally published in Maslin *et al.* (2003). The generic names used here are those that would apply by the application of currently designated types.

| TAXON | Americas | Africa ¹ | Asia | Australia & Pacific | TOTAL no. species |
|---|----------|---------------------|--|-------------------------------------|-------------------|
| <i>Faidherbia albida</i> | - | 1 | 1 | - | 1 |
| <i>Acacia sens. str.</i> (syn: <i>Acacia</i> subg. <i>Acacia</i> ; <i>Vachellia</i>) | c. 60 | 73 | 36 (incl. c. 15 also found in Africa) ¹ | 7 | c. 161 |
| <i>Senegalia</i> (syn: <i>Acacia</i> subg. <i>Aculeiferum sens. str.</i>) | 97 | 69 | 43 (incl. 7 also found in Africa) | 2 (incl. 1 also found in Asia) | 203 |
| <i>Acaciella</i> (syn: <i>Acacia</i> subg. <i>Aculeiferum</i> . sect. <i>Filicinae</i>) | 15 | - | - | - | 15 |
| Genus 'X' (<i>Acacia coulteri</i> ' group) | 13 | - | - | - | 13 |
| ' <i>Racosperma</i> ' (syn: <i>Acacia</i> subg. <i>Phyllodineae</i>) | - | 2 ² | 10 (incl. 7 also found in Australia) | 955 ³ | 960 |
| TOTAL no. species | c. 185 | 145 | 90 (incl. c. 29 occurring also outside the region) | 964 (incl. 1 also found in Asia) | c. 1353 |

¹Includes Madagascar, Reunion and Mauritius

²2 species in Madagascar, Reunion and Mauritius (Note: Du Puy & Villiers 2001 consider that only one species of this group occurs in this region.)

³948 species in Australia; 7 species in the Pacific

Table 2. Main classifications of Acacia from Bentham (1875) to Maslin et al. (2003)

| Bentham (1875) | Vassal (1972) | Pedley (1978) | Pedley (1986) | Maslin <i>et al.</i> (2003) |
|--------------------------|---|--------------------------|------------------------|-----------------------------|
| ACACIA | ACACIA | ACACIA | ACACIA | ACACIA |
| Ser Gummiferae | Sg Acacia | Sg Acacia | | |
| Ser Vulgares | Sg Aculeiferum | Sg Aculeiferum | SENEGALIA | SENEGALIA |
| | Sec <i>Monacantha</i> | | | |
| | Sec <i>Aculeiferum</i> | Sec <i>Spiciflorae</i> | Sec <i>Senegalia</i> | GENUS 'X' |
| Ser Filicinae | Sec <i>Filicinae</i> ¹ | Sec <i>Filicinae</i> | Sec <i>Filicinae</i> | ACACIELLA |
| Ser Botrycephalae | Sg Phyllodineae (syn. Sg <i>Heterophyllum</i>) | Sg Phyllodineae | RACOSPERMA | RACOSPERMA |
| Ser Phyllodineae | | Sec <i>Botrycephalae</i> | | |
| Sser <i>Uninerves</i> | Sec <i>Uninervea</i> | Sec <i>Phyllodineae</i> | Sec <i>Racosperma</i> | |
| Sser <i>Continuae</i> | | | | |
| Sser <i>Alatae</i> | | Sec <i>Alatae</i> | | |
| Sser <i>Pungentes</i> | | | | |
| Sser <i>Calamiformes</i> | Sec <i>Heterophyllum</i> | Sec <i>Plurinerves</i> | Sec <i>Plurinervia</i> | |
| Sser <i>Plurinerves</i> | | Sec <i>Juliflorae</i> | | |
| Sser <i>Juliflorae</i> | | | | |

| | | | | |
|-------------------------------|--------------------------------|---------------------|--------------------|--|
| Sser Brunioideae ² | | Sec Lycopodiifoliae | Sec Lycopodiifolia | |
| Ser Pulchellae | Sec Pulchelloidea ³ | Sec Pulchellae | Sec Pulchella | |

¹Formalized in Guinet & Vassal (1978)

²The type of subseries Brunioideae is referable to sec *Phyllodineae*, however, most taxa that Bentham included in this group are referable to sec Lycopodiifoliae; none of these species was included in Vassal's classification.

³Section Pulchelloidea included species from Bentham Subseries Pulchellae, Alatae, Continuae, Calamiformes, Plurinerves and Uninerves.

Table 3. Characters considered important in defining major groups within *Acacia sens. lat.*

The generic names used here are those that would apply by the application of currently designated types. This table was originally published in Maslin *et al.* (2003).

