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A taxonomic revision of Mulga (*Acacia aneura* and its close relatives: Fabaceae) in Western Australia

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Abstract

Maslin, B.R. & Reid, J.E. A taxonomic revision of Mulga (*Acacia aneura* and its close relatives: Fabaceae) in Western Australia. *Nuytsia* 22(4): 129–267 (2012). A taxonomic revision of the highly diverse Western Australian Mulga flora (*Acacia aneura* F.Muell. ex Benth. and its close relatives) is presented, based on morphological analyses of almost 2000 herbarium collections complemented by field studies of about 300 populations (mostly located in Western Australia, with a few from the Northern Territory and South Australia). Twelve species accommodated in three informal groups, the Blue, Grey-green and Green Alliances, are recognised. Almost all of the species contain informal variants, and putative hybrids and/or intergrades are common. Because many of the species had previously been recognised as varieties of *A. aneura* (Pedley 2001) a discussion of our taxon concepts is given. The 12 species are defined by a combination of morphological characters, the most important being branchlet resin (translucent vs opaque) and pod margins (rimmed, bevel-edged or winged), complemented by new shoot (resinous vs non-resinous), phyllode (shape, size, curvature, nervature) and pod (width) attributes. A discussion of the taxonomically most informative characters in the Mulga group is presented. Seven new species are recognised: *Acacia aptaneura* Maslin & J.E.Reid (syn. *A. aneura* var. *pilbarana* Pedley and *A. aneura* var. *tenuis* Pedley), *A. caesaneura* Maslin & J.E.Reid (syn. *A. aneura* var. *argentea* Pedley), *A. fuscaneura* Maslin & J.E.Reid (syn. *A. aneura* var. *fuliginea* Pedley), *A. incurvaneura* Maslin & J.E.Reid (syn. *A. aneura* var. *microcarpa* Pedley), *A. macraneura* Maslin & J.E.Reid (syn. *A. aneura* var. *macrocarpa* Randell), *A. mulganeura* Maslin & J.E.Reid and *A. pteraneura* Maslin & J.E.Reid. *Acacia aneura* var. *intermedia* Pedley is provisionally regarded as conspecific with the broadly circumscribed *A. aneura*.

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Introduction

This revision provides an improved understanding of the morphology, taxonomy and classification of Mulga in Western Australia. Although much remains unknown about this intriguing group of arid zone plants, substantial advances have nevertheless been made with the recognition of 12 species (with many containing informal variants) that account for a substantial amount of the variation encountered. An electronic identification key to these species will be provided elsewhere. The 12 species are accommodated within three Mulga alliances and this provides a convenient conceptual framework for understanding the group. Also, a comprehensive assessment of morphological attributes is provided which will enable workers to focus on the taxonomically most informative characters. Notwithstanding these advances, Mulga is an extremely large and taxonomically complex group and unresolved variation, confounded by presumed hybridity, still exists. It is anticipated that further studies will lead to the recognition of some additional Mulga species in Western Australia (especially in eastern areas of the State that we were unable to visit). Nevertheless, it is hoped that the present work will provide a robust framework for such studies.

Mulga is a name that is most commonly applied to the large, woody, perennial, Australian species *Acacia aneura* F.Muell. ex Benth. and some of its close relatives. The name is also used to denote the vegetation type dominated by these species. According to Maiden (1907) the word Mulga alludes to a long, narrow shield made by Aboriginal Australians from *Acacia* Mill. wood, and may have been derived from the word 'Malka' (a term used for *A. aneura* by certain Aboriginal peoples in the Lake Eyre district of South Australia). The first published use of the word Mulga appears to be that of Mueller (1863) who referred to 'Mulga scrubs' on the label of a specimen collected by the explorer John McDouall Stuart.

Mulga is a keystone group in the Australian arid zone and Mulga communities occupy over 150 million hectares or about 20% of the land surface of the continent (Sattler 1986), from Western Australia eastwards through the Northern Territory and South Australia to Queensland, New South Wales and far north-west Victoria (see Figure 1 in Miller *et al.* 2002). As noted in Maslin and van Leeuwen (2006) Mulga communities are critically important to the ecology, functioning and viability of rangeland landscapes, acting as resource 'hotspots' due to the species' ability to capture, retain and cycle scarce sediments, nutrients and water resources. Consequently, many of the Mulga-dominated areas are characterised by significant productivity and biodiversity, important characteristics that in the past were recognised and appreciated by Aboriginal Australians, as they are by today's pastoral and mining industries. Protection of this valuable resource is imperative for sustainable land use and natural resource management, especially in areas where sometimes competing interests (cultural, conservation, pastoral and mining) occur. However, one key impediment to the development of plans and management actions designed to protect Mulga and to deliver biodiversity and sustainable land use outcomes has been the inadequacy of taxonomic clarity with respect to Mulga.

Species of the Mulga group, especially *A. aneura* itself, are notoriously variable and despite relatively recent reviews by Randell (1992) and Pedley (2001) the identification of these taxa, both in the field and from herbarium material, is often very difficult. Variation in Mulga occurs both within and between populations and this variation often produces a complex mosaic of Mulga communities across the landscape. These communities commonly contain a range of different Mulga morphotypes[1] which, superficially at least, often seem to blend into one another to form bewilderingly complex, mixed populations. Stands of single Mulga morphotypes are seemingly uncommon, at least in Western

[1]As defined in Miller *et al*. (2002) the term morphotype is used to define a group of plants that share similar looking morphological features, e.g. growth form, phyllode shape, size and/or colour, pod form, etc.

Australia. Nationwide there appears to be an east-west gradient in taxonomic diversity within Mulga, the Murchison IBRA bioregion (Department of Environment, Water, Heritage and the Arts 2008) in Western Australia being the most speciose. An overview of variation in Mulga, including a discussion of factors such as polyploidy, hybridisation, apomixis and neoteny that may be responsible for its creation and maintenance, is presented in Miller *et al.* (2002); see also Andrew *et. al.* (2003). Other large arid zone groups similar to Mulga in being morphologically variable and genetically complex include *Senna* (Randell 1970, 1989; Randell & Barlow 1998), *Triodia* (Lazarides 1997) and members of the family Chenopodiaceae (Wilson 1980; Shepherd & Yan 2003).

The present study was undertaken under the auspices of the *Understanding Mulga* project (see *Acknowledgements*) established in 2006. The first objective of this project was to elucidate patterns of variation within the Western Australian Mulga flora (Maslin & van Leeuwen 2006) by defining taxa, classifying them and providing an effective means of their identification. The first two of these matters are the subject of the present paper while the last is accommodated by an electronic identification key which will be posted on the WorldWideWattle website (www.worldwidewattle.com). The second objective of the *Understanding Mulga* project was to investigate genetic factors that might be responsible for creating and maintaining the variation within the group; this will be dealt with elsewhere.

Materials and methods

Work for this project was undertaken at the Western Australian Herbarium (PERTH) between 2006 and 2010, though a small amount of Mulga-related field work had been conducted by the first author in 1999 and 2000. The taxonomic conclusions presented here are based almost exclusively on detailed analyses of herbarium specimens, supplemented by field observations as noted below. Although genetic analyses were undertaken in connection with the project (Miller *et al*., unpublished data) future studies of Mulga will undoubtedly benefit from a greater use of appropriate genetic techniques than we were able to achieve. This constraint and other factors that impeded progress of the project are noted below. All photographs were taken by the authors unless otherwise indicated.

Species treatments

The species treatments are based on specimens lodged at the Western Australian Herbarium (PERTH) unless otherwise stated. For distributions a general statement of occurrence is given together with the IBRA (Interim Biogeographic Regionalisation for Australia) bioregions (Department of Environment, Water, Heritage and the Arts 2008) in which each species occurs. Species distribution maps are based on specimens housed at PERTH.

Field studies

Many field studies were conducted between 2006 and 2009 during which time 293 populations in Western Australia were sampled (Figure 1A), resulting in 882 Mulga collections which are now deposited at the Western Australian Herbarium, thus almost doubling the number of holdings at PERTH. We also conducted short field trips in the Northern Territory (principally to sample the *A. aneura* var. *intermedia* Pedley type locality on Napperby Station) and South Australia (to sample the *A. aneura* type locality near Hawker in the Flinders Range, see Maslin *et. al*. 2012). Material for genetic analysis was also collected from many of the plants sampled.

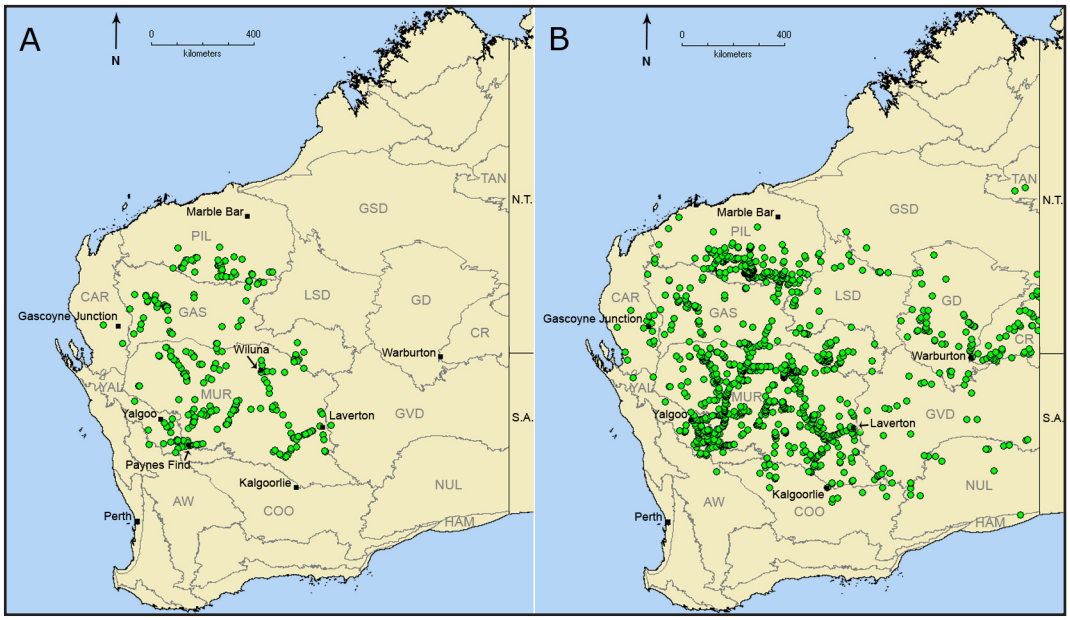


Figure 1. Distribution maps showing locations of Western Australian Mulga collections housed at PERTH. A – Maslin *et al*. collection sites during the *Understanding Mulga* field program (2006–09); B – all Western Australian Mulga collections. Boundaries and name abbreviations for IBRA bioregions (Department of Environment, Water, Heritage and the Arts 2008) are shown in grey.

Many of the most Mulga-diverse areas of Western Australia were traversed during the course of this study. However, because of constraints on the project (see below) we were obliged to target specific populations (commonly selected by edaphic considerations or the presence of plants in fruit) and often were unable to collect every Mulga morphotype at the sites visited. Notwithstanding these constraints our collections, together with those previously gathered, are most likely a reasonable representation of Mulga diversity for the areas sampled. The main Mulga areas of the State not sampled during this study were the eastern deserts and ranges and the Nullarbor region east of about longitude 123°E. For taxa from this large area we relied on previously collected herbarium specimens.

The examination of Mulga populations in the field was especially important to this study. Being able to study intra- and inter-population variation provided a critical context for the subsequent examination and interpretation of the specimens that were collected (this context was normally lacking for the approximately 1000 Mulga specimens at PERTH at the commencement of the project). Most importantly, the field studies enabled us to identify putative hybrids and to gain insights into the extremely complex and often cryptic patterns of variation that exist within populations.

Herbarium studies

Detailed scrutiny of the almost 2000 herbarium specimens of Mulga now housed at PERTH was undertaken during this project (Figure 1B). Most attention was given to specimens collected during the 2006–2009 field program, to specimens collected from both Western Australia and the Northern Territory in 1999 and 2000 by the first author and others, and a collection of specimens from West Angelas in the Pilbara region made by G. Page. These specimens provided the most taxonomically informative material available to the project because they were generally well-documented, comprehensive in their

scope at the population level and often included material gathered for genetic scrutiny. Additional to the above material we studied a small number of relevant specimens from the Northern Territory Herbarium in Alice Springs (NT), the State Herbarium of South Australia (AD), the National Herbarium of Victoria (MEL) and the Queensland Herbarium (BRI).

Morphological analysis of variation was undertaken using conventional taxonomic methodology.

Ancillary studies

In order to better understand taxonomically important characters of Mulga pods, an anatomical investigation was undertaken with Dr R. Rutishauser from the University of Zurich. The results of this investigation are presented in Rutishauser *et al.* (2010).

Constraints

Despite significant support for the *Understanding Mulga* project (see *Acknowledgements*) and having made substantial taxonomic advances, we have not progressed this study as far as we would have wished. There were three principal constraints, all of which relate to the fact that Mulga is an extremely large and perplexingly variable group.

Poor seasonal conditions. Throughout the life of the project drought conditions prevailed over most of the study area. As discussed under *Phenology* below, both flowering and fruiting in Mulga is very dependent upon rainfall which is variable, patchy and unpredictable in the arid zone where the species occur. These factors severely impeded the production of pods which are so important to the undertaking of a taxonomic investigation of Mulga. Similarly, few flowering specimens were collected but this deficiency impacted less on the project than did the lack of pods. The use of previously collected herbarium material helped ameliorate these deficiencies but most of these specimens were single collections which meant that we remained ignorant of the important population context for these gatherings.

Geographic considerations. This project was essentially restricted to Western Australia but we were not able to sample all areas of the State where Mulga occurred. Attention was focused on the Murchison, Gascoyne and southern Pilbara IBRA bioregions (Department of Environment, Water, Heritage and the Arts 2008) which are very species-diverse, containing most of the taxa recorded for the State. Mulga lands in Western Australia extend from about 22.5–30.5°S and 116–129°E equating to a distance of *c*. 1000 km north to south and 1500 km east to west. In many places where Mulga occurs (especially areas to the east of Newman, Wiluna and Kalgoorlie) there are relatively few roads and access is very difficult. Figure 1A shows the sites we sampled while Figure 1B shows the total number of sites from which Mulga has been sampled based on Western Australian Herbarium specimen records.

Insufficient genetic information. Chloroplast DNA analyses have provided a broad overview of the evolutionary history of Mulga in Western Australia (Miller *et al.*, unpublished data). However, at the population level we did not have access to genetic information that might have assisted in the detection of hybrids, apomixis, neoteny and polyploidy, all of which were factors postulated by Miller *et al.* (2002) as being implicated in causing and maintaining diversity within Mulga.

Taxon concepts

In a group as large and widespread as Mulga it is perhaps surprising that until now so few species have been recognised. Bentham (1855) described the first species, *A. aneura*, based on specimens collected by Ferdinand von Mueller from the Flinders Range in South Australia (see Maslin *et al.* 2012 for discussion). Subsequently Mueller (1887) described the Western Australian endemic *A. craspedocarpa* F.Muell. which is morphologically very distinct, particularly on account of its reticulately nerved phyllodes and large, hard-textured pods. Apart from Black's 1923 description of *A. aneura* var. *latifolia* J.M.Black (treated here as conspecific with *A. ayersiana* Maconochie) no other taxa of Mulga were described until the latter part of the 20th century when three widespread arid zone species were recognised, namely, *A. ayersiana* (Maconochie 1978) with its large phyllodes, *A. paraneura* Randell (Randell 1992) with its distinctive weeping growth form and *A. minyura* Randell (Randell 1992) with its small phyllodes. Earlier, both Everist (1949) and Pedley (1973) had recognised a few informal variants within *A. aneura* from Queensland, based primarily on growth form and phyllode structure, while Maslin (1980) recognised two informal variants under *A. aneura* from the Central Australian region. In his 2001 review of Mulga, Pedley recognised the aforementioned species but regarded *A. aneura* as comprising 10 varieties. In the present work we recognise 12 species of Mulga for Western Australia which include the aforementioned species while Pedley's varieties are either relegated to synonymy or treated as distinct species.

Many authors, including Pedley (1973, 2001), Randell (1992) and Miller *et al.* (2002) have commented on the extreme and complex nature of the variation that exists within Mulga communities and within *A. aneura s. lat.* itself. These matters are also discussed in the present work. The complex variation patterns commonly make it difficult for people to conceptualise or recall taxa that have been recognised within the Mulga group. Other factors that contribute to these difficulties include taxa that are often somewhat cryptically defined (commonly by combinations of characters), closely related and similar-looking taxa that are often sympatric or occur in close proximity to one another, and hybridisation and/or intergradation between taxa which appears to be common and often obscures taxon boundaries. Pedley (2001) speculated that because of the bewildering variability within Mulga and because of the common occurrence of hybrids it could be argued that his broadly circumscribed *A. aneura* (which contained 10 varieties) could be broadened to also include *A. ayersiana*, *A. minyura* and *A. paraneura*. While this is a reasonable argument, especially if one focuses on the similarities between the taxa, it would result in a very large and perplexingly polymorphic species. We prefer, for reasons discussed below, to emphasise the differences between the taxa and to treat them as distinct, albeit narrowly circumscribed, species. The 12 Mulga species recognised here could be considered somewhat analogous to cryptic species belonging to a 'superspecies' (see Pryor & Johnson 1971).

As noted by Cowan and Maslin (1995) the assignment of rank is largely a subjective exercise that is dependent on one's knowledge of the taxa under study. Also, as Johnson (1976) correctly stated, it does not matter too much what rank is applied to taxa provided that they are named and that they represent meaningful biological entities. With these philosophical views in mind, and judging from our detailed analysis of morphological characters and extensive field observations, we consider that the Western Australian Mulga flora is best accommodated within 12 species. Genetic data (cpDNA) provide some support for these species (Miller *et al.*, unpublished data). Treating the taxa as species rather than infraspecific taxa obliges users to rigorously test our classification, because the option of simply calling specimens '*A. aneura*' (without assigning them to an infraspecific category) no longer exists if our taxonomy is adopted.

Notwithstanding the above, the application of rank to taxa in Mulga has challenged our species concepts in *Acacia* (see Cowan & Maslin 1995 for discussion). Mulga differs from many other groups of Australian

Acacia in that presumed close relatives are often sympatric; this has possibly facilitated the creation of high numbers of presumed hybrids and intermediates. These putative hybrids and intermediates complicate and confuse taxon identification and definition; they are difficult to detect and it is possible that some have inadvertently been included within our species circumscriptions. Furthermore, because of the large amount of variation in most morphological characters, the majority of species are defined by a combination of (often cryptic) resin, new shoot, phyllode and carpological attributes. Only rarely does a single character enable a species to be unequivocally recognised, e.g. the reticulately nerved phyllodes in *A. craspedocarpa*. However, despite the absence of strong morphological boundaries between many of the taxa it does not negate their recognition as discrete species. Indeed, we consider that this approach to rank, together with the aggregation of the species into three Mulga alliances, provides a workable and useful framework that facilitates the understanding and discussion of variation, and which provides a practical platform for present and future studies of the Mulga group.