| Character | <i>Acacia sens. str.</i> (<i>Acacia</i> subg. <i>Acacia</i>) | <i>Senegalia</i> (<i>Acacia</i> subg. <i>Aculeiferum sens.</i> <i>str.</i>) | <i>Acaciella</i> (<i>Acacia</i> subg. <i>Aculeiferum</i> section <i>Filicinae</i>) | Genus 'X' ' <i>Acacia coulteri</i> ' group | ' <i>Racosperma</i> ' (<i>Acacia</i> subg. <i>Phyllodineae</i>) |
|---|--|--|---|--|---|
| Phyllodes | Absent | Absent | Absent | Absent ¹ | Present |
| Bipinnate leaves | Present | Present | Present | Present | Present |
| Stipular spines | Present, rarely absent | Absent | Absent | Absent ² | Present or absent |
| Prickles | Absent | Present, sometimes absent | Absent | Absent | Absent |
| Involucre on peduncle | Present ³ | Absent ⁴ | Absent | Absent | Absent ⁴ |
| Pollen aperture type ⁵ | Colporate | Porate | Porate | Porate, extraporate | Extraporate, infrequently porate |
| Pollen columellae | Present | Absent | Absent | Absent | Absent |
| Pollen exine ornamentation | Smooth | Smooth | Smooth | Smooth | Reticulate (rarely areolate) |
| Pods | Dehiscent or indehiscent | Dehiscent or indehiscent | Dehiscent | Dehiscent | Dehiscent, rarely indehiscent |
| Seed endosperm | Sometimes endospermous | Absent | Absent | Absent | Rare and vestigial |
| Seed aril | Absent | Present or remedial (sect. <i>Aculeiferum</i>), absent (sect. <i>Monocanthea</i>) | Absent | Absent | Present, less commonly absent or remedial |
| Free amino acids in seeds ⁶ | 1 | 3, 4 | 5 | Unknown | 2(3) |
| Gums | High molecular weight, highly positive optical rotation | Intermediate molecular weight, low positive optical rotation | Apparently not examined | Apparently not examined | Low molecular weight, low positive optical rotation |
| Rust pathogens | <i>Ravenelia</i> , infrequently <i>Uromyces</i> | <i>Ravenelia</i> | Unknown | Unknown | <i>Uromycladium</i> & <i>Uromyces</i> |

¹The petiole and rachis of leaves of *Acacia willardiana* after dehiscence of pinnae under arid conditions has been interpreted by some (Vassal & Guinet 1972) as a phyllode.

²The stipules of *Acacia coulteri* have been interpreted as feebly spinose by some workers (Vassal 1972). In most instances these stipules are vegetative and, although sometimes persistent on very young vegetation, are scarcely spinose.

³The involucre is particularly well-developed in the American "Ant *Acacia*" species but is absent in many other species, particularly those with spicate inflorescences.

⁴Bracts (presumably not homologous with an involucre) may occur on peduncle (found from near the base to near the apex of the peduncle) in some taxa.

⁵Pollen information derived from Guinet (1981), however, not all pollen characters are included here (see also Guinet 1986).

⁶See Pedley (1986) for definition of biochemical Groups 1-5.

Appendix 1. Typification and generic synonymy within *Acacia sens. lat.*

Note. The generic names given in **bold** below are those that would apply by the application of currently designated types.

Acacia Mill., Gard. Dict. ed. 4 (1754)

Lectotype: *Acacia scorpioides* (L.) W.F. Wright, *vide* Britton & Brown, Ill. fl. N. U.S., ed. 2, 2: 330 (1913) (= *A. nilotica* (L.) Delile – see Orchard & Maslin 2003 for discussion.)

Synonyms

Vachellia Wight & Arn., Prod. Fl. Ind. Orient. 272 (1834). Type: *Vachellia farnesiana* (L.) Wight & Arn.

Aldina E. Mey., Comm. Pl. Afr. Austr. 171 (1836), *nom. illeg., non* Adanson (1763) *nom. rej., nec* Endlicher (1840) *nom. cons.*
Type: Not designated.

Farnesia Gasp., *Descr. Nuov. Gen. Leg.* (1836), *nom. illeg., non* Fabricius (1763). Type: *Farnesia odora* Gasparini, *nom. illeg.*, based on *Mimosa farnesiana* L.

Gumifera Raf., *Sylva Tellur.* 118 (1838). Lectotype: *Acacia nilotica* (L.) Delile, *vide* L. Pedley, Bot. J. Linn. Soc. 92: 238 (1986).

Popanax Rafin., *Sylva Tellur.* 118 (1838). Type: *Popanax tortuosa* (L.) Rafin.

Delaportea Thorel ex Gagnep., *Notul. Syst.* 2: 118 (1911). Type: *Delaportea armata* Thorel ex Gagnep..

Pithecodendron Speg., *Physis* (Buenos Aires) 6: 313 (1923). Type: *Pithecodendron argentinensis* Speg..

Nimiria Prain ex Craib, *Bull. Misc. Inform.* 1927: 393 (1927). Type: *Nimiria siamensis* Craib.

Tauroceras Britton & Rose, *N. Amer. Fl.* 23: 85 (1928). Type: *Tauroceras spadicigerum* (Schlect. & Charm.) Britton & Rose.

Bahamia Britton & Rose, *N. Amer. Fl.* 23: 86 (1928). Type: *Bahamia acuífera* (Benth.) Britton & Rose.

Feracacia Britton & Leon, *N. Amer. Fl.* 23: 86 (1928). Type: *Feracacia daemon* (Ekman & Urban) Britton & Leon.

Lucaya Britton & Rose, *N. Amer. Fl.* 23: 87 (1928). Type: *Lucaya choriophylla* (Benth.) Britton & Rose.

Fishlockia Britton & Rose, *N. Amer. Fl.* 23: 91 (1928). Type: *Fishlockia anegadensis* (Britton) Britton & Rose.

Myrmecodendron Britton & Rose, *N. Amer. Fl.* 23: 91 (1928). Type: *Myrmecodendron hindsii* (Rose) Britton & Rose.