Classification and taxonomy

Acacia aneura and its relatives are members of *Acacia* section *Juliflorae* DC., a group of around 250 species defined by spicate inflorescences and plurinerved phyllodes (Maslin 2001). The position of the *Juliflorae* within the context of the Australian *Acacia* flora has not yet been resolved (Murphy *et al.* 2010).

Taxonomically *A. aneura* has long been recognised as heterogenous and taxonomically problematic (*fide* Burbidge 1960; Pedley 1973, 2001; Randell 1992; Miller *et al.* 2002). Until relatively recently, these problems severely constrained the reporting of ecological and other studies involving Mulga because, as noted by Preece (1971), it was 'dangerous' to generalise results beyond the population(s) under study. Early attempts to resolve the taxonomy of the Mulga group led some workers to recognise informal variants. For example, Hall *et al.* (1964) suggested that there may be two ecotypes associated with summer- and winter-rainfall regions; in Queensland Everist (1949) and Pedley (1973) recognised two and three variants respectively, based on phyllode dimensions. Beard (1976) attempted to apply Pedley's variants to plants in Western Australia and enumerated 'ecotypes' that Beard (1974) had previously recognised on the basis of growth form characteristics. These were: the 'commonest ecotype', characterised by glaucous phyllodes borne erect on ascending branches (Beard could have been referring to any one of number of species that are recognised here), a 'weeping ecotype' (now known to be *A. paraneura*) and a 'horizontal ecotype' (undoubtedly *A. aneura* var. *conifera* Randell which is discussed below). In 1992, Randell published the first reasonably comprehensive review of the Mulga group, which was followed by a *Flora of Australia* treatment by Pedley (2001).

Pedley's (2001) review of Mulga provided a good foundation upon which to build our classification of Mulga in Western Australia, and as can be seen from the list below we have retained many of the taxa that he recognised. However, for reasons discussed under *Taxon Concepts* above we think it more appropriate that the majority of Pedley's varieties of *A. aneura* be afforded species status. The only Mulga taxon recognised by Pedley (2001) but not included here is *A. aneura* var. *major* Pedley which appears not to occur in Western Australia (the Western Australia specimens that Pedley provisionally referred to var. *major* are now regarded as *A. aneura* or *A.*? *aneura* × *ayersiana*). This variety and *A. aneura* var. *intermedia* (which here we provisionally treat as conspecific with *A. aneura*) belong to a complex group of Mulgas which are very diverse in areas to the east of Western Australia. As discussed under *A. aneura* below and in Maslin *et al.* (2012) the resolution of ambiguities concerning *A. aneura* is, to a large extent, dependent upon further studies in these areas. Also, as discussed below, *A. aneura* var. *conifera* is not recognised here as a distinct entity. The only taxa recognised here but

not by Pedley (*l.c.*) are *A. pteraneura* Maslin & J.E.Reid and *A. mulganeura* Maslin & J.E.Reid; he treated specimens of the latter as a 'well-marked variant' under his account of *A. minyura*.

The rather distinctive coniferous growth forms of Mulga that are seen in some populations were accommodated by Randell (1992) and Pedley (2001) within *A. aneura* var. *conifera*; however, these morphotypes are found in four of our species, namely *A. aneura*, *A. aptaneura* Maslin & J.E.Reid, *A. fuscaneura* Maslin & J.E.Reid and *A. pteraneura*. The type of *A. aneura* var. *conifera* is referable to *A. pteraneura*. As noted below under *Morphological characters*, two basic coniferous growth forms are recognised here, 'true' conifer which is regarded as neotenous (Figure 2) and 'pseudo-conifer' which Miller *et al.* (2002) suggest is a temporal, adolescent growth phase, an idea also implied by Chippendale and Jephcott (1963) (Figure 3). Only their characteristic growth form and sometimes clustered phyllodes distinguish coniferous Mulgas from their non-conifer analogues. Furthermore, a cpDNA analysis by Miller *et al.* (unpublished data) showed that Western Australian coniferous Mulgas group with their non-conifer analogues on separate clades comprising the above-mentioned four species. Consequently, var. *conifera* is not recognised as a taxon in the present work.

The present study recognises 12 species of Mulga for Western Australia collectively comprising the 'Mulga group'. These species are arranged in three groups, the Green, Grey-green and Blue Alliances which are defined by just two morphological features, namely, whether or not the pods are winged and whether the branchlet resin is translucent or opaque. The alliance names are derived from the predominant colour of the crown foliage of included species. Although this classification provides a convenient conceptual framework for understanding Mulga the alliances are used here primarily as a mnemonic device; they are only partially supported by current genetic data (Miller *et al.*, unpublished data) and therefore should not be regarded as monophyletic entities.

Considering the extreme variation that exists within the Mulga group it is very unlikely that we encountered all morphotypes during the course of this study. While it is expected that most of these undetected morphotypes will comprise relatively minor hybrids or intergrades, it is possible that a few hitherto unrecognised species exist in the easternmost areas of the State which were not surveyed during this study (see *Constraints* under *Introduction* above). Also, even in some regions that were sampled a number of times during this study there remains unresolved taxonomic issues. The Pilbara is a case in point where it will be seen from discussions below under *A. aneura*, *A. aptaneura*, *A. ayersiana*, *A. minyura*, *A. paraneura* and *A. pteraneura* that further study is needed.

The following list summarises the classification adopted here and shows the placement of the varieties of *A. aneura* that Pedley (2001) recognised. Figure 4 depicts the presumed relationships of the 12 species while their more important morphological features are summarised in Tables 1 and 2.

A. Green Alliance (pods rimmed[2]; branchlet resin translucent)

- *Acacia aptaneura* (syn. *A. aneura* var. *pilbarana* Pedley and *A. aneura* var. *tenuis* Pedley)
- *Acacia macraneura* Maslin & J.E.Reid (syn. *A. aneura* var. *macrocarpa* Randell)

[2]A few plants with bevel-edged pods are noted under *A. aptaneura* below but are not included within the circumscription of the species (see *A. aptaneura* for discussion).

B. Grey-green Alliance (pods winged, rarely bevel-edged; branchlet resin translucent)

- *Acacia aneura* (provisional syn. *A. aneura* var. *intermedia* Pedley)
- *Acacia ayersiana*
- *Acacia craspedocarpa*
- *Acacia fuscaneura* (syn. *A. aneura* var. *fuliginea* Pedley)
- *Acacia paraneura*
- *Acacia pteraneura*

C. Blue Alliance (pods winged; branchlet resin some or all opaque)

- *Acacia caesaneura* Maslin & J.E.Reid (syn. *A. aneura* var. *argentea* Pedley)
- *Acacia incurvaneura* Maslin & J.E.Reid (syn. *A. aneura* var. *microcarpa* Pedley)
- *Acacia mulganeura*
- *Acacia minyura*

Species considered most closely related to those of the Mulga group include *A. atopa* Pedley, *A. brachystachya* Benth., *A. clelandii* Pedley, *A. ramulosa* W.Fitzg. and *A. subtessaragona* Tindale & Maslin (*fide* Miller *et al.* 2002). *Acacia catenulata* C.T. White, *A. coolgardiensis* Maiden, *A. effusifolia* Maslin & Buscumb, *A. latior* (R.S.Cowan & Maslin) Maslin & Buscumb and *A. thoma* Maslin are also related but seemingly more distant. These species are most readily distinguished from Mulga group species by their pods which normally have a higher length: width ratio and are terete to compressed or quadrangular in section (flat in Mulga group species), except *A. catenulata* which has flat pods that are strongly constricted between the seeds and which readily break into 1-seeded articles (Figure 10Dc; also Figure 4 in Rutishauser *et al.* 2010). Furthermore, the Mulga relatives commonly lack glandular hairlets on their new shoots (glandular hairlets always present in Mulga group species). Putative hybrids sometimes occur between Mulga group species and some of their relatives, especially *A. ramulosa*.

An electronic identification key to Western Australia Mulga will be made available on the WorldWideWattle website (www.worldwidewattle.com).

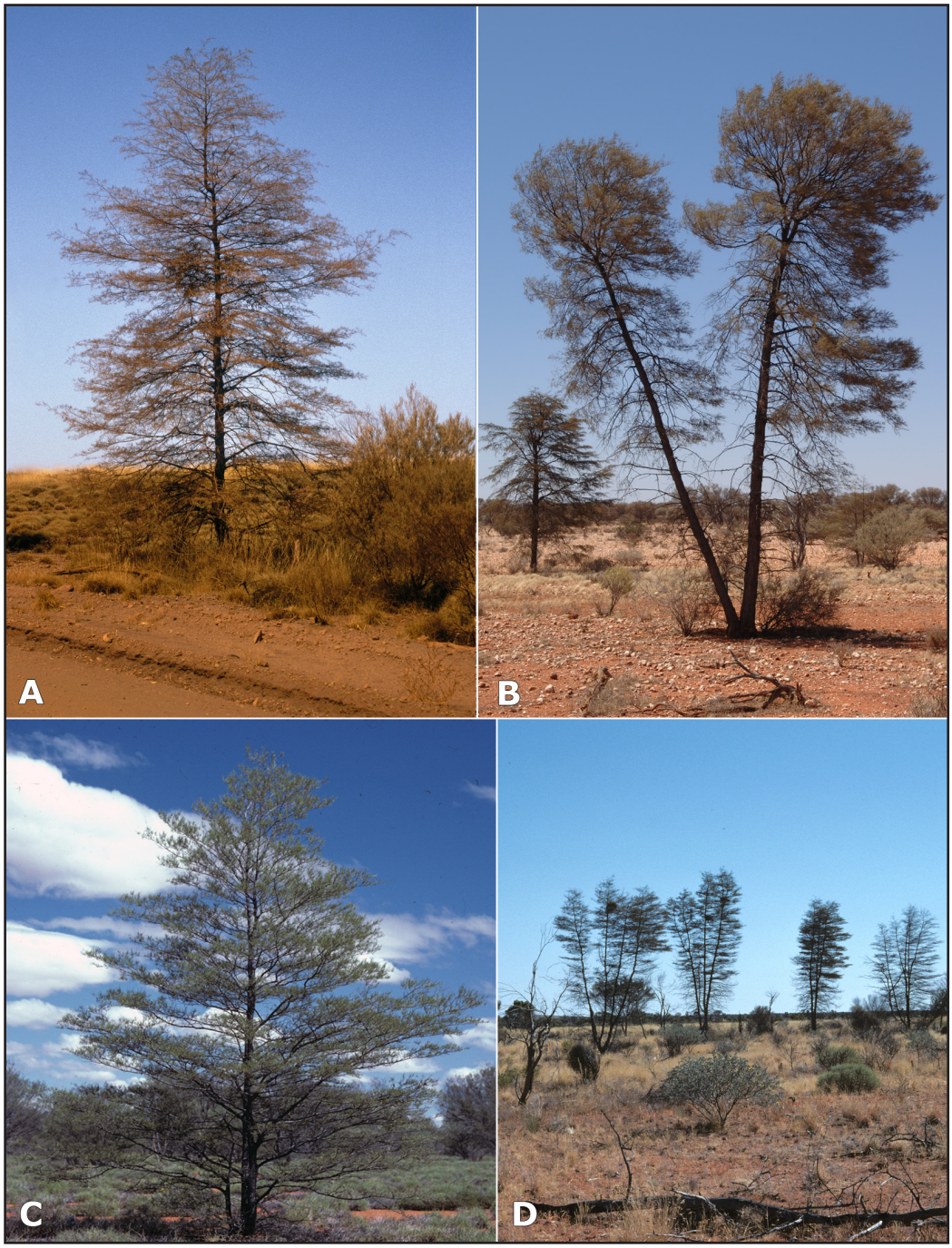


Figure 2. Mulga plants showing coniferous growth forms with all branches wide-spreading. A – *Acacia aneura* plant conical in shape, near Newman; B – *A. pteraneura* plant obconical in shape, near Leonora; C – *A. aptaneura* plant conical in shape, Gibson Desert; D – stand of *A. pteraneura* plants (holotype population of *A. aneura* var. *conifera* from near Yuendumu, Northern Territory). Photographs by J. Maslin (A), B.R. Maslin (B, C) and P.K. Latz (D).

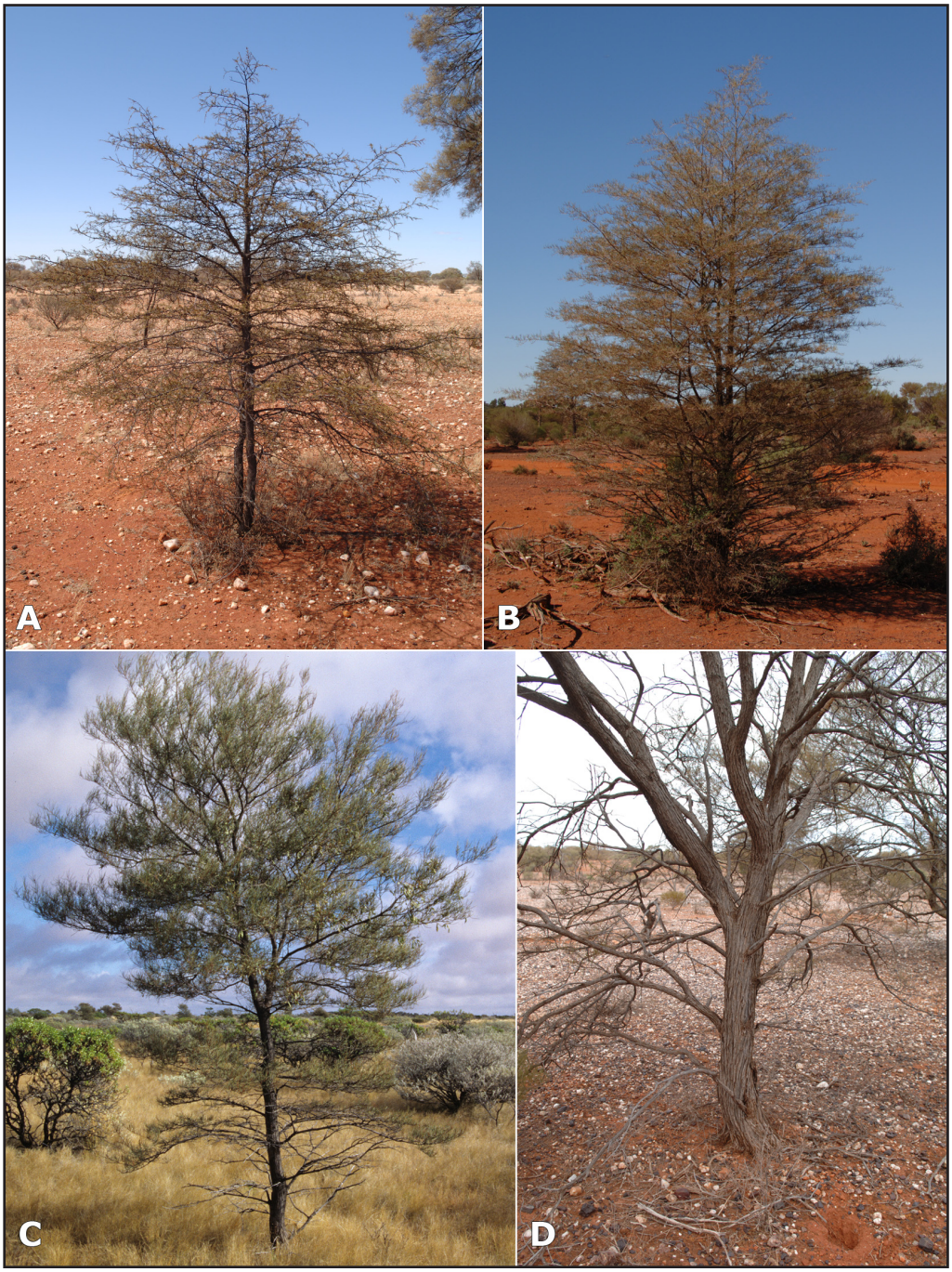


Figure 3. Mulga plants showing pseudo-coniferous growth forms with wide-spreading lower lateral branches and obliquely ascending to erect upper branches. A – *Acacia pteraneura*, near Leonora; B – *A. aneura*, near Menzies; C – *A. aneura*, near Meekatharra; D – main stem of *A. pteraneura* plant with old, persisting, wide-spreading lateral branches on lower part and obliquely ascending to erect branches on upper part; this plant probably would have possessed a pseudo-conifer growth form when younger. Photographs by B.R. Maslin.