Acaciopsis Britton & Rose, *N. Amer. Fl.* 23: 93 (1928). Type: *Acaciopsis pringlei* (Rose) Britton & Rose.

Senegalia Rafinesque, *Sylva Tellur.* 119 (1838)

Type: *Senegalia senegal* (L.) Britton (*Senegalia triacantha* Rafin., *nom. illeg.*)

Synonyms

Manganaroa Speg., *Physis* (Buenos Aires) 6: 312 (1923). Type: *Manganaroa monacantha* (Willd) Speg..

Dugandia Britton & Killip, *Ann. New York Acad. Sci.* 35: 137 (1936). Type: *Dugandia rostrata* (Humb. & Bonpl.) Britton & Killip.

Acaciella Britton & Rose, *N. Amer. Fl.* 23: 96 (1928).

Type: *Acaciella villosa* (Swartz) Britton & Rose.

Racosperma C. Mart., *Hort. Monac. Seminifer* (1835).

Basionym: *Acacia* section *Phyllodineae* Sieber ex DC., *Prodr.* 2: 425 (1825). Lectotype: *Racosperma pennenerve* (Sieber ex DC.) Pedley, Bot. J. Linn. Soc. 92: 239 (1986).

Synonyms

Phyllodoce Link, *Handbuch* 2: 132 (1829) *nom. illeg., non* Salisbury (1806). Lectotype: *Phyllodoce alata* (R. Br.) Link, *lecto. nov.*

Racosperma C. Mart., in C. Martius & F von P. Schrank, Hort. Reg. Monac. 188 (1829), *nom. inval.*

Cuparilla Rafin., Sylva Tellur. 120 (1838). Lectotype: *Cuparilla myrtifolia* (Smith) Rafin., *fide* L. Pedley, Bot. J. Linn. Soc. 92: 239 (1986).

Drepaphyla Rafin., Sylva Tellur. 120 (1838). Lectotype: *Drepaphyla lanigera* (Cunn.) Rafin., *fide* L. Pedley, Bot. J. Linn. Soc. 92: 239 (1986).

Hectandra Rafin., Sylva Tellur. 120 (1838). Lectotype: *Hectandra suaveolens* (Smith) Rafin., *fide* L. Pedley, Bot. J. Linn. Soc. 92: 239 (1986).

Zigmaloba Rafin., Sylva Tellur. 120 (1838). Type: *Zigmaloba sulcata* (R. Br.) Rafin.

Chithonanthus Lehmann, Pl. Preiss. 2: 368 (1848). Type: *Chithonanthus restiaceus* (Benth.) Lehm.

Tetracheilos Lehm., Pl. Preiss. 2: 368 (1848). Type: *Acacia tetragonocarpa* Meisn. (*nom. syn. Tetracheilos meissneri* Lehm., *nom. illeg.*).

Phytomorula Kofoid, Univ. Calif. Publ. Bot. 6: 38 (1914). Type: *Phytomorula regularis* Kofoid.

Appendix 2. Seeds of *Acacia* subg. *Phyllodineae* taxa distributed worldwide for research purposes

List showing 71 countries who have received seed of Australian *Acacias* (157 different taxa) for research purposes that have been distributed over the past 10 years by the Australian Tree Seed Centre (CSIRO, Forestry and Forest Products, Canberra, Australia.)

Albania: *A. dealbata* ssp. *dealbata*, *A. implexa*, *A. mearnsii*, *A. melanoxylon*

Angola: *A. colei* var. *colei*, *A. cowleana*, *A. neurocarpa*, *A. tumida* var. *tumida*

Antigua and Barbuda: *A. ampliceps*, *A. auriculiformis*, *A. crassicarpa*

Argentina: *A. melanoxylon*, *A. salicina*, *A. saligna*, *A. tumida* var. *tumida*

Bangladesh: *A. auriculiformis*, *A. crassicarpa*, *A. mangium*, *A. peregrinalis*

Belgium: *A. dealbata* ssp. *dealbata*, *A. dealbata* ssp. *subalpina*, *A. frigescens*, *A. melanoxylon*, *A. obliquinervia*

Benin: *A. auriculiformis*

Bhutan: *A. mearnsii*, *A. melanoxylon*

Bolivia: *A. dealbata* ssp. *dealbata*, *A. decurrens*, *A. mearnsii*, *A. melanoxylon*, *A. pravissima*, *A. stenophylla*

Botswana: *A. adsurgens*, *A. colei* var. *colei*, *A. cowleana*, *A. dictyophleba*, *A. dictyophleba* aff., *A. difficilis*, *A. holosericea*, *A. jennerae*, *A. murrayana*, *A. neurocarpa*, *A. oligophleba*, *A. salicina*, *A. saligna*, *A. torulosa*, *A. tumida*, *A. victoriae*

Brazil: *A. auriculiformis*, *A. blayana*, *A. cincinnata*, *A. colei* var. *colei*, *A. crassicarpa*, *A. decurrens*, *A. flavescens*, *A. holosericea*, *A. irrorata* ssp. *irrorata*, *A. leptocarpa*, *A. mangium*, *A. mearnsii*, *A. melanoxylon*, *A. parramattensis*, *A. peregrinalis*, *A. pycnantha*, *A. silvestris*, *A. trachyphloia*