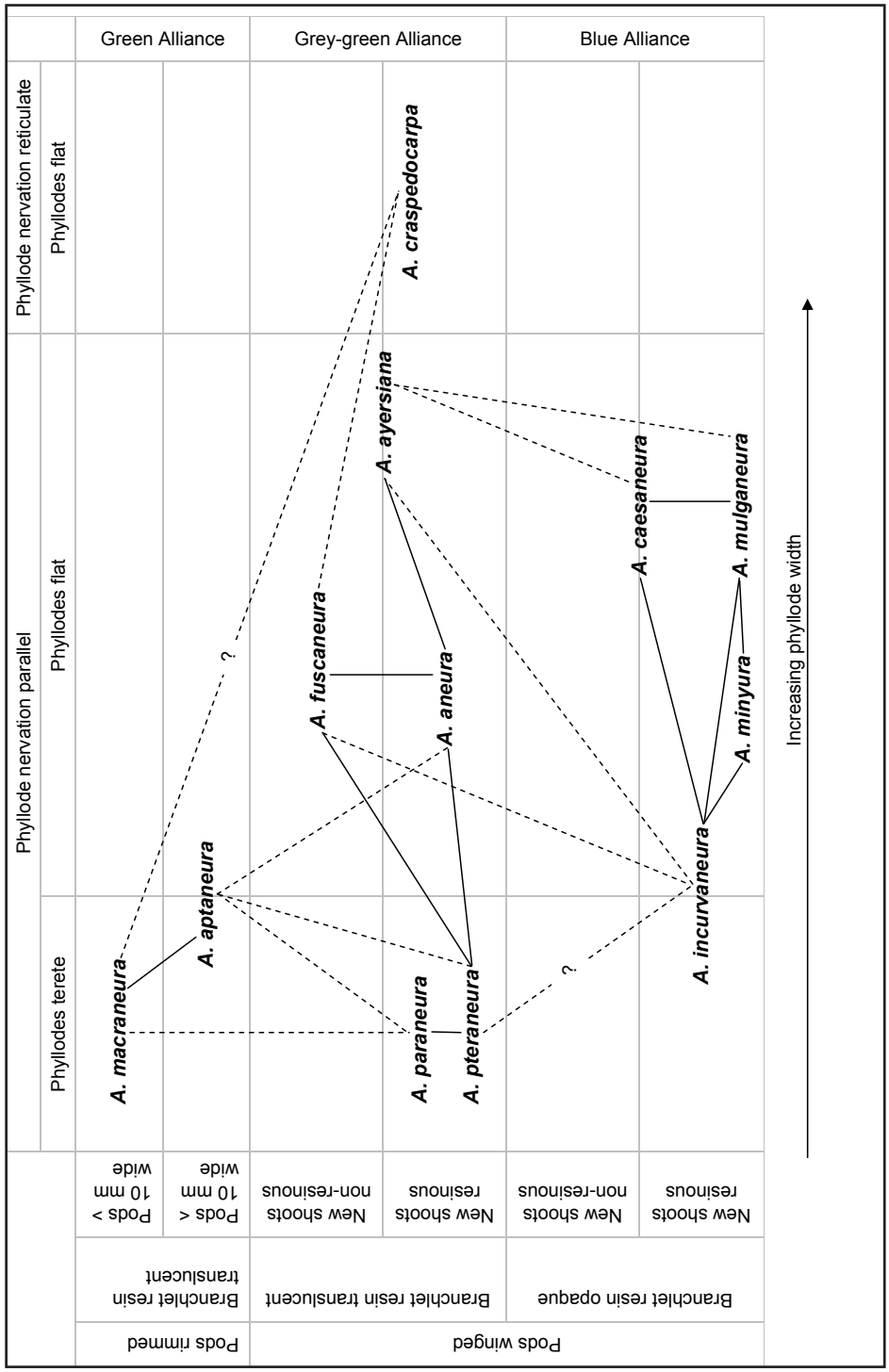
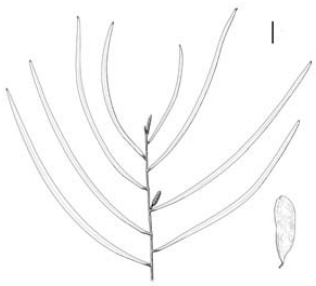
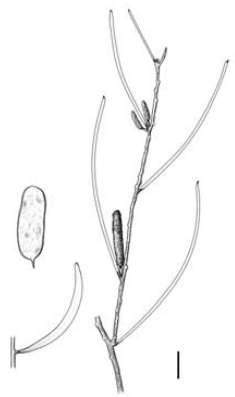
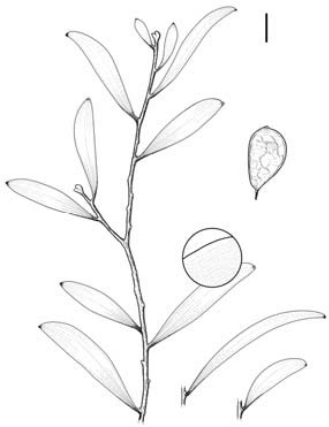
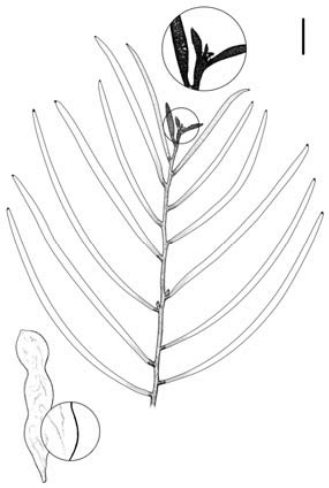
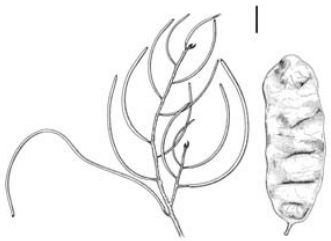


Figure 4. Presumed relationships of Mulga group species based on morphological characters. Solid lines represent close relationships; broken lines represent more distant relationships (the occurrence of presumed hybridity was commonly the prime determiner of these relationships).

Table 1. Overview of Western Australian Mulga species showing synoptic line drawings and salient features. Scale bar = 1 cm, or 1.5 cm where indicated by × 1.5 on drawing. Illustrations by Bradley Durrant.

Species name	Salient features
A. aneura 	• Bushy, ±rounded or obconic, multi-stemmed *shrubs* or *trees* 2.5–7 m tall but sometimes single- or few-stemmed and/or reaching 8–10 m. • *Branchlets* ribless or obscurely ribbed, the ribs not resinous or with a thin veneer of translucent resin. • *New shoots* resinous. • *Phyllodes* flat, narrow (normally 1.5–3 mm wide), normally shallowly incurved and grey-green to sub-glaucous often with a silvery sheen; discrete resinous marginal nerve absent or vestigial. • *Pods* winged, rarely bevel-edged, often shiny-resinous on margin. • *Seeds* 2.5–3(–3.5) mm wide.
A. aptaneura 	• Shrubs or *trees* 3–10(–12) m tall, sometimes with a conifer or (adolescent plants) pseudo-conifer growth form. • *Branchlets* ribless or obscurely ribbed, the ribs not resinous or with a thin veneer of translucent, yellow resin. • *New shoots* resinous. • *Phyllodes* terete to flat, normally linear, 0.8–1.5 mm wide and green to grey-green or sub-glaucous. • Gland 0–3 mm above the pulvinus, the phyllode normally not obviously kinked or swollen at the gland. • *Pods* often tinged orange, smooth, normally glabrous and ±nerveless, *margins* rimmed.
A. ayersiana 	• Large, rounded or obconic, multi-stemmed *shrubs* maturing to *trees* 7–12 m tall. *Branchlets* densely silvery-sericeous between often red-brown ribs at extremities; ribs sometimes with a thin veneer of translucent resin. • Youngest phyllodes on *new shoots* densely sericeous with normally pale yellow hairs (often striate in narrow phyllode variant); margins dark-coloured and resinous. • *Phyllodes* normally large (mostly 50–80 x 7–12 mm), narrowly elliptic to lanceolate and acute to acuminate, commonly silvery light grey-green; discrete marginal nerve resinous and red-brown or yellow resinous. • *Pods* short and broad (mostly 10–40 x 10–14 mm); *marginal wing* 1–2 mm wide.

A. caesaneura 	• Multi-stemmed *shrubs* maturing to shapely, obconic *trees* 3–8(–10) m tall with the crowns dense and silvery bluish grey, grey or grey green tinged blue. • Branchlets densely appressed-pubescent between rather obscure resinous ribs towards apices, the resin normally yellowish and opaque. • Youngest phyllodes on *new shoots* densely tomentulose with normally white hairs, sometimes striate-nerved, margins dark-coloured and resinous • *Phyllodes* commonly 30–70 x 2.5–10 mm, straight-dimidiate to falcately recurved; discrete resinous marginal nerve often not especially prominent. • *Pods* short and broad (mostly 15–35 x 10–15 mm; *marginal wing* 1–2(–2.5) mm wide.
A. craspedocarpa 	• Rounded or obconic, dense *shrubs* 1–4 m tall and about the same across, occasionally small *trees* to *c.* 5 m tall. • Branchlets often with translucent resin ribs at extremities. • *New shoots* dark-coloured. • *Phyllodes* relatively short and broad (mostly 15–30 x 7–13 mm with l: w = 1–3), nerves anastomosing to form a net-like reticulum. • *Pods* rather wide (15–30 mm), indehiscent, thick-coriaceous to sub-woody, yellowish to light brown, openly reticulate with nerves raised or plane; *marginal wing* broad (mostly 1.5–4 mm). • *Seeds* large (8.5–10.5 x 7–9 mm), ± orbicular and flat.
A. fuscaneura 	• Obconic, often shapely *trees* 3–8(–10) m tall, sometimes with a conifer or pseudo-conifer growth form. • Branchlets obscurely ribbed or ribless, the ribs normally not resinous. • *New shoots* not resinous, blackish to chocolate or red-brown, often with a finely granular appearance, glandular hairlets somewhat persistent as shoot expands. • *Phyllodes* rather long and narrow (mostly 50–100 x 1–3 mm), flat, sub-straight to shallowly curved, sigmoid or wavy. • *Pods* mostly 8–13 mm wide and ±constricted between seeds, commonly greyish brown tinged purple, minutely appressed hairy; *margins* bevel-edged or narrowly winged. • *Seeds* rather large (mostly 4–7 x 4–6 mm).

A. incurvaneura 	• Rounded or obconic, dense, multi-stemmed *shrubs* 2.5–5 m tall, maturing to single-or few stemmed *trees* to 6(–8) m tall, crowns ±dense and pale grey to grey-green or bluish grey often with a slight silvery sheen. • *Branchlets* resin-ribbed, the resin normally opaque, rather thick and persistent on mature branchlets as whitish beaded lines. • *New shoots* resinous. • *Phyllodes* terete to flat and narrowly linear, normally 40–80 x 1–2.5 mm, all or mostly shallowly incurved. • *Pods* oblong to fusiform, mostly 5–8 mm wide, brown but often tinged greyish, ±longitudinally reticulate, *marginal wing* 0.5–1 mm wide
A. macraneura 	• Spreading *shrubs* commonly 2–5 m tall and about the same across, sometimes obconic *trees* to 4–6(–7) m tall. • *Branchlets* obscurely ribbed at extremities, the ribs often with translucent resin. • *New shoots* resinous, becoming yellowish (often tinged brown) or light green as the shoot expands. • *Phyllodes* mostly terete and 40–70 mm long, shallowly to strongly curved or sigmoid to sinuous, green to grey-green. • *Gland* 0–3 mm above pulvinus, phyllode curved upwards and/or ±kinked at the gland. • *Pods* large (mostly 20–70 x 12–22 mm), normally yellow to light brown and glabrous; *margins rimmed* by a thick, resinous nerve. • *Seeds* large (mostly 7–9.5 x 5–7 mm).
A. minyura 	• Rounded or obconic, multi-stemmed *shrubs* or small *trees* 1–4(–5) m tall and about the same across; crowns compact and often grey or bluish grey. • *Branchlet* ribs with a thick, opaque overburden of resin that often persists as beaded, white lines on mature branchlets. • *New shoots* enveloped by a conspicuous layer of resin when young, the resin opaque and whitish grey tinged bluish or translucent and brown. • *Phyllodes* small (mostly 5–25 x 2–4 mm), flat, elliptic to oblong-elliptic or oblong-obovate, mucronate, straight-dimidiate to shallowly recurved or shallowly sigmoid. • *Pods* short and broad (mostly 15–35 x 8–15 mm); *marginal wing* 1–2 mm wide.

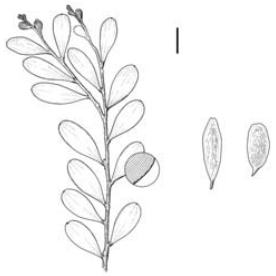
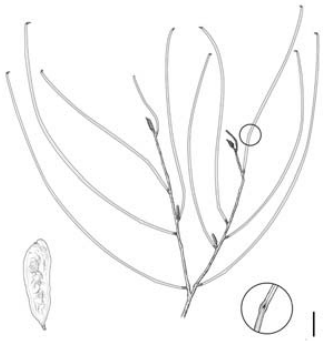
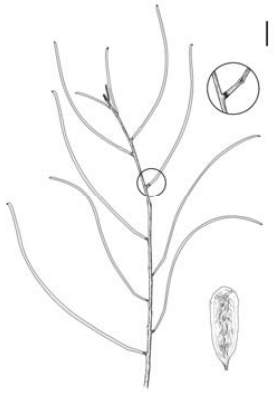
A. mulganeura 	• Rounded, multi-stemmed *shrubs* commonly 1.5–3 m tall and about the same or wider across, maturing to obconic, single- or few-stemmed *trees* 4–5(–7) m tall; crowns often compact and greyish green to bluish grey. • *Branchlet* ribs with a thick overburden of opaque, segmented, milky blue-grey or yellowish resin that often persists as beaded white lines on mature branchlets. • *New shoots* very resinous. • Phyllodes mostly 20–50 x 5–10 mm, elliptic to oblanceolate, often slightly twisted or shallowly undulate; marginal nerve resinous. • *Calyx* and *bracteoles* very reduced. • *Pods* mostly 15–35 x 6–10 mm, oblong or fusiform, dark greyish brown; *marginal wing* 1–1.5 mm wide.
A. paraneura 	• Graceful *trees* 4–10 m tall with open and often wispy crowns, the ultimate branchlets commonly (but not always) pendulous or sub-pendulous. • *Branchlets* white appressed-hairy between normally red-brown ribs at extremities, the ribs not resinous or with a veneer of shiny, translucent resin. • *New shoots* resinous. • *Phyllodes* normally terete, long and slender (mostly 80–200 x *c.* 1 mm), commonly pendulous, commonly variously curved, sigmoid or sinuous, dull green to light grey-green. • *Gland* mostly 4–25 mm above pulvinus, the phyllode often slightly but noticeably bent and/or slightly swollen at the gland. • *Pods* mostly 20–50 x 8–12 mm; *marginal wing* mostly 1–2 mm wide.
A. pteraneura 	• Multi-stemmed *shrubs* maturing to single- or few-stemmed *trees* to 6(–8) m tall, sometimes with a conifer or (adolescent plants) pseudo-conifer growth form; stems and major branches sub-straight to crooked; crowns normally ±dense and green. • *Bark* grey to blackish. • *Branchlet* ribs not resinous or with a ±thin layer of translucent resin. • *New shoots* resinous, the youngest phyllodes with a dense covering of dark-coloured glandular hairlets. • *Phyllodes* terete to sub-terete, 40–80(–100) mm long, normally variously curved to sinuous or sigmoid and green to greyish green. • *Gland* mostly 2–10 mm above pulvinus, the phyllode often swollen and kinked at the gland. • *Pods* mostly 15–40 x 8–15 mm, not or scarcely constricted between seeds; *marginal wings* normally 1–3 and often shallowly undulate.

Table 2. Distinguishing morphological characters of Western Australian Mulga species. [1]Branchlet resin determined from penultimate branchlets, where O = opaque (including where opaque resin co-occurs with small patches of translucent resin), T = translucent, A = absent. [2]New shoot resin determined from youngest phyllodes (excluding margins), where P = present, A = absent. [3]Phyllode transverse sectional shape (T.S.), where T = terete (including sub-terete), F = flat. [4]Predominant phyllode curvature, where St = straight, In = incurved, Re = recurved, S/W = sigmoid/wavy. [5,6]Measurements from mature phyllodes of adult plants. Brackets represent rare states.

Species (with Mulga Alliance names in **bold**)	Pods (margin type)	Branchlet resin[1]	New shoot resin[2]	Phyllodes				Figures
				T.S.[3]	Curvature[4]	Length (mm)[5]	Width (mm)[6]	
Green								
A. aptaneura	Rim, (Bevel)	T, A	P	T, F	St, In, (S/W)	(25–)40–100(–130)	(0.6–)0.8–1.5(–5)	15–18
A. macraneura	Rim	T, A	P	T	In, (Re), S/W	40–70(–90)	0.8–1.1	42–45
Grey-green								
A. aneura	Wing, (Bevel)	T, A	P	F	(St), In, (Re), (S/W)	40–120(–180)	(1–)1.5–3(–4)	11–14
A. ayersiana	Wing	T, A	A	F	St, (Re)	(30–)50–80(–100)	(4–)7–12(–18)	19–23
A. craspedocarpa	Wing	T, (A)	P	F	St	(10–)15–30(–40)	7–13(–18)	29–33
A. fuscaneura	Bevel, Wing	T, A	A	F	St, In, Re, S/W	50–100(–120)	1–3(–5)	34–37
A. paraneura	Wing	T, A	P	T, (F)	St, In, Re, S/W	(60–)80–200(–230)	0.8–1.2	55–58
A. pteraneura	Wing	T, A	P	T	In, Re, S/W	40–80(–100)	0.8–1.2	59–62
Blue								
A. caesaneura	Wing	O, A	A	F	St, Re	(20–)30–70(–80)	(2–)2.5–10(–12)	24–28
A. incurvaneura	Wing	O	P	T, F	In, (S/W)	(30–)40–80(–90)	(0.8–)1–2.5(–3)	38–41
A. minyura	Wing	O, (T)	P	F	St, Re, (S/W)	5–25(–30)	(1.5–)2–4(–5)	46–49
A. mulganeura	Wing	O	P	F	St	(10–)20–50	5–10(–13)	50–54

Population variation in Mulga

One of the perplexing characteristics of Mulga becomes obvious upon entering virtually any Mulga-dominated population, namely, the array of numerous morphotypes in the stand. It is not uncommon for some of these morphotypes to re-occur in adjacent or more distant populations, often in association with different morphotypes. This results in a very complex mosaic of morphotypes in mixed populations across arid landscapes. Single-morphotype Mulga populations seem to be rare. The factors responsible for creating and maintaining this variation are largely unknown, but most likely include genetic drivers such as polyploidy, neoteny, apomixis and hybridisation as discussed by Miller *et al.* (2002), as well as ecological drivers (Cody 1989).

An appreciation of the diversity within Mulga populations can be obtained from an examination of two populations, just 10 km apart, on the main road between Mt Magnet and Sandstone (Figures 5, 6).

The first population, located 67 km east of Mt Magnet, is dominated by members of the Blue Alliance. At first impression this population comprises a complex mix of similar-looking morphotypes with most plants possessing grey to bluish grey phyllodes and winged pods (Figure 5). Upon inspection, and using the morphological characters discussed here for distinguishing Mulga species, six entities could be identified: *A. caesaneura, A. caesaneura* (narrow-phyllode variant), *A.* ? *caesaneura* × *incurvaneura, A. incurvaneura, A. mulganeura* (variant 1) and *A. pteraneura*. Phyllode morphology (principally shape, dimension and curvature), new shoot resinosity and indumentum, and pod width enabled the three Blue Alliance species and putative hybrids to be identified. *Acacia pteraneura* (Grey-green Alliance) was infrequent in the population, readily recognised by a combination of its distinctive green phyllodes and dark-coloured new shoots (the Green Alliance species *A. aptaneura* is sometimes found in these sorts of stands in lieu of *A. pteraneura*). Such populations, dominated by hybridizing species of the Blue Alliance, are common in the area approximately bounded by Paynes Find, Meekatharra, Wiluna, Leonora and Menzies. As noted in Maslin *et al.* (2012) similar-looking stands in the Northern Territory, are dominated by members of the Grey-green Alliance.

The second population, located 77 km east of Mt Magnet, is dominated by a mixture of both Blue and Grey-green Alliance taxa (Figure 6). The general structure and appearance of this population differed from the one above dominated by the Blue Alliance taxa. In this population the predominant colour of the crowns was dull greyish green because *A. craspedocarpa*, *A. craspedocarpa* (hybrid) and *A. pteraneura* (Grey-green Alliance) were relatively more common in the stand than the Blue Alliance taxa (*A. caesaneura* and *A.* ? *caesaneur*a × *incurvaneura*). Plants do display a greater variation in height because of the frequent occurrence of the normally shrubby *A. craspedocarpa*. *Acacia craspedocarpa* appears to be very promiscuous, with putative hybrids involving this species commonly found in populations where it occurs. The putative hybrids are recognised by their phyllodes being less obviously reticulate than parental *A. craspedocarpa*. The second parent of these putative hybrids is often unknown (see Miller *et al*. 2002), but its Grey-green Alliance relatives, *A. pteraneura* and *A. fuscaneura*, are suspected in at least some cases.

These two examples serve to illustrate some of the interrelated factors that contribute to the structure and general appearance of Mulga communities, the most important of which appear to be:

- The number of different species present within populations.
- The different combinations of species within populations (see Figure 7).

- The Mulga alliance(s) to which the co-occurring species belong.
- The relative frequency of each species within the population.
- The amount of hybridity or intergradation between species.
- The age of the stand.
- The spacing between individual plants.
- Ecological factors (especially soil type, depth of hardpan and availability of water).

Although the definition, characterisation and dynamics of Mulga communities is beyond the scope of this paper, the taxonomic framework provided here is an essential foundation upon which these and other studies can be based.

Hybridity

Hybridisation has been investigated in a number of groups of Australian *Acacia* species (e.g. Leach & Whiffin 1978; Piccinin *et al.* 2004) but most detailed genetic studies have involved tropical species allied to *A. mangium* Willd. that have commercial significance (Kha 1996; McDonald *et al.* 2001; Midgley & Turnbull 2003). Hybridisation has been regarded by a number of authors as a factor contributing to the diversity within Mulga (e.g. Davies 1976; Cody 1989; Randell 1992; Pedley 2001; Miller *et al.* 2002). However, there is little direct genetic evidence demonstrating this hybridity, and in the few cases where it has been confirmed genetically the origin of the hybrids is equivocal (see Miller *et al.* 2002 for discussion). Notwithstanding the above, both morphological and field evidence suggest that hybrids or intergrades are relatively common in the Mulga group.

In the absence of detailed studies (especially genetic) the assumptions made here concerning putative hybridity and intergradation are based on an assessment of morphological characters, complemented by observations of plants in the field. Recognising the subjectivity involved in this approach, we have been conservative in our determination of specimens or plants as putative hybrids or intergrades. In the field, putative hybrid plants can often be recognised by their low frequency within populations and their possession of morphological characters that are seemingly intermediate between the presumed parents, with which they commonly co-occur. While some putative hybrids are particularly fecund (especially those involving the Mulga close relative, *A. ramulosa*), others appear sterile. Two useful characters for recognising putative hybrids include bevel-edged pods (see note under *Morphological characters*: *Pods* below) and few phyllode anastomoses (see discussion under *A. craspedocarpa*), but the most widely-used characters are those relating to other aspects of phyllode morphology. Putative hybrids or intergrades are often intermediate in their phyllode shape, size or curvature between the presumed parents, or possess various combinations of characters that suggest intermediacy (e.g. see discussion under *A. fuscaneura*).

Figure 5. Variation in Mulga population dominated by Blue Alliance taxa. A – phyllode and pod variation (with each group of phyllodes and pods collected from a single individual) from a population located 67 km E of Mt Magnet, a, b) *Acacia incurvaneura*, c) *A. mulganeura* (variant 1), d) *A. pteraneura* (pods slightly narrower than normal), e, f) *A.* ? *caesaneura* × *incurvaneura*, g, h) *A. caesaneura* (narrow-phyllode variant), i) *A. caesaneura* (typical variant); B – photograph of a similar population located 36.5 km E of Mt Magnet. Scale bar shown on figure; vouchers are listed in Appendix 1. Photographs by B.R. Maslin.

Figure 6. Variation in Mulga population dominated by Grey-green and Blue Alliance taxa. A – phyllode variation (with each group of phyllodes collected from a single individual) from a population located 77 km E of Mt Magnet, a) *Acacia craspedocarpa*, b, c, f–h) *A. craspedocarpa* (hybrid), d) *A. pteraneura*, e) *A.* ? *caesaneura* × *incurvaneura*, i, j) *A. caesaneura*, k) *A. caesaneura s. lat.*; B – photograph of a similar population located 44.5 km W of Laverton. Scale bar shown on figure; vouchers are listed in Appendix 1. Photographs by B.R. Maslin.

Mulga Alliance		Green		Grey-green								Blue						
	Species	apt	mac	ane	ayer	ayer NPV	cras	fus	fus-pter	par	pter	caes	caes	incur	min	mul	mul V1	mul V2
Green	apt																	
	mac	6																
Grey-green	ane	8	2															
	ayer	4	0	1														
	ayer NPV	3	0	1	1													
	cras	3	1	1	0	0												
	fus	10	2	1	1	0	3											
	fus-pter	3	0	2	0	0	0	4										
	par	5	1	2	2	1	1	1	0									
	pter	12	2	3	2	2	3	14	6	2								
Blue	caes	3	0	2	0	0	3	0	0	1	4							
	caes NPV	8	0	5	0	1	2	1	2	1	5	6						
	incur	11	0	4	7	2	2	1	2	2	12	7	12					
	min	1	0	1	0	1	0	0	0	0	2	0	1	1				
	mul	3	0	0	0	0	0	0	0	0	3	0	0	5	1			
	mul V1	4	0	0	0	0	1	0	0	0	2	4	7	4	0	0		
	mul V2	2	0	1	0	0	0	0	0	0	0	0	2	2	0	0	1	

Figure 7. Co-occurrence of Western Australian Mulga species and major informal variants. Numbers represent the frequency of co-occurrences based on collections made during the *Understanding Mulga* project from populations containing more than one taxon. Species abbreviations: apt = *A. aptaneura*, mac = *A. macraneura*, ane = *A. aneura*, ayer = *A. ayersiana*, ayer NPV = *A. ayersiana* (narrow-phyllode variant), cras = *A. craspedocarpa*, fus = *A. fuscaneura*, fus-pter = *A. fuscaneura-pteraneura* group, par = *A. paraneura*, pter = *A. pteraneura*, caes = *A. caesaneura*, caes NPV = *A. caesaneura* (narrow-phyllode variant), incur = *A. incurvaneura*, min = *A. minyura,* mul = *A. mulganeura*, mul V1 = *A. mulganeura* (variant 1), mul V2 = *A. mulganeura* (variant 2).

Using herbarium material to assess the frequency of hybridity is fraught with difficulty because populations are often only selectively sampled and little or no information is provided on labels concerning species composition of these populations. However, several simple analyses based on data collected during the *Understanding Mulga* field program (August 2006–November 2009) provide some insights into putative hybridity (or intergradation). Because these analyses are based on comparatively few populations, many of which were not comprehensively sampled to include all morphotypes, the following statistics provide only general indications of the frequency and occurrence of hybridity within Western Australian Mulga communities.

During this study 882 collections of Mulga from 293 populations were gathered of which 119 (13.5%) collections have been assessed as putative hybrids or intergrades. Of these, we identified both presumed parents for 54 collections (e.g. *A. aneura* × *ayersiana*) while for the remaining 65 collections only one presumed parent could be identified, e.g. *A. ayersiana* (hybrid). Also, of the 187 populations from which we gathered more than one collection, 62 (33%) contained one or more putative hybrids (or intergrades). Despite the limitations of the sampling methodology the above figures suggest that hybridity occurs at a relatively high frequency in Western Australian Mulga communities.

It should be noted that additional to the above there were 116 collections (13% of the 882 total) that could not be named with confidence and it is possible that some of these collections represent hybrids or intergrades. Also, it is possible that hybrids or intergrades exist within taxa determined as *A. mulganeura* variants 1 and 2 (23 collections), *A. pteraneura* (narrow-pod variant) (17 collections) and the *A. fuscaneura-pteraneura* group (21 collections).

The 54 collections presumed to be hybrids and for which both parents could be identified were used to investigate putative hybridity between the Mulga alliances and also between individual species (Figure 8). These data show the following trends:

- Green Alliance species putatively hybridise with half the species from the Grey-green Alliance but rarely with species from the Blue Alliance. No hybrids were detected between the two species that constitute the Green Alliance.

- Grey-green Alliance species putatively hybridise with Green Alliance species (see above) but infrequently with species of the Blue Alliance. Hybrids between species of the Grey-green Alliance are infrequent.

- Blue Alliance species infrequently hybridise with those of the Grey-green Alliance and rarely with species from the Green Alliance. Hybrids between species within the Blue Alliance are common.

- Some Green and Grey-green species putatively hybridise with the Mulga close relative, *A. ramulosa.*

As will be seen from Figure 8, in almost all cases of inter-specific hybridity we have detected at least some populations where both presumed parents co-occurred with the putative hybrids.

Mulga Alliance		Green		Grey-green						Blue				Mulga Outgroup
	Species	apt	mac	ane	ayer	cras	fusc	par	pter	caes	inc	min	mulg	ram
Green	apt													
	mac													
Grey-green	ane	6												
	ayer			1										
	cras		4											
	fusc													
	par	3	2											
	pter	5	2											
Blue	caes													
	inc	1			2		1			8				
	min													
	mulg				1						10			
Mulga Outgroup	ram	2				2	5							

Figure 8. Presumed hybridity involving Western Australian Mulga species. Numbers represent frequency of hybrid occurrences within populations based on 54 collections made during the *Understanding Mulga* project where both presumed parents could be recognised. Green shading indicates that both putative parents occur with the hybrid in at least one population; yellow shading indicates only one putative parent occurs with the hybrid; orange shading indicates no putative parents occurred with the hybrid. Species abbreviations: apt = *A. aptaneura*, mac = *A. macraneura*, ane = *A. aneura*, ayer = *A. ayersiana*, cras = *A. craspedocarpa*, fusc = *A. fuscaneura*, par = *A. paraneura*, pter = *A. pteraneura*, caes = *A. caesaneura*, inc = *A. incurvaneura*, min = *A. minyura*, mulg = *A. mulganeura*, ram = *A. ramulosa.*

Distribution and ecology

Distribution maps and ecological notes are provided under *Taxonomy* below for each of the 12 Western Australian species of Mulga.

Western Australian Mulga species occur principally between latitudes 22.5 and 30.5°S and from the west coast at Shark Bay eastwards to the South Australian and Northern Territory borders (Figure 1B), a distance of *c*. 1000 km north to south and 1500 km east to west. This distribution lies within the arid zone in areas not exceeding 250–300 mm annual rainfall, and often coincides with the distribution of red-brown hardpan soils (Beard 1974). Mulga does not extend to the agricultural regions of the South-west Botanical Province, while the Great Sandy Desert in the north-east forms the boundary of distribution there. In both the far west and south-east the distribution is constrained by the limestone-dominated Carnarvon Basin and Nullarbor Plain respectively. Outlier populations occur in the stony Tanami Desert (the identity of these plants is uncertain) to the north of the Great Sandy Desert, and in the Hampton Basin on the southern edge of the Nullarbor Plain. Mulga is either absent or infrequent in the sandy deserts of Western Australia, namely, the Great Sandy Desert, Little Sandy Desert and Great Victoria Desert. The Murchison IBRA bioregion probably contains the most extensive Mulga communities, but they are also common in the Gascoyne, southern Pilbara, Gibson Desert and Central Ranges bioregions.

As noted by Nix and Austin (1973) Mulga is adapted to environments where the soil water regime is almost always limiting for growth, but where there is some probability of recharge in all seasons. The arid zone where Mulga predominates has a conspicuously erratic, low rainfall (van Etten 2009).

Beard (1974) noted that Mulga communities are rarely found growing in deep unconsolidated sands but are commonly associated with red loamy soils that overlie a siliceous, calcareous or ferruginous hardpan; they also occur on stony gibber plains, rocky ranges and breakaways.

While extensive, dense stands of Mulga occur in many areas, plants are often not uniformly distributed across the landscape. This uneven distribution appears to be correlated with the availability of soil water and the depth of the hardpan (usually 0.3 m to 3 m below the surface, A. Mitchell, pers. comm.). The most dense stands occur in areas where the soil above the hardpan is deepest and/or along watercourses, floodplains and other water-gaining sites. Open plains between the dense stands (which often support sparser Mulga communities) provide run-off which supports the dense stands. If this run-off is disrupted, the dense stands collapse. The importance to Mulga of access to soil water was noted by Fox and van Leeuwen (1985) who suggested that this factor significantly influences the distribution patterns of Mulga and may explain why the largest individuals and densest woodland tend to occupy water-gaining sites low in the landscape. The distribution of Mulga in areas where populations abut Spinifex (*Triodia* spp.) hummock grasslands is constrained by the frequency and intensity of fire. Many Mulga communities are extremely vulnerable to fire with most plants succumbing to even the coolest of burns. In some areas (e.g. the Pilbara and central deserts) Mulga has been largely replaced by *Triodia* communities due to burning practices (Latz 2007).

Descriptions of many Western Australian communities in which Mulga occurs or is dominant are provided by Beard (1974, 1974a, 1975, 1975a, 1976). Cody (1989,1991) discusses population variation within some Western Australian Mulga communities in relation to ecological factors. Many aspects of Mulga ecology, biology, utilisation, and more, across its entire range in Australia, are provided by authors in Sattler (1986).

Phenology

Flowering and fruiting phenology based on herbarium records are shown for each species in the descriptions below. These data provide only a general view of phenology but they indicate that most Mulga species in Western Australia have a similar phenology although there is some species-dependent variation, especially with respect to flowering. Sporadic flowering occurs in most months of the year but the principal flushes appear to occur most often from autumn to early spring (March to September); pods with mature seed are mostly found in spring (September/October to November). Not all mature plants produce flowers or fruits during these months.

These observations on flowering phenology to some extent reflect collecting activity, but it is not at variance with field-based studies conducted by others. For example, Davies (1976) observed that *A. aneura s. lat.* plants on Mileura Station near Cue flowered mainly in autumn, but flowering also occurred in other months if heavy rains fell. Davies (1968, 1976) also noted that specific climatic requirements were needed in order for successful seed production to occur: heavy pod crops resulted only when plants received good quantities of rainfall in summer/autumn (to initiate flowering and commence fruit set) followed by good rainfall in winter (in order for the seed to mature). These results are similar to those of Preece (1971) who also showed that flowers produced from winter rainfall events did not set seed (i.e. seed resulted only from plants that flowered in late summer). Everist (1949) reported that in Queensland Mulga plants did not flower every year and that flowering was not strongly seasonal, occurring mostly between April and July. Everist also reported that seed on these Queensland plants was shed between November and January (slightly later than herbarium records would suggest for Western Australia).

It is therefore apparent that the timing and intensity of rainfall plays a crucial role in the flowering and fruiting of Mulga. However, rainfall in the arid zone where Mulga grows is erratic and patchy and it is impossible to predict with certainty when particular plants will be in flower or fruit. The amount of fruit produced by individual plants is also variable: we have observed that within one species in a single population some plants may have exceedingly large pod crops while adjacent plants may have few or no pods at all.

Uses

Mulga is not only a very important component of arid zone natural ecosystems but also provides many commodities for man. Mulga species are commonly used in minesite rehabilitation projects in the Pilbara. They are also important to the pastoral industry and form a significant part of the dry-range diet of sheep in arid Australia, although without supplementary high-quality feed Mulga is barely sufficient for subsistence. Further information on the fodder value of Mulga is given in Everist (1949, 1969), Chippendale and Jephcott (1963), Askew and Mitchell (1978), Cunningham *et al.* (1981), Goodchild and McMeniman (1987), Mitchell and Wilcox (1994) and Doran and Turnbull (1997). Aboriginal peoples of the central and western Pilbara use Mulga in various ways (e.g. Juluwarlu Aboriginal Corporation 2003). The hard, dense wood of mature plants is used to make *wanu* (women's fighting sticks), *mirru* (spearthrowers), *gurrardu* (walking sticks) and *jurna* (tapping sticks), while wood from young plants is used to make *marrandu* (spears). Edible Mulga Apple, a fruit-like structure (*jagarlurlu*) which is actually a wasp gall, is obtained from some Mulga plants. Latz (1995) provides an excellent account of the importance of Mulga to Aboriginal peoples of central Australia (see also Devitt 1986); McKellar (1986) provides notes on Aboriginal use of Mulga in south-west Queensland.

Morphological characters

The following morphological attributes characterise Mulga species and/or have proved most useful in defining taxa or groups of taxa within this highly polymorphic group.

Growth form

Many species of Mulga are relatively small, obconic trees (commonly 3–10 m tall) with grey bark, erect to obliquely ascending branches and a somewhat dense, green, grey, grey-green or bluish crown. However, these attributes are not exclusive to Mulga among the numerous arid zone wattles. Also, despite some species having a rather distinctive field facies, there is variation in growth form and this is not a particularly reliable means of identifying taxa. For example, *A. paraneura* is often very distinctive in its pendulous branchlets and phyllodes but there are non-pendulous morphotypes and these often co-occur with the typical morphotype. Similarly distinctive coniferous morphotypes characterised by their ±horizontally diverging lateral branches are sometimes found in *A. aptaneura*, *A. fuscaneura*, *A. pteraneura* and *A. aneura* (see note under *Classification and taxonomy* above). Two types of coniferous growth form are recognised; 'true' conifer in which all the branches are ±horizontal (Figure 2) and pseudo-conifer in which the lower branches are ±horizontal and the upper ones are obliquely ascending to erect (Figure 3). The overall shape of 'true' conifer plants is variable (Figure 2). Coniferous plants often co-occur with their non-conifer analogues. Species such as *A. minyura*, *A. craspedocarpa* and *A. mulganeura* are commonly low, dense, obconic or rounded shrubs 1–4 m tall while *A. macraneura* is normally a sprawling shrub 2–5 m tall and about the same across; however, in all these species there exist arborescent individuals. Photographs showing growth form variation for each species of Mulga are provided in the treatments under *Taxonomy* below.

Branchlets (especially resin) (Figure 9A)

Young branchlets in Mulga species are sometimes glabrous but more commonly are invested with short, straight, normally white, appressed hairs. These hairs are often difficult to see and are normally lost as the branchlet matures. Randell (1992) describes different types of trichomes found in Mulga, including the glandular hairlets which are discussed below under *New shoots*. The branchlets are ribless or more commonly finely ribbed with the ribs often (but not always) possessing a thin or thick overburden of resin. The nature of this resin is taxonomically informative and is a character that has been overlooked until now.

Two types of resin occur, opaque and translucent, and these resin differences help define the three main assemblages recognised within Mulga (see above) and to assist in species identification. Opaque resin occurs in species of the Blue Alliance (though it sometimes co-occurs with a little translucent resin) whereas translucent resin occurs in members of the Green and Grey-green Alliances (opaque resin is completely absent from these two groups).

No Mulga species completely lacks branchlet resin; however, resin is not present on every individual of many species. When present Mulga resin is best developed on the ribs of the uppermost branchlets, but it is sometimes difficult to accurately assess this character (i.e. to determine with certainty if it is opaque or translucent). On occasional specimens the resin is intermediate between the two types (see e.g. Figure 9Ae).