Burma: *A. ampliceps*, *A. auriculiformis*, *A. colei* var. *colei*, *A. coriacea* ssp. *coriacea*, *A. crassicarpa*, *A. dealbata* ssp. *dealbata*, *A. decurrens*, *A. difficilis*, *A. elachantha*, *A. elata*, *A. fulva*, *A. leptocarpa*, *A. maconochieana*, *A. mangium*, *A. mearnsii*, *A. melanoxylon*, *A. neriifolia*, *A. peregrinalis*, *A. plectocarpa*, *A. saligna*, *A. silvestris*, *A. stenophylla*, *A. torulosa*, *A. tumida* var. *tumida*

Burundi: *A. mangium*

Cambodia: *A. auriculiformis*, *A. crassicarpa*, *A. difficilis*, *A. holosericea*, *A. mangium*, *A. peregrinalis*

Canada: *A. dealbata* ssp. *subalpina*

Central African Republic: *A. auriculiformis*, *A. crassicarpa*

Chile: *A. ampliceps*, *A. aneura*, *A. auriculiformis*, *A. coriacea*, *A. crassicarpa*, *A. dealbata* ssp. *dealbata*, *A. decurrens*, *A. elata*, *A. holosericea*, *A. mangium*, *A. mearnsii*, *A. melanoxylon*, *A. murrayana*, *A. peregrinalis*, *A. salicina*, *A. saligna* *stenophylla*, *A. victoriae*

China: *A. ampliceps*, *A. aneura*, *A. aulacocarpa*, *A. auriculiformis*, *A. binervata*, *A. binervia*, *A. blayana*, *A. brassii*, *A. chrysotricha*, *cincinnata*, *A. crassicarpa*, *A. cultriformis*, *A. dangarensis*, *A. dealbata* ssp. *dealbata*, *A. dealbata* ssp. *subalpina*, *A. deanei* ssp. *deanei*, *A. decurrens*, *A. difficilis*, *A. drummondii*, *A. dunnii*, *A. elata*, *A. falciformis*, *A. filicifolia*, *A. fimbriata*, *A. floribunda*, *A. fulva*, *A. glaucocarpa*, *A. holosericea*, *A. implexa*, *A. inaequilatera*, *A. irrorata* ssp. *irrorata*, *A. irrorata* ssp. *velutinella*, *A. jennerae*, *A. leptocarpa*, *A. leucoclada* ssp. *argentifolia*, *A. leucoclada* ssp. *leucoclada*, *A. mabellae*, *A. mangium*, *A. mearnsii*, *A. melanoxylon*, *A. midgleyi*, *A. murrayana*, *A. myrtifolia*, *A. nano-dealbata*, *A. neriifolia*, *A. obliquinervia*, *A. parramattensis*, *A. parvipinnula*, *A. peregrinalis*, *A. plectocarpa*, *A. podalyrifolia*, *A. pruinocarpa*, *A. pycnantha*

Colombia: *A. auriculiformis*, *A. cincinnata*, *A. crassicarpa*, *A. ligulata*, *A. mangium*, *A. peregrinalis*, *A. salicina*, *A. stenophylla*

Congo: *A. auriculiformis*, *A. blayana*, *A. colei* var. *colei*, *A. cowleana*, *A. crassicarpa*, *A. decurrens*, *A. elata*, *A. holosericea*, *A. leptocarpa*, *A. maidenii*, *A. mangium*, *A. mearnsii*, *A. melanoxylon*, *A. neriifolia*, *A. parramattensis*, *A. peregrinalis*, *A. silvestris*

Costa Rica: *A. crassicarpa*, *A. mangium*, *A. peregrinalis*

Cuba: *A. auriculiformis*, *A. crassicarpa*, *A. mangium*, *A. mearnsii*, *A. peregrinalis*

Denmark (aid programs): *A. auriculiformis*, *A. crassicarpa*, *A. mangium*

Ecuador: *A. melanoxyton*, *A. tumida*

Egypt: *A. melanoxyton*

Ethiopia: *A. ampliceps*, *A. colei* var. *colei*, *A. coriacea* ssp. *sericophylla*, *A. decurrens*, *A. elachantha*, *A. irrorata* ssp. *irrorata*, *A. mearnsii*, *A. melanoxyton*, *A. saligna*, *A. torulosa*, *A. tumida* var. *tumida*, *A. victoriae*

Fiji: *A. ampliceps*, *A. auriculiformis*, *A. cincinnata*, *A. crassicarpa*, *A. difficilis*, *A. leptocarpa*, *A. peregrinalis*, *A. midgleyi*

Finland (aid programs): *A. auriculiformis*, *A. crassicarpa*, *A. mangium*, *A. midgleyi*

France: *A. auriculiformis*, *A. peregrinalis*, *A. crassicarpa*, *A. dealbata* ssp. *dealbata*, *A. mangium*

Gambia: *A. colei* var. *colei*, *A. tumida* var. *tumida*

Ghana: *A. auriculiformis*, *A. cincinnata*, *A. colei*, *A. cowleana*, *A. crassicarpa*, *A. difficilis*, *A. holosericea*, *A. leptocarpa mangium* *plectocarpa*, *A. torulosa*, *A. tumida*