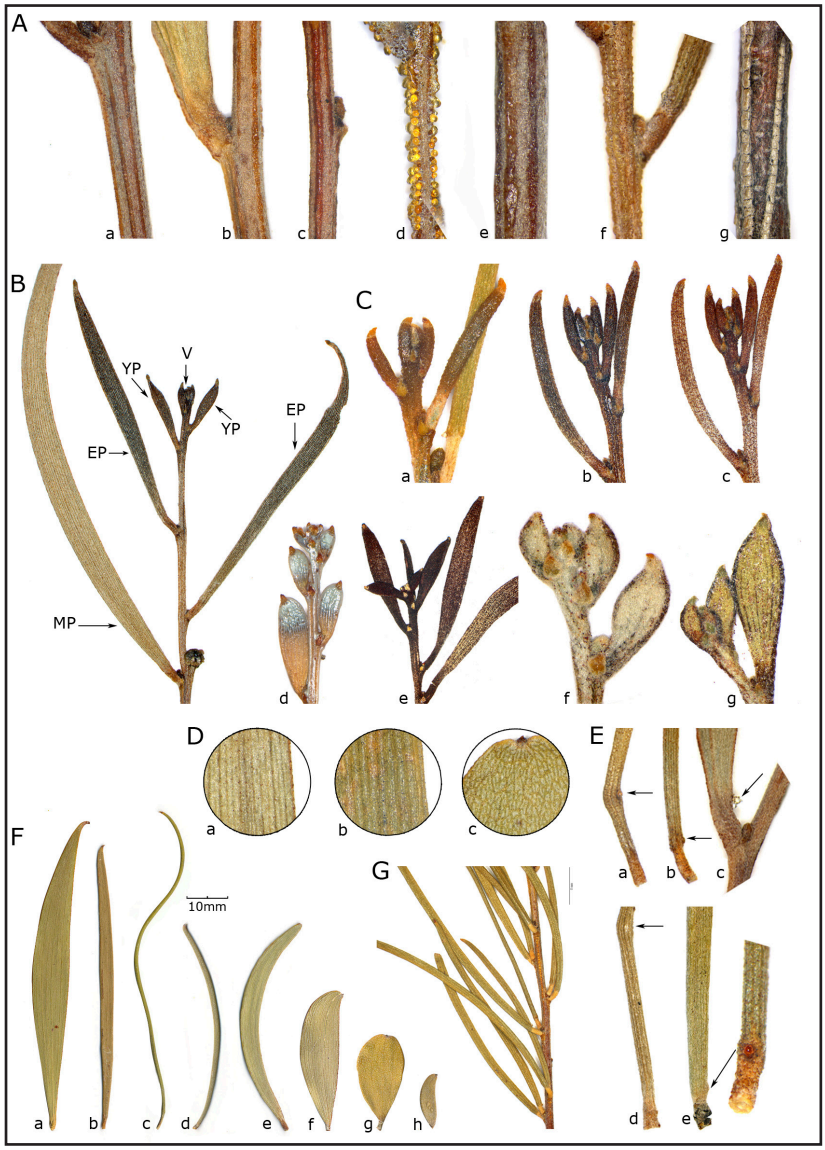


Figure 9. Some morphological features found in taxa of Mulga. A – branchlet resin variation, a–d) in Mulga Green and Grey-green Alliance taxa the translucent resin is often poorly developed (a), occurs as a thin overburden (b) or a thin veneer (c) over the branchlet ribs and is best developed on juvenile plants (d), e) the resin is sometimes intermediate between translucent and opaque, f–g) in Mulga Blue Alliance taxa the opaque resin is best developed on upper branchlets (f) and commonly persists on the mature branchlets (g); B – new shoot showing age-related growth stages, V = vegetative bud, YP = youngest phyllode, EP = expanding phyllode, MP = mature phyllode; C – new shoots showing variation, a–d) resinous shoots, resin can obscure underlying glandular hairlets (b) which become apparent when resin dissolves in alcohol (c), a conspicuous overburden of resin occurs in *A. minyura* (d), e–g) non-resinous new shoots show dense layer of glandular hairlets (e) or white (f) or sometimes yellow (g) orthodox hairs; D – phyllode nerves are normally parallel with (a) or without (b) a discrete marginal nerve, or occasionally anastomosing (c); E – phyllode glands (arrowed) are normally close to the pulvinus (b, c, e) or removed from the pulvinus and often kinked (a, d); F – phyllode variation, phyllodes are normally symmetric (a–e, g) but occasionally asymmetric (f, h); G – clustered phyllode development is common on some juvenile and adolescent plants. Scale bar shown on figure; vouchers are listed in Appendix 1.

In most species of the Blue Alliance the opaque resin develops as a thick overburden on the ribs, and is commonly segmented due to the development of transverse fractures and often pale yellowish in colour (the colour varies to milky blue-grey or light brownish). Although best-developed on new shoots and penultimate branchlets (Figure 9Af) the resin often persists on mature branchlets where it forms whitish, beaded lines visible to the unaided eye (Figure 9Ag). The resin is less well-developed in *A. caesaneura* than in other species of the Blue Alliance.

In species of the Green and Grey-green Alliances the translucent resin often occurs as a thin veneer over the branchlet ribs, and is often difficult to see (Figure 9Aa–c). In these species the resin normally does not persist on mature branchlets as it does in most species of the Blue Alliance. Furthermore, it is not uncommon in species of the Green and Grey-green Alliances to have non-resinous mature branchlets. Normally only juvenile plants have resin as a thick overburden (Figure 9Ad).

New shoots (Figure 9B, C)

New shoots in Mulga species are often resinous and have an indumentum comprising a mixture of dark-coloured glandular hairlets and white or rarely yellow orthodox hairs (that are often obscured by the resin or the glandular hairlets). For identification purposes these characters are best assessed by carefully inspecting the one to three *youngest phyllodes* that occur immediately below the *vegetative bud*; these phyllodes are followed by a variable number of *expanding phyllodes*, then *mature phyllodes*, as the shoot elongates (Figure 9B).

The degree of resinosity of new shoots varies among the species but is best developed in *A. minyura* (Figure 9Cd) where the youngest phyllodes are partially or wholly enveloped by a conspicuous overburden of opaque or sometimes translucent resin. By way of contrast the youngest phyllodes of a few species are not resinous (Figure 9Ce–g) making it easier to observe the shoot indumentum, e.g. *A. caesaneura* (white orthodox hairs, Figure 9Cf) and *A. fuscaneura* (often black glandular hairlets, Figure 9Ce).

The glandular hairlets are minute, stalked trichomes with ±globose heads consisting of four or more cells (see Figure 1e in Boughton 1989). They vary from sparse (e.g. *A. macraneura* and often *A. aptaneura*, Figure 9Ca) to dense (e.g. *A. paraneura*), range in colour from red through red-brown and dark brown to black and are often embedded in a resin matrix, making them difficult to see (compare 9Cb and c). The density of glandular hairlets decreases as the shoot elongates and they are normally absent from mature phyllodes. However, in some species the hairlets persist on the expanding phyllodes where they can impart a 'sooty' appearance to the shoot, best developed in *A. fuscaneura* (Figure 9Ce). While all species of Mulga possess glandular hairlets they are not exclusive to this group, being present in some related species such as *A. latior* and related taxa in the *A. coolgardiensis* group (Randell 1992; Maslin & Buscumb 2008).

Orthodox hairs on the youngest phyllodes of most species are obscured by the glandular hairlets and/or resin. However, the indumentum is obvious and completely covers the phyllode laminae in *A. ayersiana* (indumentum often yellow, Figure 9Cg) and *A. caesaneura* (indumentum white, Figure 9Cf). The expanding phyllodes are often striate by resinous longitudinal nerves with the indumentum confined to the inter-nerve spaces.

Phyllodes (Figure 9D, F, G)

Although phyllodes of Mulga species are very variable in shape, size and curvature they are particularly useful for discriminating taxa. A range of variation is shown for each species in the plates presented under *Taxonomy* below.

Mulga phyllodes vary in size from 5–230 mm long and 0.8–18 mm wide. There is no obvious discontinuity within this range but a large majority of species have phyllodes about 40–80 mm long and two-thirds of them have phyllodes less than 3(–5) mm wide. *Acacia minyura* has the smallest mature phyllodes (mostly 5–25 × 2–4 mm, Figure 9Fh) while *A. paraneura* has the longest (mostly 80–200 mm). Juvenile plants normally have smaller phyllodes than adults.

Phyllode shape is generally correlated with width, being linear when narrow and often narrowly elliptic when broad. Most straight phyllodes are symmetric with both margins convex or straight, but occasionally they are asymmetric. The term *dimidiate* is used to describe asymmetric phyllodes where the lower margin is ±straight and the upper margin is convex (Figure 9Ff, h). The juvenile phyllodes of *A. caesaneura* are dimidiate and these normally give way to falcately recurved adult phyllodes. Dimidiate adult phyllodes occur only in *A. minyura* and rarely *A. mulganeura*. In many species the phyllodes are straight to shallowly incurved, but in some they are falcately recurved (most notably *A. ayersiana* and *A. caesaneura*, Figure 9Fe) or, when terete, sometimes sigmoid or sinuous (e.g. *A. paraneura*, *A. macraneura*, Figure 9Fc). In *A. macraneura*, *A. paraneura* and *A. pteraneura* the phyllodes are normally always terete whereas in both *A. aptaneura* and *A. incurvaneura* they vary from terete to flat; the remaining species have flat phyllodes.

Except for *A. craspedocarpa* the phyllodes of Mulga species are characterised by having numerous, fine, parallel nerves (Figure 9Da, b) which are often only visible with magnification. This type of nervation is very common in *Acacia* species from arid and semi-arid areas. In *A. craspedocarpa* the phyllode nerves anastomose to form a distinctive, net-like reticulum (Figure 9Dc). The phyllode apices of Mulga species are never pungent-pointed.

Phyllode colour and indumentum are not especially taxonomically informative, although these characters do contribute to the overall 'look' of the crowns which can help distinguish taxa in the field.

Phyllodes normally occur singly at the nodes but in those species that sometimes develop a conifer or pseudo-conifer growth form a proportion of phyllodes are often grouped in clusters of 2–5, especially on juvenile and adolescent individuals (Figure 9G). In Mulga plants possessing clustered phyllodes, the clusters normally occur at a relatively low frequency and are interspersed with non-clustered phyllodes; only very occasionally are all phyllodes clustered on an individual plant.

The phyllode margins are resinous in some species, but this occurs only when the phyllode is flat; this character is best observed on the uppermost, young phyllodes. A discrete resinous margin is best developed in the Grey-green Alliance species *A. ayersiana* (and in hybrids involving this species), where the resin is often shiny and red-brown (Figure 9Da), but often becomes less pronounced, dull and yellowish as the phyllodes age. Discrete resinous margins also occur in all members of the Blue Alliance but in these species the resin is normally dull, commonly yellowish and not especially prominent. In the remaining species the margins are normally not resinous (Figure 9Db) although sometimes a very thin band of resin develops on some phyllodes.

Glands (Figure 9E)

Like most members of section *Juliflorae* the phyllode gland in Mulga species is not prominent and is located on the upper surface or margin of the phyllode, normally at or near the distal end of the pulvinus (Figure 9Eb, c, e). However, in a few species with terete phyllodes the gland is removed from the pulvinus and the phyllode is often noticeably swollen and/or kinked at the gland (Figure 9Ea, d). This occurs most commonly in *A. macraneura*, *A. paraneura* and *A. pteraneura* and can be helpful in distinguishing these species from their relatives.

Inflorescences and flowers

Inflorescences in Mulga species are normally simple (rarely some rudimentary racemes also develop) and occur singly or in pairs in the axils of phyllodes. The peduncles are very variable in length (mostly 3–15 mm long), even within the one species, and are therefore not helpful in discriminating taxa. The small, 5-merous flowers are arranged in golden to light golden spikes 10–30 mm long. The sepals are oblong to narrowly oblong or linear to linear-spathulate, free or shortly united at their base and commonly about half to two-thirds the length of the petals (except in *A. ayersiana* and *A. mulganeura* where they are noticeably shorter). The bracteoles are either morphologically similar or dissimilar to the sepals; this rather cryptic character warrants further investigation.

Pods (Figure 10)

Mulga pods are somewhat variable and are normally required in order to undertake reliable identification of taxa. The morphology and anatomy of Mulga pods are discussed in Rutishauser *et al.* (2010).

Typically, Mulga pods are flattened and straight, stipitate, commonly oblong and infrequently constricted between the seeds. They are normally thin-textured (mostly chartaceous to thinly coriaceous) but in *A. craspedocarpa* (Figure 10Cf) they are thick-coriaceous to sub-woody. These textural differences are reflected in the anatomical structure of the pericarp as discussed in Rutishauser *et al.* (2010). Mulga pods are mostly 10–60 mm long and 5–15 mm wide but there are two notable exceptions: *A. craspedocarpa* (pods 15–30 mm wide, Figure 10Cf) and *A. macraneura* (pods 12–22 mm wide, Figure 10Aa). Pod colour is commonly brown to red-brown or greyish brown; in *A. aptaneura* (Figure 10Ab) the pods are normally orange-brown, in *A. craspedocarpa* and *A. macraneura* they are commonly yellowish while in *A. fuscaneura* (Figure 10B) they are often tinged purplish (most evident when fresh). The pods are either glabrous or have an indumentum of minute, appressed, white hairs (sometimes obscured by a thin layer of resin) and sometimes accompanied (especially when young) by the same reddish glandular hairlets that occur on the new shoots. They are reticulate, with the anastomosing nerves normally relatively obscure to moderately prominent, but in *A. aptaneura* the pods are often nerveless while in *A. craspedocarpa* the reticulum is often very pronounced.

The most important carpological feature of Mulga, from both a taxonomic and identification perspective, is the nature of the pod margin. This helps define the three Mulga alliances recognised in this work; also, without knowledge of the margin type it is often very difficult, even impossible, to confirm the identity of specimens.

Three different types of pod margins are recognised here: winged, bevel-edged and rimmed. It is principally the position of the vascular trace (nerve) that extends around the pod relative to the external

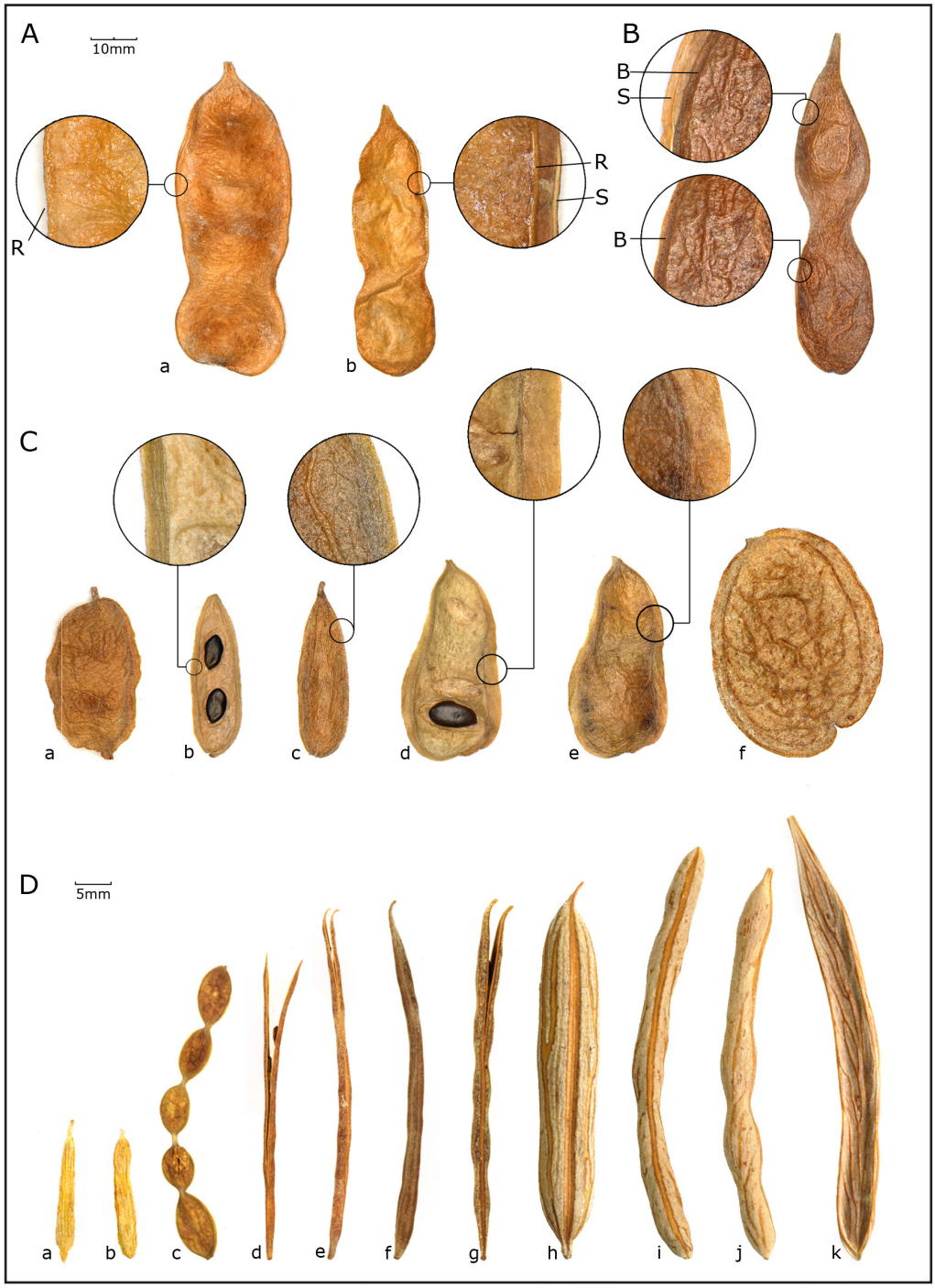


Figure 10. Pod variation in Mulga group (A–C) and Mulga out-group (D) species. A – rimmed pods with inserts showing the external marginal rim (R) and internal suture (S); B – bevel-edged pod with insert showing external bevel-edge (B) and internal suture (S); C – winged pods showing variation in wing width and inserts showing wing more evident on internal surface of valve (b, d) relative to external surface of valve (c, e); D – pods of Mulga outgroup species are less flattened and have a greater l: w ratio than Mulga pods. Scale bars shown on figure; vouchers are listed in Appendix 1.

edge of the pod that enables these margin types to be defined. In winged and bevel-edged pods the nerve is displaced internal to the edge, whereas in rimmed pods the trace ±coincides with the outer edge of the pod. Determining pod margin type can sometimes be difficult, especially when the pods are immature.

Winged (Figure 10C). The wing is a band of tissue that extends along the dorsal and ventral margins of the pod between its outer edge and the intra-marginal nerve. The wing is normally (0.5–)1–2(–3) mm wide but in *A. craspedocarpa* it can reach 4–5 mm; it is often not especially evident on the outer surface of the valve (best observed by opening the pod and inspecting the inner surface of the valve). The majority of Mulga species have winged pods. Although Randell (1992) considered that 'wing' was an incorrect term she, like Pedley (2001), Miller *et al.* (2002), Rutishauser *et al.* (2010) and ourselves use it as a convenient descriptor.

Rimmed (Figure 10A). The term 'rim' was used by Pedley (2001) to describe pods which lack a wing because the vascular trace (nerve) that occurs along the dorsal and ventral sides of the pod is located along the edge of the valve. On mature pods the nerve comprising the rim is normally obscure and is commonly overtopped by resin and the edge of the pod is ±rounded. On immature pods the rim is normally rather pronounced and occurs as a thickened, resinous band of tissue along the outer edge.

Bevel-edged (Figure 10B). This hitherto unrecognised margin type is uncommon in Mulga and is interpreted by Rutishauser *et al.* (2010) as an extremely narrow wing. A bevel-edge develops when the intra-marginal nerve is only slightly removed from the edge of the pod (to *c*. 0.5 mm) and the margin is ±abruptly and obliquely deflexed at the nerve to form a flat or shallowly concave face. This is a very subtle character and can sometimes be difficult to distinguish from a rim. In some specimens both margins of the pods are bevel-edged whereas in others only one margin is bevel-edged with the other being either rimmed or winged. Bevel-edged pods commonly occur (together with winged pods) in *A. fuscaneura* and in some Western Australian specimens here referred to *A. aneura*. Bevel-edged variants are also noted under *A. aptaneura* but are not included within the circumscription of the species. Most pods on the type of *A. aneura* are bevel-edged. As discussed by Maslin *et al.* (2012) the taxonomic significance of this character is yet to be properly assessed; however, in some cases at least it is suspected that bevel-edging may be an indicator of hybridity.

Seeds

Seeds in most Mulga species are oblique to transverse within the pods; often both orientations occur within a single species. The seeds are not seated within discrete chambers as occurs in the Mulga relatives allied to *A. ramulosa*. The seeds are normally ellipsoid to obloid or ovoid, compressed to some degree, and dark brown and shiny; there is a small 'u'-shaped pleurogram on each face of the seed and the white basal aril is not especially well-developed. In most species the seeds are 3.5–6 mm long and 2–4 mm wide; however, there are two species with noticeably larger seeds, namely, *A. craspedocarpa* (8.5–10.5 × 7–9 mm) and *A. macraneura* (7–9.5 × 5–8 mm). Hybrids involving these two species sometimes also have similarly large seeds. *Acacia fuscaneura* has slightly larger than normal seeds, mostly 4–7 × 4–6 mm. Apart from these size variations there is very little significant variation in Mulga seeds.

Taxonomy

The Mulga group. There is no single morphological attribute that uniquely defines this group; however, the following characters often characterise the species (variation within these characters is discussed under individual species treatments below). *Plants* are often relatively small trees (commonly about 3–10 m tall) with green to grey-green, grey or bluish grey crowns. *Bark* grey. *Branchlets* often resin-ribbed (the resin opaque or translucent), with short, straight, normally white, appressed hairs between the ribs (at least on young branchlets). *New shoots* invested with red-brown to blackish glandular hairlets. *Phyllodes* not especially rigid, not spiny tipped, flat to terete (never quadrangular), striate by numerous, fine, closely-spaced, longitudinal nerves (except reticulately nerved in *A. craspedocarpa*) which often possess a very thin overburden of resin and have minute, appressed hairs between them (hairs normally difficult to see and are often absent from oldest phyllodes). *Inflorescences* simple or occasionally rudimentary racemes; flowers arranged in cylindrical spikes or very rarely in obloid (never globular) heads; *sepals* free or very shortly united at their base. *Pods* flat, normally thin-textured (often ±chartaceous, never woody) and reticulately nerved, winged (but wing often extremely reduced in *A. fuscaneura*) or rimmed (in *A. aptaneura* and *A. macraneura*). *Seed* aril small and whitish.

Acacia aneura F.Muell. ex Benth., *Linnaea* 26: 627 (1855). *Racosperma aneurum* (F.Muell. ex Benth.) Pedley, *Austrobaileya* 2: 344 (1987). *Type citation.* 'Ad Cudnaka in Australia meridionali. (F. Müll.)'. *Type*: In solo ….. prope Cudnaka, N. Holl. Austr. [Kanyaka, Flinders Range, South Australia], October 51, *F. Mueller s.n.* (*holo*: MEL 724218, specimen seen by Bentham; *iso*: PERTH 08247064 - fragment ex MEL, PERTH 00600350 - fragment of unknown origin but most probably ex MEL; ?*iso*: MEL 724215 - ex herb. Sonder, MEL 724219 - sterile specimens on sheet). See accompanying paper by Maslin *et al*. (2012) for discussion of type.

?*Acacia aneura* var. *intermedia* Pedley*, Fl. Australia* 11B: 489 (2001). *Type citation*: 'Hiraji Bore, Napperby [Laramba], 100 miles [160 km] NW of Alice Springs, N.T., 27 Jan. 1950, *S.L. Everist* 4226; holo: BRI.' *Type*: see note below under *Typification* for discussion of type.

Bushy, rounded to sub-rounded or obconic, multi-stemmed *shrubs* or *trees* 2.5–7 m tall but sometimes single- or few-stemmed and/or reaching 8–10 m, rarely having a conifer or pseudo-conifer growth form, with 1–3 or more straight or somewhat crooked main stems from ground level, the branches obliquely ascending to erect (except all or some horizontal on conifer and pseudo-conifer plants); crowns green (tinged greyish) to grey-green. *Bark* grey. *Branchlets* sparsely to densely sericeous at extremities but glabrous or indumentum obscure on mature branchlets, often mealy, obscurely ribbed or ribless, the ribs not resinous or sometimes (at branchlet extremities) covered with a thin veneer of translucent resin (resin rarely moderately thick). *New shoots* resinous; *youngest phyllodes* covered by a dense layer of dark-coloured glandular hairlets embedded in a resin matrix which obscures the underlying nerves and appressed white hairs; soon passing to the striate expanding phyllodes. *Phyllodes* 40–120(–180) mm long, (1–)1.5–3(–4) mm wide, narrowly linear to linear-elliptic, 20–30 mm long and narrowly oblong-elliptic on juvenile plants, flat, mostly shallowly incurved, infrequently straight or moderately incurved, occasionally shallowly to moderately recurved, shallowly sigmoid or shallowly wavy, normally ascending to erect, not rigid, normally very slightly resinous, glabrous or very obscurely appressed-hairy especially between nerves, single or rarely clustered in groups of 2 or 3 at each node, normally grey-green to sub-glaucous and often with a silvery sheen, sometimes some dull green; parallel *longitudinal nerves* very fine (often indistinct), close together and of uniform prominence; *margins* not resinous or occasionally slightly resinous; *apices* acute to sub-acute, innocuous. *Gland* situated on adaxial margin of phyllode 0–1(–3) mm above pulvinus, indistinct. *Inflorescences* mostly

simple; *peduncles* 4–10(–15) mm long, with sparse to ±dense, minute, white, appressed hairs, rarely glabrous, commonly also with some red-brown glandular hairlets; *spikes* (10–)15–30(–40) mm long when dry, golden to light golden. *Bracteoles* peltate to sub-peltate, *c.* 1 mm long, the claws narrowly linear and glabrous, the laminae ±thickened, brown and widely ovate, normally morphologically similar to sepals except the laminae larger and thicker. *Flowers* 5-merous; *sepals* free, ½–¾ length of petals, normally linear-spathulate with narrowly linear to narrowly oblong claws and small, non-thickened laminae; *petals* 1.3–1.5(–2) mm long. *Pods* (10–)15–40 mm long, (6–)7–15 mm wide including the wing, oblong to narrowly oblong or occasionally elliptic, mostly straight-edged but some ±shallowly constricted between the seeds, not or scarcely raised over seeds, chartaceous to firmly chartaceous, brown to grey-brown or sometimes yellow-brown, glabrous to sparsely appressed white-hairy and sometimes with scattered red-brown glandular hairlets, dull except often shiny-resinous on margins and sometimes nerves on face of valves, obscurely reticulate with nerve orientation varying from transverse to longitudinal, stipitate; *marginal wing* 0.4–1(–2) mm wide and often not obvious on outer surface of valve, rarely bevel-edged. *Seeds* transverse to oblique in the pods, 3.5–5 mm long, 2.5–3(–3.5) mm wide, ellipsoid to obloid or ovoid, dark brown, shiny; *funicle* and the small *aril* whitish or cream when dry. (Figures 11–13)

Characteristic features. Bushy, multi-stemmed *shrubs* or *trees* 2.5–7 m tall but sometimes single- or few-stemmed and/or reaching 8–10 m, rarely with a conifer or pseudo-conifer growth form. *Branchlets* obscurely ribbed or ribless, the ribs not resinous or sometimes with a thin (rarely thick) covering of translucent resin. *New shoots* resinous, the *youngest phyllodes* covered by a dense layer of dark-coloured glandular hairlets that obscure the underlying nerves. *Phyllodes* linear to linear-elliptic, 45–120(–180) × 1–4 mm, flat, mostly shallowly incurved, normally grey-green to sub-glaucous and often with a silvery sheen, discrete marginal nerve absent or almost so. *Gland* 0–1(–3) mm above pulvinus, indistinct. *Sepals* ½–¾ length of petals. *Pods* mostly straight-edged, normally brown to grey-brown; *margins* winged or rarely bevel-edged, the wing 0.4–1(–2) mm wide and often shiny-resinous. *Seeds* 3.5–5 × 2.5–3(–3.5) mm.

Selected specimens seen. WESTERN AUSTRALIA: 6 km SE of Earaheedy Station homestead, 200 km NE of Wiluna, 15 Apr. 2002*, D.J. Edinger, B. & B. Backhouse* & *G. Marsh* DJE 2965 (PERTH); 6 miles [9.6 km] E of Leonora, 18 Aug. 1962, *A.S. George* 3740 (PERTH); 85 km SW Kintore, East Gibson Desert, 1 May 2005, *P.K. Latz* 20885 (NT, PERTH: phyllodes unusually narrow); 80 km SSW of Kintore, Mu Hills, 2 May 2005, *P.K. Latz* 20893 (NT, PERTH); 5 miles [8 km] E of Lawlers, 4 Sep. 1954, *A.R. Main s.n.* (PERTH 00490970); 'Four Mile Hill', which is ca 4 miles [6.4 km] NE of Kanowa (NE of Kalgoorlie), 7 Aug. 1971, *B.R. Maslin* 1875 (PERTH); 88 km NW of Newman on the road to Juna Downs, 9 July 1980, *B.R. Maslin* 4620 (PERTH); Gibson Desert, 24 km N of Warburton-Laverton Road on 'Heather Highway' (which intersects 'Gunbarrel Highway' just SE of Lake Breaden), 9 Sep. 1984, *B.R. Maslin* 5667 (PERTH); Hamersley Range, Juna Downs Station, Flat Rocks, along Hamersley Iron access road to Yandi ore deposit, 14 July 2000, *B.R. Maslin* 8064 (CANB, PERTH); 17 km along Eudamullah Station access road from Gascoyne Junction–Cobra Station Road, 6 Oct. 2007, *B.R. Maslin, J. Miller & J.E. Reid* BRM 9176 (PERTH); BHP Yandi Iron Ore access road, 21.5 km E of Great Northern Highway, between Newman and Munjina roadhouse, 13 Oct. 2007, *B.R. Maslin, J. Miller & J.E. Reid* BRM 9228 (PERTH: coniferous growth form); 22.5 km E of Leonora on road to Laverton, 28 Oct. 2007, *B.R. Maslin, J. Miller & J.E. Reid* BRM 9352 (PERTH: pods both bevel-edged & winged); 25 km E of Great Northern Highway at Meekatharra on Goldfields Highway to Wiluna, 28 Apr. 2009, *B.R. Maslin & J.E. Reid* BRM 10009 (PERTH); 16 km W of Menzies on the road to Lake Ballard, 30 Apr. 2009, *B.R. Maslin & J.E. Reid* BRM 10023 (PERTH: coniferous growth form); 63.4 km NE of Cosmo Newbery along the Warburton Road, 21 July 1993, *M. McDonald* 1795 (PERTH: elongate recurved phyllodes); head of Savory Creek, Savory

Figure 11. *Acacia aneura*. A – plant showing typical obconic, multi-stemmed habit; B – resinous new shoot; C – branchlet with immature pods; D – inflorescence spikes; E – mature stand; F – pods showing obscure marginal wings. Photographs by B.R. Maslin.

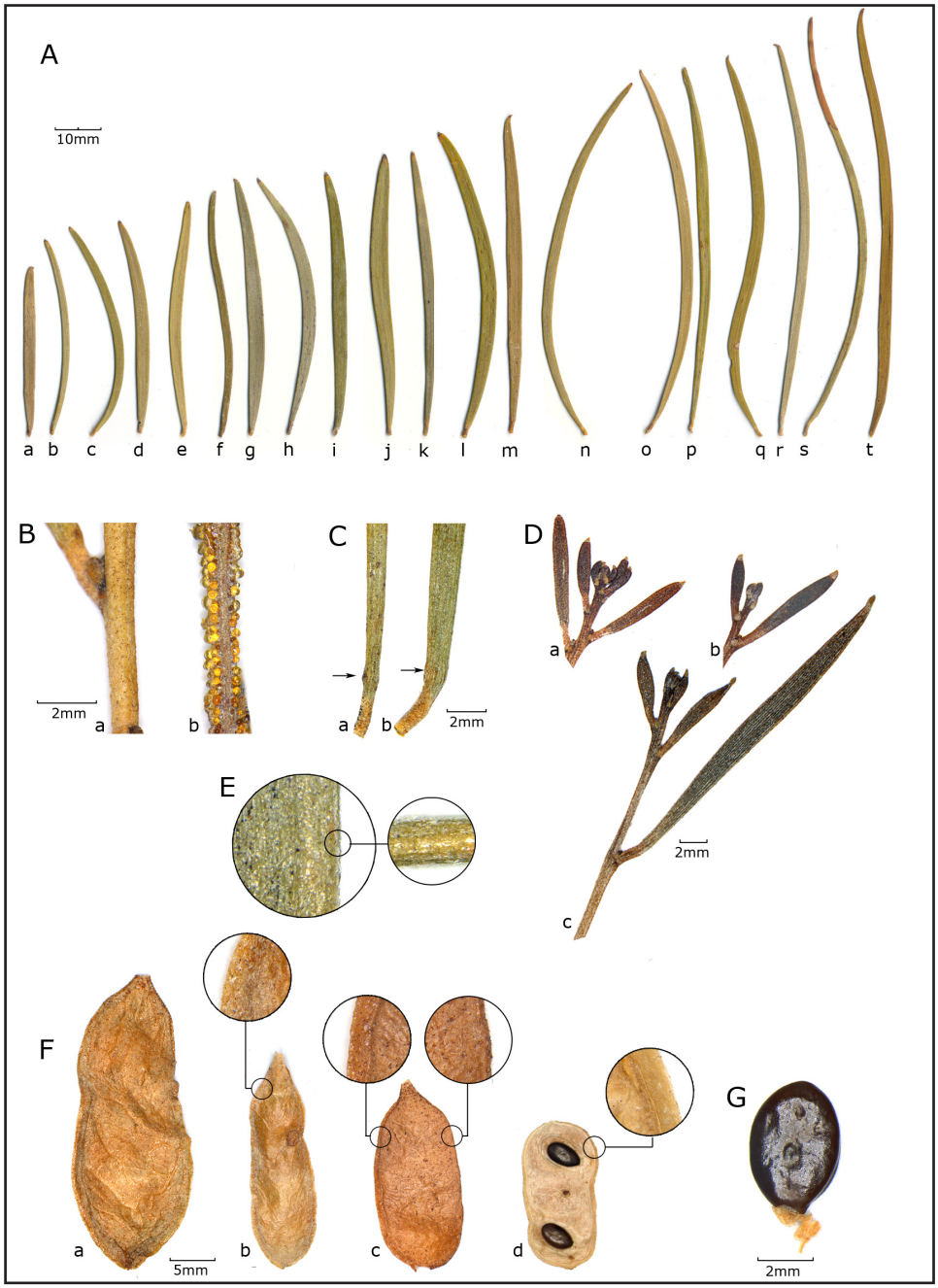


Figure 12. *Acacia aneura*. A – phyllode variation from a range of specimens; B – branchlets, a) penultimate branchlet ribless, b) penultimate branchlet of juvenile plant with overburden of translucent resin on ribs; C – phyllode glands (arrowed), a) not swollen, b) slightly swollen; D – new shoots, a-c) dark-coloured and resinous, vegetative buds and first phyllodes covered with glandular hairlets and translucent resin, expanding phyllodes becoming striate; E – phyllode margin not obviously resinous (with close-up showing end view of margin); F – pods, a) exterior, b) exterior with close-up showing ±marginal wing, c) exterior with close-up showing marginal wing (left) and bevel-edge (right), d) interior with seeds and close-up showing marginal wing; G – seed with small aril. Scale bars shown on figure; vouchers are listed in Appendix 1.

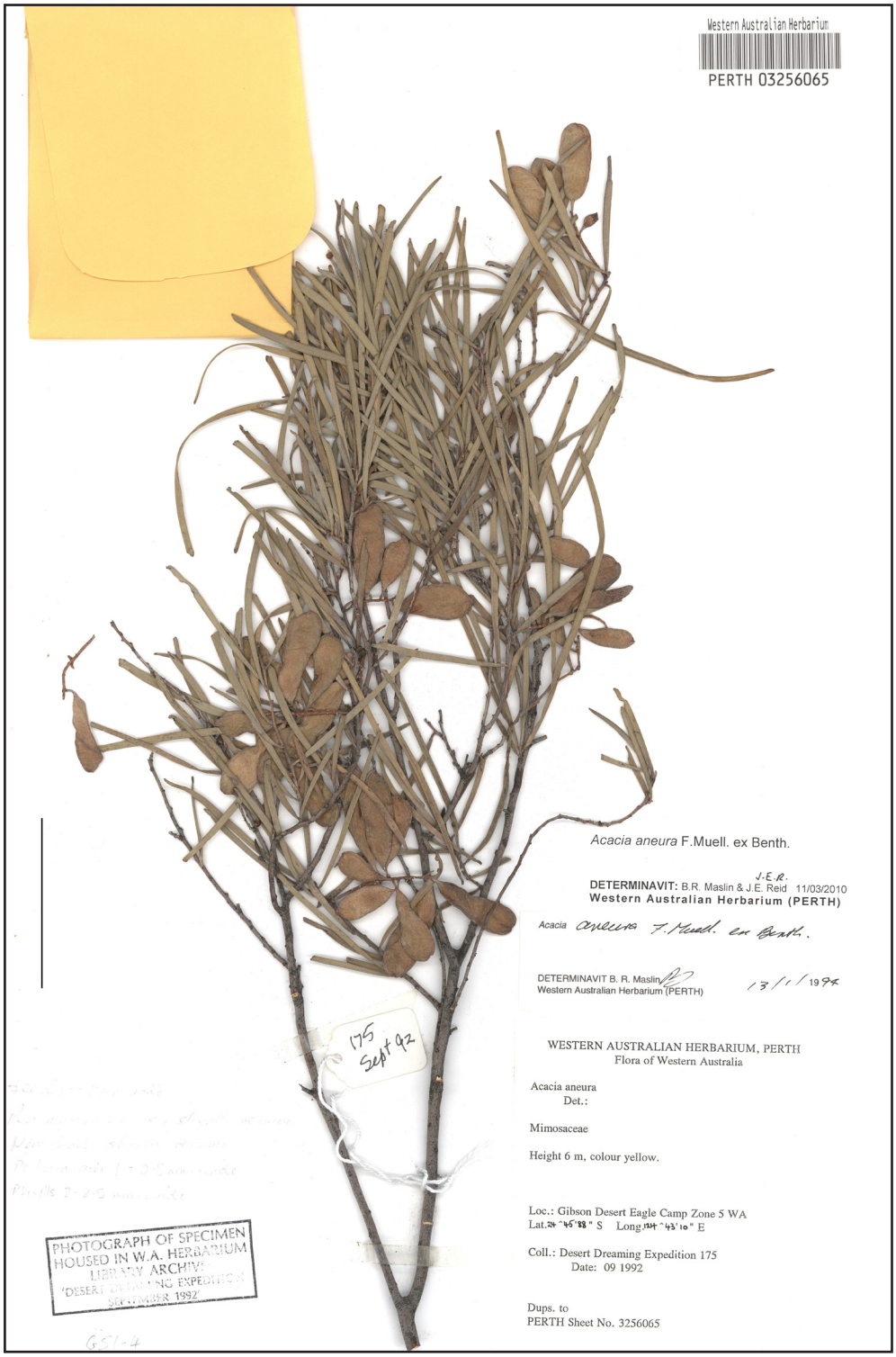


Figure 13. Specimen sheet of *Acacia aneura* (PERTH 03256065), scale = 5 cm

Bore, 10 km E of Mundiwindi Station, Keartland district, 3 June 1984, *G.J. Morse* 6 (PERTH: phyllodes somewhat short); 9 km N of Everard Junction, Gibson Desert Nature Reserve, 26 Apr. 1994, *D.J. Pearson* 4010 (PERTH: phyllodes unusually long); Brockman 4 Marrra Manta (sic.), SW of B4 camp, 13 Nov. 2006, *E. Thoma* 1214 (PERTH: pods both bevel-edged & winged); site number: 1239, 24 km WSW of The Governor, Hamersley Ranges, Fortescue Botanical District, 26 Sep. 1997, *M.E. Trudgen* 19001 (PERTH: phyllodes atypically narrow); site number: 1209, 4.25 km NNW of The Governor, Hamersley Ranges, Fortescue Botanical District, 23 Sep. 1997, *M.E. Trudgen* 19123 (PERTH); Mount Windell Road corridor, survey site MW9, 10.25 km ENE of Mount Windell, 19.8 km ESE of Karijini National Park headquarters, 28 July 1991, *S. van Leeuwen* 838 (PERTH). SOUTH AUSTRALIA: Wirrealpa H.S. [Homestead], 31 Oct. 1943, *H.M. Cooper s.n.* (AD 97941324: this specimen agrees with Mueller's type of this species but phyllodes slightly longer); Moolooloo Station [*c.* 30 km NNW of Blinman], 4 Oct. 1918, *E.H. Ising s.n.* (AD 97301065: this specimen agrees with Mueller's type of this species); Yappala Range, 8 km NW of Hawker, 31 Aug. 2001, *D.E. Murfet* 4397 (AD, UTEP: this specimen agrees with Mueller's type of this species). NORTHERN TERRITORY, NEW SOUTH WALES and QUEENSLAND: because of taxonomic complexities in this species no specimens have been determined for these States.