Greece: *A. cyclops*, *A. saligna*, *A. xanthina*

Guam: *A. auriculiformis*, *A. cincinnata*, *A. crassicarpa*, *A. leiocalyx*, *A. leptocarpa*, *A. mangium*, *A. peregrinalis*

Guatemala: *A. dealbata* ssp. *dealbata*, *A. mearnsii*, *A. melanoxyton*

Guinea-Bissau: *A. mangium*

India: *A. adsurgens*, *A. ampliceps*, *A. anaticeps*, *A. aneura*, *A. auriculiformis*, *A. bivenosa*, *A. brassii*, *A. cambagei*, *A. catenulata* aff. *cincinnata*, *A. colei*, *A. coriacea* ssp. *coriacea*, *A. cowleana*, *A. crassicarpa*, *A. deanei* ssp. *deanei*, *A. difficilis*, *A. holosericea*, *A. jenerae*, *A. leptocarpa*, *A. ligulata*, *A. mangium*, *A. mearnsii*, *A. melanoxyton*, *A. neurocarpa*, *A. peregrinalis*, *A. plectocarpa*, *A. rothii*, *A. salicina*, *A. saligna*, *A. sclerosperma*, *A. stenophylla*, *thomsonii*, *torulosa*, *A. tropica*, *A. tumida*, *A. victoriae*

Indonesia: *A. auriculiformis*, *A. binervata*, *A. blakei*, *A. blayana*, *A. celsa*, *A. cincinnata*, *A. cowleana*, *A. crassicarpa*, *A. elata*, *A. falciformis filicifolia*, *A. flavescens*, *A. holosericea*, *A. hylonoma*, *A. implexa*, *A. irrorata* ssp. *irrorata*, *A. leptocarpa mangium*, *A. mearnsii*, *A. melanoxyton*, *A. midgleyi*, *A. neriifolia*, *A. oraria*, *A. peregrinalis*, *A. schinoides*, *A. silvestris*, *A. simsii*

Israel: *A. mangium*, *A. pycnantha*

Italy: *A. myrtifolia*

Ivory Coast/Cote D'Ivoire: *A. auriculiformis*: *A. colei* var. *colei*, *A. holosericea*, *A. neurocarpa*

Japan (aid programs): *A. ampliceps*, *A. auriculiformis*, *A. blayana*, *A. colei* var. *colei*, *A. crassicarpa*, *A. dealbata* ssp. *dealbata*, *A. dealbatasp. subalpine*, *A. elata*, *A. ligulata*, *A. mangium*, *A. mearnsii*, *A. melanoxyton*, *A. neriifolia*, *salicina*, *A. saligna*, *A. stenophylla*, *A. tumida* var. *tumida*

Jordan: *A. inophloia*, *A. prainii*, *A. resinimarginea*, *A. saligna*

Kenya: *A. ampliceps*, *A. auriculiformis*, *A. blakei*, *A. burrowii* *colei*, *A. crassicarpa*, *A. difficilis*, *A. elachantha*, *A. glaucocarpa*, *A. holosericea*, *A. julifera* ssp. *julifera*, *A. leptocarpa*, *A. mangium*, *A. mearnsii*, *A. melanoxyton*, *A. neurocarpa*, *A. peregrinalis*, *A. salicina*, *A. senegal*, *A. stenophylla*, *A. striatifolia*, *A. tenuinervis*, *A. torulosa tumida* var. *tumida*

Kiribati: *A. ampliceps*, *A. auriculiformis*, *A. crassicarpa*, *A. peregrinalis*

Kuwait: *A. ampliceps*, *A. calcicola*, *A. cambagei*, *A. colei*

Laos: *A. auriculiformis*, *A. crassicarpa*, *A. dunnii*, *A. mangium*, *A. platycarpa*

Liberia: *A. auriculiformis*, *A. crassicarpa*, *A. mangium*, *A. peregrinalis*

Madagascar: *A. crassicarpa*

Malawi: *A. colei*, *A. elachantha*, *A. tumida*

Malaysia: *A. auriculiformis*, *A. celsa*, *A. cincinnata*, *A. crassicarpa*, *A. leptocarpa*, *A. mangium*, *A. midgleyi*, *A. melanoxyton*, *A. peregrinalis*

Mali: *A. ampliceps*, *A. aneura*, *A. aulacocarpa*, *A. auriculiformis*, *A. brachystachya*, *A. citrinoviridis*, *A. colei* var. *colei* *colei* var. *ileocarpa*, *A. coriacea* ssp. *pendens*, *A. coriacea* ssp. *sericophylla*, *A. cowleana*, *A. difficilis*, *A. elachantha*, *A. glaucocoesia*, *A. holosericea*, *A. leptocarpa*, *A. mountfordiae*, *A. shirleyi*, *A. thomsonii*, *A. torulosa*, *A. trachycarpa*, *A. tumida*, *A. victoriae*

Mexico: *A. aneura*, *A. auriculiformis*, *A. colei* var. *colei*, *A. coriacea* ssp. *coriacea*, *A. crassicarpa*, *A. harpophylla*, *A. holosericea*, *A. mangium*, *A. peregrinalis*, *A. shirleyi*