Distribution. *Acacia aneura* has a widespread but somewhat uneven distribution in Western Australia; it also occurs in the Northern Territory, South Australia, Queensland and New South Wales (Pedley 2001, as *A. aneura* var. *aneura* and var. *intermedia*). In Western Australia the species extends from near Gascoyne Junction south to Mt Magnet and Kalgoorlie, then east to the border with the Northern Territory and South Australia. It is most common in the Murchison, southern Pilbara, Gibson Desert and Central Ranges IBRA bioregions, but extends to the northern periphery of the Coolgardie and Nullarbor bioregions. It is seemingly uncommon in the Little Sandy Desert, Great Victoria Desert and southern extremity of the Great Sandy Desert bioregions, but to some extent the paucity of collections from these areas may simply reflect the relative dearth of collecting activity (Figure 14).

Habitat. *Acacia aneura* is recorded from a wide range of habitats. It grows in red to red-brown, sometimes gravelly sand, sandy loam or loam, or in clay. It occurs on plains or flats, in gently undulating country or on low rocky hills. It has also been recorded from dune swales (especially in the Gibson Desert), gibber plains and (especially in the Pilbara) skeletal soils on slopes and tops of low rocky hills and breakaways. It is commonly found in mixed Mulga communities with the ground cover associates including Spinifex (*Triodia* spp.) and Chenopods.

Flowering and fruiting period. Herbarium material shows flowering as occurring between March and August and mature seed from late September to mid-November; many sterile plants have also been collected during these periods.

Typification. A detailed discussion of the type of *A. aneura* is provided in the accompanying paper by Maslin *et al.* (2012). As will be seen from this article there is ambiguity concerning the application of this name (see below under *Taxonomy* for further discussion).

Pedley (2001) cited the type of *A. aneura* var. *intermedia* as a BRI specimen collected by *S.L. Everist* (no. 4226) from Hiraji Bore on Napperby Station, in the Northern Territory. Only one specimen with these collection details has thus far been located at BRI, it is sheet no. 000636 and is annotated holotype, but there is no indication that Pedley actually saw this sheet. The specimen is in flower and has terete phyllodes about 1 mm in diameter, and appears to be *A. aneura* var. *tenuis* Pedley (which we treat below as conspecific with *A. aptaneura*). It certainly does not agree with Pedley's description of var. *intermedia* which was described as having flat phyllodes at least 2.5 mm wide, and therefore

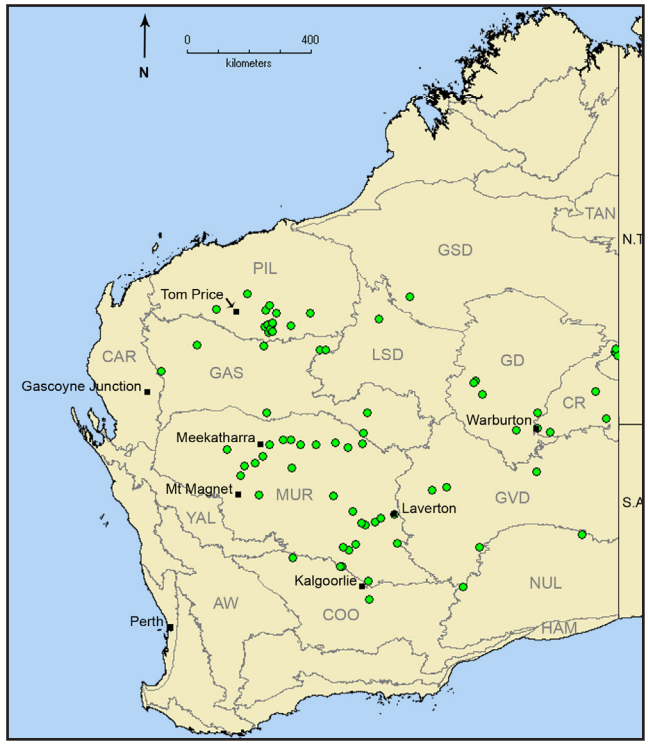


Figure 14. Distribution of *Acacia aneura* (●) based on specimens examined at the Western Australian Herbarium (PERTH). Boundaries and name abbreviations for IBRA bioregions (Department of Environment, Water, Heritage and the Arts 2008) are shown in grey.

cannot be the type of this name. We visited Napperby Station in September 2008 and although the (drought-affected) plants were sterile we collected what was believed at the time to be both var. *tenuis* (e.g. *B.R. Maslin & J.E. Reid* BRM 9497) and var. *intermedia* (e.g. *B.R. Maslin & J.E. Reid* BRM 9498) from the immediate vicinity of Hiraji Bore. It is possible that the specimen that was the intended type of *A. aneura* var. *intermedia* will be located in due course, but if not then this name will need to be treated as synonymous with *A. aptaneura* and a new name will need to be provided for the entity described as var. *intermedia* if it is recognised as being discrete.

Taxonomy. *Acacia aneura* is a member of the Grey-green Alliance. Pedley (2001) recognised ten varieties within *A. aneura* but as discussed in the introduction to this paper we have treated most of these as distinct species.

Acacia aneura as presently defined is a variable species in need of further study. However, in order not to pre-empt or compromise future work the species is here deliberately broadly circumscribed to include the entities described by Pedley (2001) as both *A. aneura* var. *aneura* and *A. aneura* var. *intermedia*. This means that as defined here *A. aneura* includes specimens with winged pods (these correspond to var. *intermedia*) and/or bevel-edged pods (these are less common and mostly correspond to var. *aneura*). The main constraints in attempting to elucidate the taxonomic complexities within *A. aneura* here are that much of the relevant variation occurs in areas to the east of Western Australia (thus, beyond the scope of this study), and also because there are ambiguities concerning the type of the species. These matters are discussed in Maslin *et al.* (2012) and will not be repeated here.

The above description of *A. aneura* is based on specimens of plants occurring in Western Australia but as can be seen from the discussions below there are a number of different morphotypes of the species within this State. Future analyses of the complex patterns of variation within *A. aneura* should also take into account *A. pteraneura* (especially the variant which has narrow pods) and the taxa that Pedley (2001) described as *A. aneura* var. *aneura*, *A. aneura* var. *intermedia* and *A. aneura* var. *major*.

The single Western Australian specimen that Pedley (2001) cited under *A. aneura* var. *aneura*, namely, *M.E. Trudgen* 440, is *A. aptaneura* (which has rimmed pods). No specimens referable to *A. aneura* var. *major* appear to occur in Western Australia. The Western Australian specimens that Pedley (*l.c.*) provisionally referred to this variety are treated here as *A. aneura* (*B.R. Maslin* 4620; *S. van Leeuwen* 838) and *A.* ? *aneura* × *ayersiana* (*B.R. Maslin* 7235); see also *Variation* under *A. ayersiana* below.

Morphology. Juvenile plants of this species sometimes have some phyllodes arranged in clusters of two to four; these clusters are absent or very infrequent on adult plants. Plants possessing a conifer (all lateral branches horizontal) (Figure 2A) or pseudo-conifer (lower lateral branches horizontal) (Figure 3B & C; see Figure 7B in Maslin *et al.* 2012) growth form are seemingly rare in *A. aneura*; these individuals normally also have some clustered phyllodes.

The few juvenile plants of *A. aneura* that have been seen are characterised by very short phyllodes (20–30 mm long) and by a thick overburden of translucent resin on their branchlet ribs (e.g. *B.R. Maslin & J.E. Reid* BRM 9719 from 5 km N of Menzies).

Most Western Australian plants of *A. aneura* have winged pods with the wings normally varying from very narrow (0.4 mm wide) to 1 mm wide, or sometimes to 2 mm. There are, however, a few specimens where the pods are bevel-edged along one margin and winged along the other, or less commonly, bevel-edged along both margins. These plants have been collected from the Laverton–Leonora area (e.g. *B.R. Maslin et al.* BRM 9352) and the Pilbara (e.g. *E. Thoma* 1214) and are possibly hybrids involving *A. aneura* and *A. aptaneura* (see Maslin *et al*. 2012 for discussion of taxonomic implications of bevel-edged pods). Northern Territory and South Australian plants currently attributed to *A. aneura* show this same range of variation for pod margins (i.e. winged and/or bevel-edged). Although a bevel-edge and a marginal wing look (subtly) different, Rutishauser *et al.* (2010) interpret these structures as homologous with the bevel-edge being a highly reduced wing. See under *A. aptaneura* below for notes regarding bevel-edged entities related to that species.

Variation. The following two variants of *A. aneura* have been identified from herbarium specimens for the Gibson and Great Victoria Deserts.

A rather distinctive morphotype has been collected on the Great Central Road between Cosmo Newbery and Giles (e.g. *M. McDonald* 1795). These plants grow as large trees (5–12 m tall) and have distinctively recurved phyllodes that are long and narrow (70–180 × 1.5–3 mm). Pods are unknown for these plants. It is likely that this morphotype occurs also in the Northern Territory.

Some of the *A. aneura* plants collected in 2005 by P.K. Latz from the eastern extremity of the Gibson Desert in the vicinity of the Mu Hills, *c.* 350 km due north-west of Warburton, are unusual in having atypically narrow phyllodes (1–1.5 mm wide) (*P.K. Latz* 20885, 20886, 20895, 20891). Seemingly typical *A. aneura* also occurs in this same general area (*P.K. Latz* 20893) together with *A. incurvaneura* (*P.K. Latz* 20877) and *A. paraneura* (*P.K. Latz* 20907).

In the Pilbara region of Western Australia there are two variants of *A. aneura*. The first is more common and has a scattered distribution within the region, with most collections coming from the West Angelas area in the central Hamersley Range; it also appears to occur in the Gibson Desert. This variant is characterised by having relatively long and often quite broad phyllodes (mostly 70–120 × 2–4 mm), and seems to approximate Pedley's (2001) concept of *A. aneura var. intermedia*. However, further study of this entity is needed because cpDNA results of Miller *et al.* (unpublished data) show it as occurring on a clade with *A. aptaneura*, well-separated from the other *A. aneura* samples in that analysis. Judging from field and morphological studies this entity appears to grade into *A. ayersiana* in places (see under *A. ayersiana Hybridity* for discussion). Representatives of this variant include *B.R. Maslin* 4620 and *S. van Leeuwen* 838. The second variant of *A. aneura* in the Pilbara is known from only a few specimens from the West Angelas area, e.g. *M.E. Trudgen* MET 19001 and 19021. It is characterised as being obviously resinous and having atypically narrow phyllodes (*c.* 1.5 mm wide) and pods (6–7 mm wide). Field and genetic study of this variant are needed in order to better characterise its taxonomic status.

Affinities. In Western Australia *A. aneura* is most closely related to the generally more westerly distributed *A. fuscaneura*; it also seems closely related to *A. ayersiana* and *A. pteraneura* (see these species for discussion).

It is sometimes difficult to distinguish *A. aneura* from *A. aptaneura* (Green Alliance), at least in the absence of mature pods. These two species have similar new shoots, branchlet resin and inflorescences but *A. aptaneura* can be recognised by its rimmed (never winged) pods that are ±nerveless and often tinged orange, and its often terete phyllodes (or if flat then commonly less than 2 mm wide). The two species are sometimes sympatric and in the field *A. aneura* can be recognised because it tends to have a more silvery grey-green crown than *A. aptaneura* and less commonly develops a pseudo-conifer growth form when young.

Hybridity. A few herbarium specimens suggest that *A. aneura* hybridises or intergrades with *A. ayersiana* in the Pilbara, Gibson Desert and central ranges east of Warburton (see *A. ayersiana* for discussion). The species may possibly also occasionally hybridise with *A. aptaneura* (see that species for discussion); putative hybrids between *A. aneura* and *A. aptaneura* are noted above under *Morphology*.

Notes. Many papers have been published mentioning *A. aneura*; however, only rarely are voucher specimens cited and therefore it is normally difficult or impossible to know to which of the currently recognised species the information refers.

Conservation status. Not considered rare or endangered.

Common name. Mulga.

Etymology. The species name comes from the Greek words *a* (not) and *neuron* (a nerve) in allusion to the absence of conspicuous nerves on the phyllodes.

Acacia aptaneura Maslin & J.E.Reid, *sp. nov.*

Arbores 3–10(–12) m altae, interdum forma coniferarum vel (in statu juvenili) pseudo-coniferarum. *Ramuli* ecostati vel obscure costati. *Surculi* novi resinosi. *Phyllodia* teretia ad plana, plerumque longa

et angusta (plerumque 40–100 × 1–2 mm), viridia ad cinereo-viridia vel sub-glauca vel interdum ±cinerea. *Glans* 0–3 mm supra pulvinum posita; phyllodium ad glandem plerumque non manifeste crispatum vel tumidum. *Sepala* longitudine ≥½ petalii partes aequantia. *Legumina* plerumque aurantio-brunnea, levia, plerumque glabra, ±enerva, marginibus rimosis vel subinde devexis. *Semina* plerumque 4–6 mm × 3–4 mm.

Typus. Paynes Find–Sandstone Road, 25 km east of Great Northern Highway, Western Australia, 11 November 2008, *B.R. Maslin* 9908 (*holo*: PERTH 07955111; *iso*: CANB, K, MEL).

Acacia aneura var. *tenuis* Pedley, *Fl. Australia* 11B: 489 (2001). *Racosperma aneurum* var. *tenue* (Pedley) Pedley, *Austrobaileya* 6: 450 (2003). *Type citation*: 'Lorne Creek Desert, N.T., 20 Sept. 1947, *C.J. Mulhearn* 6713; holo: AD ex ADW.' *Type*: Lorne Creek Desert, Northern Territory, 20 September 1947, *C.J. Mulhearn* 6713 (*holo*: AD 126321).

Acacia aneura var. *tenuis*, L.Pedley (ms) in B.R.Maslin (co-ordinator), *WATTLE Acacias of Australia* (2001), *nom. inval*.

Acacia aneura var. *pilbarana* Pedley, *Fl. Australia* 11B: 489 (2001); *Racosperma aneurum* var. *pilbaranum* (Pedley) Pedley, *Austrobaileya* 6: 450 (2003). *Type citation*: '11 km NW of Newman on road to Rhodes Ridge, W. A., 8 July 1980, *B.R. Maslin* 4589; holo: BRI; iso: MEL, PERTH.' *Type*: About 11 km NW of Newman on road to Rhodes Ridge, Western Australia, 8 July 1980, *B.R. Maslin* 4589 (*holo*: BRI; *iso*: MEL, PERTH 00599778).

Acacia aneura var. *pilbarana*, L.Pedley (ms) in B.R.Maslin (co-ordinator), *WATTLE Acacias of Australia* (2001), *nom. inval*.

Obconic or sometimes rounded *shrubs* maturing to single- or multi-stemmed, obconic *trees* 3–10(–12) m tall, sometimes with a pseudo-conifer (adolescent plants) or rarely a conifer growth form, stems and major branches normally straight to slightly crooked, the upper branches obliquely ascending to erect (except some or all horizontal in pseudo-conifer and conifer plants); crowns normally sub-rounded to rounded, sub-dense to dense and green to grey-green. *Bark* light grey to dark grey, longitudinally fissured and fibrous on main stems, smooth on upper branches. *Branchlets* yellow to pale (reddish) orange or light brown, ribless or obscurely ribbed, ±glabrous extremities, the ribs yellow and not resinous or with a thin veneer of translucent, yellow resin (resin sometimes thick, but mainly on juvenile plants). *New shoots* resinous; *youngest phyllodes* pale brown to dark brown or khaki to green, shiny to dull resin obscuring the underlying nerves and indumentum except often towards the phyllode base, with red-brown to orange-red glandular hairlets sparse to moderately dense and commonly obscured by the resin. *Phyllodes* (25–)40–100(–130) mm long, the shortest phyllodes normally occurring on juvenile plants, (0.6–)0.8–1.5(–2.5) mm wide, rarely to 5 mm on some Pilbara plants, terete to flat, narrowly linear or very rarely linear-elliptic, occasionally (on some short-phyllode forms) narrowly oblong, ±straight to shallowly or moderately incurved, rarely shallowly sigmoid or wavy, ascending to erect, not rigid, single or sometimes clustered in groups of 2–4 at each node, green to grey-green or sub-glaucous or sometimes ±grey (foliage on juvenile plants often bright, shiny green), obscurely appressed-hairy between the nerves or glabrous; parallel *longitudinal nerves* numerous, fine, of uniform prominence and close together, resinous on young phyllodes (but resin absent or obscure on mature phyllodes); *margins* not resinous except occasionally a very narrow band of resin present in the wide-phyllode Pilbara morphotype; *apices* innocuous, straight to sub-uncinate or occasionally uncinate. *Gland* situated on adaxial surface or edge of phyllode 0–3 mm above the pulvinus, the phyllode normally not obviously

kinked or swollen at the gland. *Inflorescences* simple; *peduncles* (2–)3–10(–13) mm long, glabrous or with ±sparse, appressed, white hairs (often obscured by resin) and commonly also ±scattered, red-brown, glandular hairlets; *spikes* 10–30(–35) mm long when dry, light- to mid-golden. *Bracteoles* sub-peltate, 0.5–0.7 mm long, the claws linear, glabrous and pale-coloured, the laminae widely ovate, pale-coloured or brown, slightly thickened and larger than sepal laminae. *Flowers* 5-merous; *sepals* free, ≥½ length of petals, linear-spathulate, the claws narrowly linear, glabrous and expanded into relatively small, glabrous or ciliolate laminae; *petals* 1.5–2 mm long. *Pods* (15–)20–60 mm long, (4–)5–10(–11) mm wide, oblong to narrowly oblong or occasionally oblanceolate, straight-edged or slightly constricted between seeds, sometimes with a few deep constrictions, chartaceous, flat, not undulate, often orange-brown but ranging to yellow-brown, light brown to mid-brown or rarely greyish brown, often with a slight sheen, smooth, glabrous or rarely sparsely appressed-hairy, occasionally slightly scurfy, ±nerveless or occasionally very obscurely reticulately nerved (nerves normally not longitudinally trending), stipitate; *margins* rimmed, often resinous. *Seeds* oblique to transverse or sometimes longitudinal in the pods, (2.5–)4–5(–6) mm long, (1.5–)3–4 mm wide, ellipsoid to ±ovoid, dark brown, shiny; *aril* small and creamy white. (Figures 15–17)

Characteristic features. Single- or multi-stemmed *trees* 3–10(–12) m tall, sometimes with a conifer or (adolescent plants) pseudo-conifer growth form. *Branchlets* ribless or obscurely ribbed, the ribs not resinous or with a thin veneer of translucent, yellow resin. *New shoots* resinous, the *youngest phyllodes* pale brown to dark brown or khaki to green and invested with sparse to moderately dense red-brown to orange-red glandular hairlets. *Phyllodes* terete to flat, normally narrowly linear, mostly 40–100 × 0.8–1.5 mm, green to grey-green or sub-glaucous or sometimes ±grey. *Gland* 0–3 mm above the pulvinus, the phyllode normally not obviously kinked or swollen at the gland. *Sepals* ≥½ length of petals. *Pods* often orange-brown (but colour somewhat variable), smooth, normally glabrous and ±nerveless, the *margins* rimmed. *Seeds* mostly 4–5 mm × 3–4 mm.