Morocco: *A. cyclops*, *A. mearnsii*, *A. melanoxyton*, *A. saligna*

Namibia: *A. adsurgens*, *A. ampliceps*, *A. ancistrocarpa*, *A. aneura*, *A. bivenosa*, *A. cambagei*, *A. colei* var. *colei*, *A. cowleana*, *A. cuthbertsonii*, *A. dictyophleba*, *A. difficilis*, *A. holosericea*, *A. jennerae*, *A. ligulata*, *A. lysiphloia*, *A. murrayana*, *A. neurocarpa*, *A. oligophleba*, *A. pruinocarpa*, *A. salicina*, *A. saligna*, *A. stenophylla*, *A. tenuissima*, *A. torulosa*, *A. tumida* var. *tumida*, *A. victoriae*

Nepal: *A. auriculiformis*, *A. cincinnata*, *A. crassicarpa*, *A. mangium*, *A. mearnsii*, *A. peregrinalis*, *A. simsii*

Netherlands: *A. crassicarpa*, *A. mangium*, *A. peregrinalis*

New Caledonia: *A. ampliceps*, *A. auriculiformis*, *A. crassicarpa*

New Zealand: *A. auriculiformis*, *A. crassicarpa*, *A. dealbata* ssp. *dealbata*, *A. elata*, *A. falciformis*, *A. glaucocarpa*, *A. implexa*, *A. mangium*, *A. mearnsii*, *A. melanoxyton*, *A. pendula*, *A. trachyphloia*

Nicaragua: *A. ampliceps*, *A. brassii*, *A. colei*, *A. coriacea* ssp. *coriacea*, *A. cowleana*, *A. crassicarpa*, *A. difficilis*, *A. flavescens*, *A. glaucocarpa*, *A. holosericea*, *A. leptocarpa*, *A. mangium*, *A. peregrinalis*, *A. neriifolia*, *A. oraria*, *A. plectocarpa*, *A. rothii*, *A. shirleyi*, *A. simsii*, *A. torulosa*, *A. tumida* var. *tumida*, *A. victoriae*

Niger: *A. ampliceps*, *A. colei* var. *colei*, *A. colei* var. *ileocarpa*, *A. coriacea* ssp. *coriacea*, *A. coriacea* ssp. *pendens*, *A. coriacea* ssp. *sericophylla*, *A. cowleana*, *A. eriopoda*, *A. gonoclada*, *A. jennerae*, *A. plectocarpa*, *A. thomsonii*, *A. torulosa*, *A. tumida* var. *tumida*, *A. victoriae*

Nigeria: *A. auriculiformis*, *A. brassii*, *A. colei* var. *colei*, *A. colei* var. *ileocarpa*, *A. cowleana*, *A. crassicarpa*, *A. mangium*, *A. peregrinalis*, *A. tumida*

Niue: *A. ampliceps auriculiformis*

Pakistan: *A. adsurgens*, *A. ampliceps*, *A. aneura*, *A. auriculiformis*, *A. citrinoviridis*, *A. colei* var. *colei*, *A. coriacea* ssp. *coriacea*, *A. cowleana*, *A. crassicarpa*, *A. dictyophleba*, *A. elachantha*, *A. eriopoda*, *A. holosericea*, *A. jennerae*, *A. ligulata*, *A. maconochieana*, *A. mearnsii*, *A. peregrinalis*, *A. salicina*, *A. saligna*, *A. stenophylla*, *A. torulosa*, *A. tumida*, *A. victoriae*

Panama: *A. auriculiformis*, *A. cowleana*, *A. crassicarpa*, *A. holosericea*, *A. leiocalyx*, *A. mangium*, *A. mearnsii*, *A. peregrinalis*

Papua New Guinea: *A. auriculiformis*, *A. crassicarpa*, *A. mangium*, *A. peregrinalis*

Paraguay: *A. auriculiformis*, *A. deanei* ssp. *deanei*, *A. elata*, *A. mangium*, *A. mearnsii*, *A. melanoxyton*, *A. neriifolia*, *A. saligna*, *A. terminalis*

Peru: *A. auriculiformis*, *A. crassicarpa*, *A. dealbata* ssp. *dealbata*, *A. mangium*, *A. peregrinalis*

Philippines: *A. ampliceps auriculiformis*, *A. celsa*, *A. cincinnata*, *A. colei*, *A. crassicarpa*, *A. holosericea*, *A. leptocarpa*, *A. mangium*, *A. mearnsii*, *A. neriifolia*, *A. neurocarpa*, *A. oraria*, *A. peregrinalis*, *A. salicina*, *A. simsii*

Rwanda: *A. auriculiformis*, *A. colei* var. *colei*, *A. crassicarpa*, *A. holosericea*, *A. mangium*, *A. mearnsii*, *A. neurocarpa*, *A. tumida* var. *tumida*

Saudi Arabia: *A. acuminata*, *A. ampliceps*, *A. brachystachya*, *A. colei* var. *colei*, *A. cowleana*, *A. elachantha*, *A. ligulata*, *A. pruinocarpa*, *A. rhodophloia*, *A. salicina*, *A. saligna*, *A. stenophylla*, *A. trachycarpa*, *A. victoriae*

Senegal: *A. auriculiformis*, *A. colei* var. *colei*, *A. colei* var. *ileocarpa*, *A. crassicarpa*, *A. elachantha*, *A. holosericea*, *A. mangium*, *A. peregrinalis*, *A. thomsonii*, *A. tumida*

Singapore: *A. auriculiformis*, *A. crassicarpa*, *A. difficilis*, *A. implexa*, *A. mangium*, *A. melanoxyton*

Solomon Islands: *A. auriculiformis*, *A. cincinnata*, *A. crassicarpa*, *A. leptocarpa*, *A. mangium*, *A. peregrinalis*

South Africa: *A. acuminata*, *A. amplexiceps*, *A. ancistrocarpa*, *A. aneura*, *A. auriculiformis*, *A. bidwillii*, *A. binervata*, *A. binervia*, *A. bivenosa*, *A. blayana*, *A. brachystachya*, *A. burrowii*, *A. calcicola*, *A. cambagei*, *A. chrysotricha*, *A. cincinnata*, *A. colei*, *A. coriacea*, *A. coriacea* ssp. *pendens*, *A. dangarensis*, *A. dealbata* ssp. *dealbata*, *A. deanei* ssp. *deanei*, *A. decurrens*, *A. difficilis*, *A. drepanophylla*, *A. elachantha*, *A. elata*, *A. falcata*, *A. falciformis*, *A. filicifolia*, *A. flavescens*, *A. georginae*, *A. glaucocarpa*, *A. grasbyi*, *A. gregorii*, *A. harpophylla*, *A. hemsleyi*, *A. holosericea*, *A. implexa*, *A. irrorata* ssp. *irrorata*, *A. irrorata* ssp. *velutinella*, *A. julifera* ssp. *julifera*, *A. kempeana*, *A. leuococlada* ssp. *argentifolia*, *A. leuococlada* ssp. *leuococlada*, *A. ligulata*, *A. mabellae*, *A. maconochieana*, *A. mearnsii*, *A. melanoxyton*, *A. monticola*, *A. murrayana*, *A. nano-dealbata*, *A. neriifolia*, *A. obliquinervia*, *A. pachycarpa*, *A. parramattensis*, *A. parvipinnula*, *A. peregrinalis*, *A. plectocarpa*, *A. pruinocarpa*, *A. salicina*, *A. schinoides*, *A. sclerosperma*, *A. shirleyi*, *A. silvestris*, *A. simsii*, *A. stenophylla*, *A. storyi*, *A. tephрина*, *A. torulosa*, *A. trachycarpa*, *A. trachyphloia*, *A. tumida*, *A. victoriae xiphophylla*

Spain: *A. amplexiceps*, *A. aneura*, *A. colei* var. *colei*, *A. cowleana*, *A. dealbata* ssp. *dealbata*, *A. mearnsii*, *A. murrayana*, *A. parramattensis*, *A. plectocarpa*, *A. saligna*, *A. shirleyi*, *A. tumida* var. *tumida*

Sri Lanka: *A. acuminata*, *A. auriculiformis*, *A. colei* var. *colei*, *A. crassicarpa*, *A. decurrens*, *A. difficilis*, *A. leptocarpa*, *A. mangium*, *A. melanoxyton*, *A. oraria*, *A. peregrinalis*, *A. plectocarpa*, *A. tumida* var. *tumida*

St. Vincent/Grenada: *A. auriculiformis*, *A. crassicarpa*, *A. mangium*

Sudan: *A. adsurgens*, *A. amplexiceps*, *A. aneura*, *A. bivenosa*, *A. colei* var. *colei*, *A. colei* var. *ileocarpa*, *A. coriacea* ssp. *coriacea*, *A. coriacea* ssp. *sericophylla*, *A. cowleana*, *A. elachantha*, *A. saligna*, *A. sclerosperma* x *ligulata*, *A. stenophylla*, *A. trachycarpa*, *A. translucens*, *A. tumida* var. *tumida*

Swaziland: *A. amplexiceps*, *A. salicina*, *A. stenophylla*, *A. mangium*

Taiwan: *A. auriculiformis*, *A. crassicarpa*, *A. peregrinalis*

Tanzania: *A. amplexiceps*, *A. auriculiformis*, *A. colei*, *A. cowleana*, *A. crassicarpa*, *A. difficilis*, *A. elachantha*, *A. holosericea*, *A. julifera* ssp. *julifera*, *A. maconochieana*, *A. mangium*, *A. neurocarpa*, *A. peregrinalis*, *A. salicina*, *A. saligna*, *A. stenophylla*, *A. torulosa*, *A. tumida* var. *tumida*, *A. victoriae*

Thailand: *A. adsurgens*, *A. amplexiceps*, *A. auriculiformis*, *A. bidwillii*, *A. brassii*, *A. buxifolia*, *A. cincinnata*, *A. citrinoviridis*, *A. colei* var. *colei*, *A. concurrens*, *A. conferta*, *A. cowleana*, *A. crassicarpa*, *A. cuthbertsonii*, *A. dealbata* ssp. *dealbata*, *A. deanei* ssp. *deanei*, *A. decurrens*, *A. difficilis*, *A. dunnii*, *A. falcata*, *A. falciformis*, *A. farnesiana*, *A. fimbriata*, *A. flavescens*, *A. floribunda*, *A. glaucocarpa*, *A. hemsleyi*, *A. holosericea*, *A. hylonoma*, *A. irrorata* ssp. *irrorata*, *A. julifera* ssp. *gilbertensis*, *A. julifera* ssp. *julifera*, *A. leiocalyx*, *A. leptocarpa*, *A. ligulata*, *A. macradenia*, *A. maidenii*, *A. mangium*, *A. mearnsii*, *A. mountfordiae*, *A. myrtifolia*, *A. neriifolia*, *A. oraria*, *A. orthocarpa*, *A. pellita*, *A. peregrinalis*, *A. platycarpa*, *A. plectocarpa*, *A. podalyrifolia*, *A. polybotrya*, *A. redolens*, *A. rothii*, *A. salicina*, *A. shirleyi*, *A. spectabilis*, *A. stenophylla*, *A. torulosa*, *A. trachycarpa*, *A. tumida* var. *tumida*

Tonga: *A. auriculiformis*, *A. tumida* var. *tumida*

Tunisia: *A. cyclops*, *A. salicina*, *A. saligna*, *A. stenophylla*, *A. victoriae*

Turkey: *A. dealbata* ssp. *dealbata*, *A. decurrens*, *A. mearnsii*, *A. melanoxyton*, *A. obliquinervia*, *A. parramattensis*, *A. pravissima*, *A. retinodes*, *A. rubida*, *A. silvestris*

Uganda: *A. auriculiformis*, *A. crassicarpa*, *A. mangium*

United Arab Emirates: *A. adsurgens*, *A. colei* var. *colei*, *A. coriacea*, *A. elachantha*, *A. holosericea*, *A. jenerae*, *A. tumida*, *A. victoriae*

United Kingdom: *A. ancistrocarpa*, *A. aneura*, *A. auriculiformis*, *A. bidwillii*, *A. colei* var. *colei*, *A. coriacea* ssp. *sericophylla*, *A. covenyi*, *A. crassicarpa*, *A. dealbata* ssp. *dealbata*, *A. dealbata* ssp. *subalpine*, *A. drummondii*, *A. filicifolia*, *A. holosericea*, *A. implexa*, *A. leiocalyx*, *A. mangium*, *A. mearnsii*, *A. melanoxyton*, *A. pendula*, *A. podalyrifolia*, *A. pravissima*, *A. rubida*, *A. saligna*, *A. tetragonophylla*

United States: *A. ampliceps*, *A. auriculiformis*, *A. blakei*, *A. burrowii*, *A. cincinnata*, *A. colei* var. *colei*, *A. colei* var. *ileocarpa*, *A. crassicarpa*, *A. dealbata* ssp. *dealbata*, *A. dealbata* ssp. *subalpine*, *A. decurrens*, *A. difficilis*, *A. elachantha*, *A. elata*, *A. holosericea*, *A. implexa*, *A. leiocalyx*, *A. leptocarpa*, *A. mangium*, *A. mearnsii*, *A. melanoxyton*, *A. murrayana*, *A. orites*, *A. peregrinalis*, *A. salicina*, *A. sparsiflora*, *A. stenophylla*, *A. torulosa*, *A. tumida* var. *kulparn*, *A. tumida* var. *tumida*, *A. victoriae*

Uruguay: *A. dealbata* ssp. *dealbata*, *A. decurrens*, *A. elata*, *A. mearnsii*, *A. melanoxyton*

Venezuela: *A. auriculiformis*, *A. crassicarpa*, *A. mangium*

Vietnam: *A. ampliceps*, *A. auriculiformis*, *A. bancroftii*, *A. binervata*, *A. binervia*, *A. blayana*, *A. brassii*, *A. cambagei*, *A. celsa*, *A. chrysotricha*, *A. cincinnata*, *A. colei*, *A. concurrens*, *A. cowleana*, *A. crassa* ssp. *crassa*, *A. crassicarpa*, *A. dangarensis*, *A. dealbata* ssp. *dealbata*, *A. deanei* ssp. *deanei*, *A. decurrens*, *A. difficilis*, *A. elata*, *A. falciformis*, *A. filicifolia*, *A. flavescens*, *A. fulva*, *A. glaucocarpa*, *A. harpophylla*, *A. holosericea*, *A. implexa*, *A. irrorata* ssp. *irrorata*, *A. irrorata* ssp. *velutinella*, *A. julifera* ssp. *gilbertensis*, *A. julifera* ssp. *julifera*, *A. leiocalyx*, *A. leptocarpa*, *A. leucoclada* ssp. *argentifolia*, *A. leucoclada* ssp. *leucoclada*, *A. longispicata*, *A. mabellae*, *A. mangium*, *A. mearnsii*, *A. melanoxyton*, *A. mountfordae*, *A. mountfordiae*, *A. nano-dealbata*, *A. nerifolia*, *A. neurocarpa*, *A. obliquinervia*, *A. oraria*, *A. parramattensis*, *A. parvipinnula*, *A. peregrinalis*, *A. plectocarpa*, *A. rothii*, *A. shirleyi*, *A. silvestris*, *A. simsii*, *A. thomsonii*, *A. torulosa*, *A. trachycarpa*, *A. trachyphloia*, *A. tumida*

Western Samoa: *A. auriculiformis*, *A. crassicarpa*, *A. mangium*, *A. peregrinalis*

Zaire: *A. auriculiformis*, *A. colei* var. *colei*, *A. crassicarpa*, *A. decurrens*, *A. holosericea*, *A. mangium*, *A. mearnsii*

Zimbabwe: *A. auriculiformis*, *A. colei* var. *colei*, *A. holosericea*, *A. neurocarpa*, *A. tumida* var. *tumida*