Selected specimens seen. WESTERN AUSTRALIA: LGS 6, Lorna Glen Station, 150 km ENE of Wiluna, 7 Apr. 2002, *A. Chant* 40 (GRH, PERTH: coniferous growth form); *c*. 5 km W of Gahnda Rockhole, Gibson Desert, 1 Apr. 1982, *A. Kalotas* 1128 (NT, PERTH: coniferous growth form; this specimen was cited by Randell (1992) under *A. aneura* var. *conifera*); Joyners Find Greenstone Belt, survey site WILU44. On Ullula Station, *c.* 7.7 km SSW of Linden Bore and 0.7 km NW Coon Well, *c.* 37.4 km SW of Wiluna, 22 Aug. 2006, *A. Markey* & *S. Dillon* 4326 (NY, PERTH); upper Rudall River area, 9 Sep. 1971, *B.R. Maslin* 2220 (CANB, K, NSW, NT, PERTH, US: coniferous growth form; upper Rudall River area, 9 Sep. 1971, *B.R. Maslin* 2221 (CANB, PERTH); this specimen was cited by Randell (1992) under *A. aneura* var. *conifera*); 66.5 km N of Leinster turnoff on Goldfields Highway to Wiluna, 8 Sep. 2006, *B.R. Maslin* 9017 (CANB, K, MEL, PERTH); Hamersley Range, West Angelas area, 19 km W of Coondewanna Hill, 15 July 2000, *B.R. Maslin* 8084c (PERTH); *c*. 75 km N of Meekatharra, 8.5 km NW of Great Northern Highway on road to Peak Hill Station, 11 Sep. 2006, *B.R. Maslin* 9089 (BRI, PERTH); 4 km N of Kookyne on Kookyne Malcolm Road, 19 Oct. 2008, *B.R. Maslin* & *J.E. Reid* BRM 9710 (PERTH); 69 km S of Mt Magnet–Leinster Road on Sandstone–Paynes Find Road, 22 Oct. 2008, *B.R. Maslin & J.E. Reid* BRM 9730 (PERTH: phyllodes linear-elliptic); *c.* 18 km W of Giles Point (between Newman and Tom Price), 20 May 2009, *B.R. Maslin & J.E. Reid* BRM 10034 (PERTH: Pilbara woodland variant); *c.* 30 km E of Juna Downs Homestead, 5 Sep. 1995, *A.A. Mitchell* PRP669 (PERTH); flats between Rhodes Ridge and Pamelia Hill, between Hamersley and Ophthalmia Ranges, 11 Aug. 1973, *M.E. Trudgen* 440 (PERTH: this specimen was cited by Pedley 2001 as *A. aneura* var. *aneura*); site number 816, 3.5 km ESE of West Angela Hill, Hamersley Ranges, Fortescue Botanical District, 28 Sep. 1997, *M.E. Trudgen* 17599 (NSW, PERTH); Newman, 7 Nov. 1980, *K. Walker* 215 (PERTH); Boolardy Station, Yalgoo, 24 Mar. 1952, *D.G. Wilcox* M16 (PERTH). NORTHERN TERRITORY: 42 km N of Alice Springs, 2 Oct.

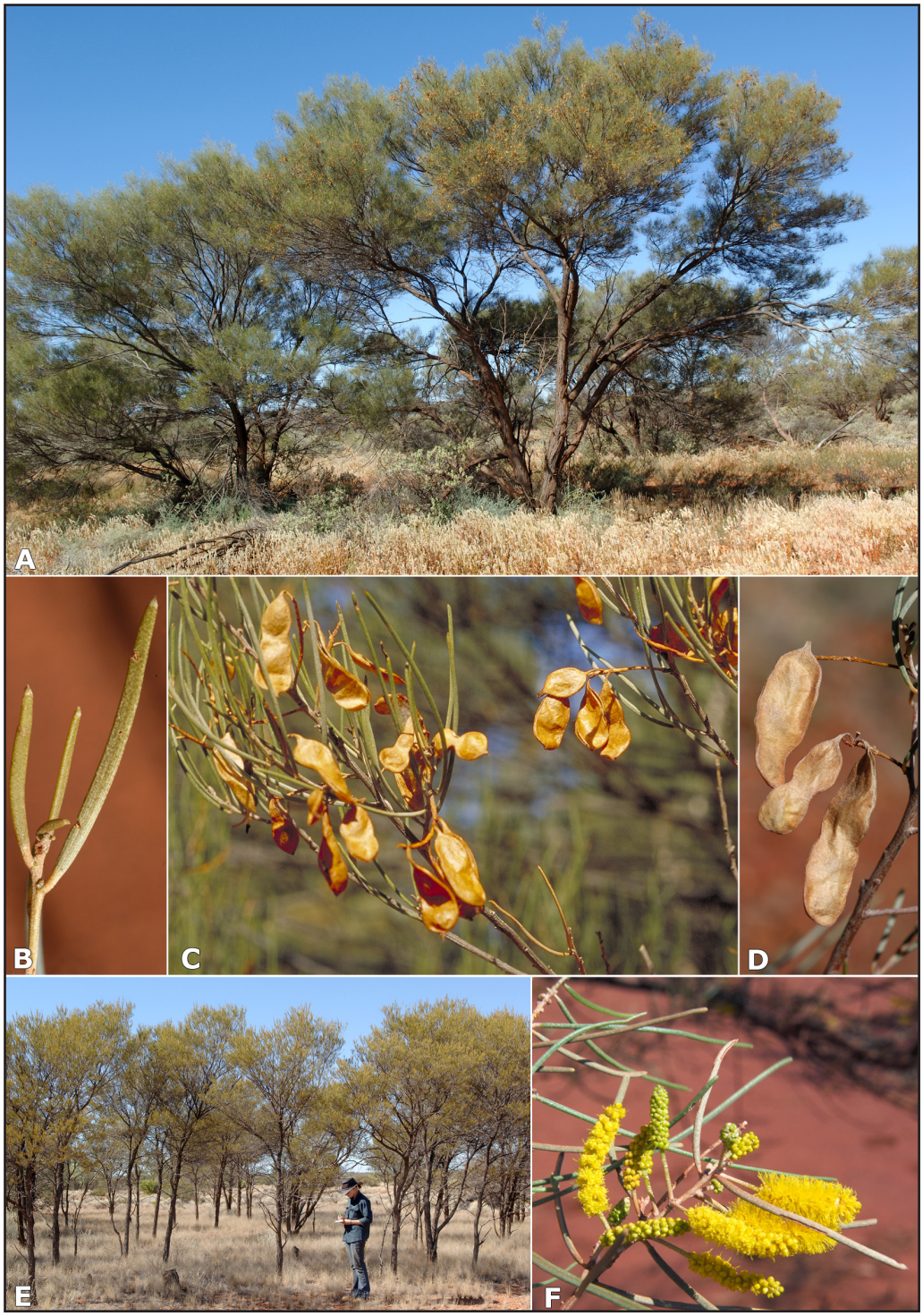


Figure 15. *Acacia aptaneura*. A – mature plants showing obconic habit; B – resinous new shoot (with few glandular hairlets); C – mature pods tinged orange; D – mature pods showing marginal rim; E – adolescent stand; F – inflorescence spikes. Photographs by B.R. Maslin.

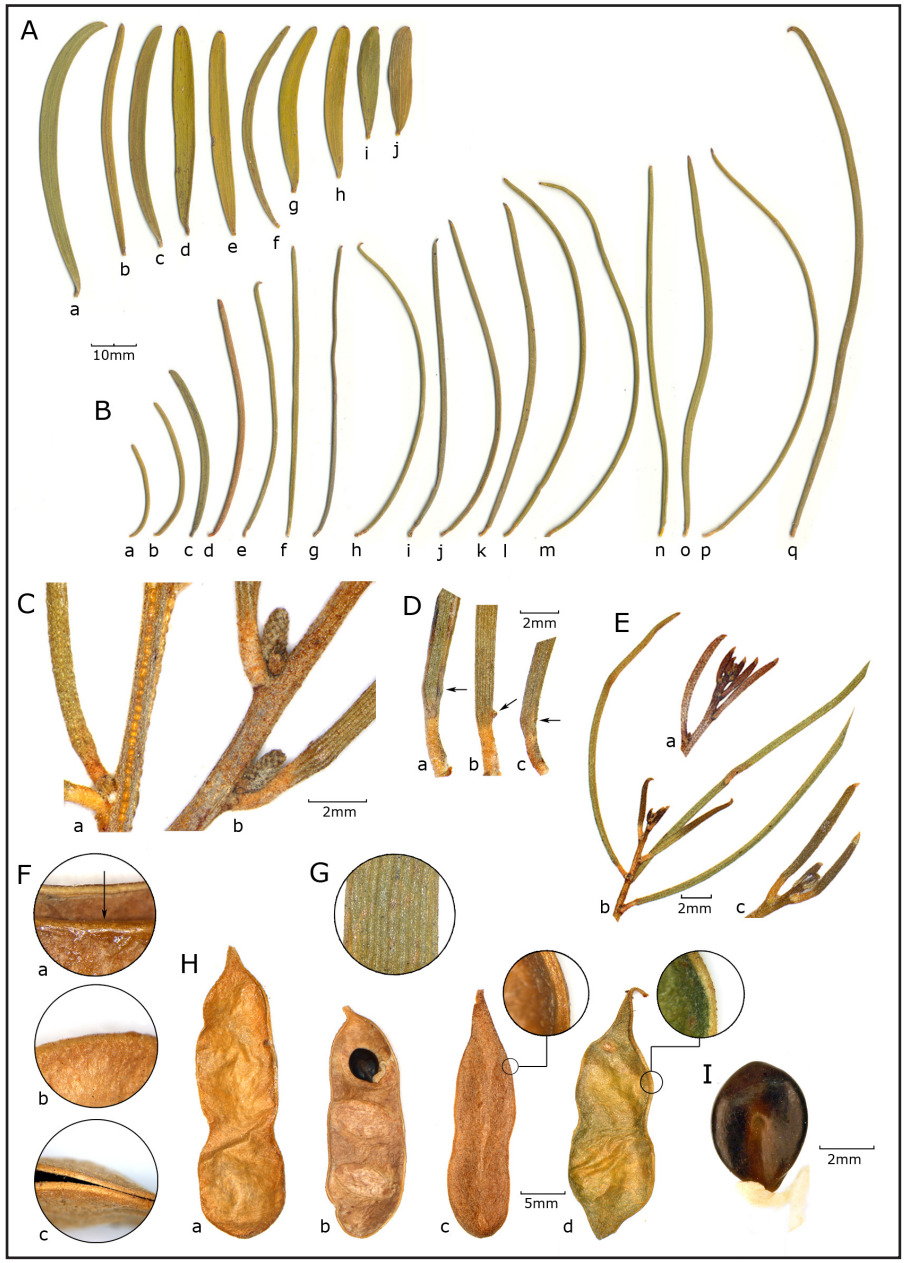


Figure 16. *Acacia aptaneura*. A – phyllode variation from a range of specimens (Pilbara woodland variant); B – phyllode variation from a range of specimens (typical variant); C – penultimate, pale-coloured branchlets, a) with overburden of translucent resin on ribs, b) ribless; D – phyllode glands (arrowed), a) slightly swollen, b) not swollen, c) slightly swollen and slightly kinked; E – new shoots, a) resin dissolved to show glandular hairlets, b) resinous (resin obscuring ±few glandular hairlets), c) greenish and resinous; F – close-up of marginal rim a) opened pod with rounded margin (arrowed), b) rounded margin (plane view), c) rounded margin (end view); G – phyllode margin not resinous (plane view); H – pods, a) exterior, b) interior with seed, c) exterior of bevel-edge pod variant showing close-up of bevel-edge (this variant is not included within the normal range of variation for *A. aptaneura*, see text for explanation), d) slightly immature pod, exterior showing close-up of marginal rim; I – seed with small aril. Scale bars shown on figure; vouchers are listed in Appendix 1.

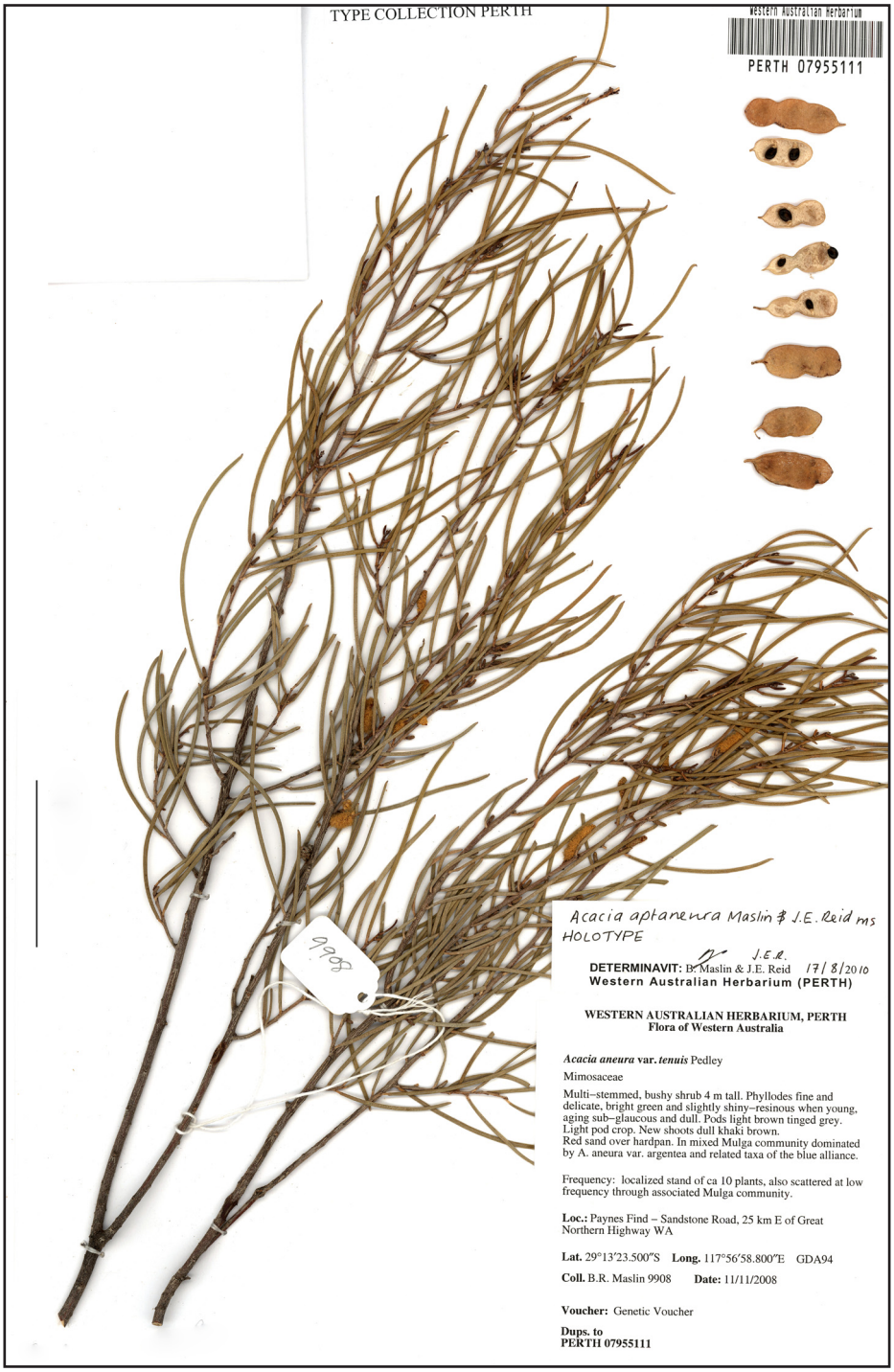


Figure 17. Holotype of *Acacia aptaneura* (PERTH 07955111), scale = 5 cm.

1995, *D.E. Albrecht* 7030 (NT); Curtin Springs Station, 4 km S of Uluru-Stuart Highway road on road to Victory Downs, 14 Oct. 2000, *B.R. Maslin* 8114 (PERTH); Tanami Road, 64 km W of junction with Stuart Highway, 29 Oct. 1982, *S. Midgley* 355 (PERTH). SOUTH AUSTRALIA: Mt Fitton [*c.* 140 km ESE of Marree], 30 Aug. 1972, *B. Copley* 3840 (AD, FI *n.v.*, MEL *n.v.*, NSW *n.v.*, UC *n.v.*); Hamilton Creek Gorge [*c.* 163 km ENE of Leigh Creek], 15 Oct. 1962, *D.N. Kraehenbuehl* 755 (AD, LE *n.v.*, Z *n.v.*); Commonwealth Hill Station, off E–W road from Bulgunnia Station, 25 Oct. 2004, *M. O'Leary* MOL 4620 (AD: coniferous growth form); 0.5 km N of Nudlamutana Well [*c.* 20 km N of Balcanoona], 26 Oct. 1967, *D.J.E Whibley* 2136 (AD, AK *n.v.*, MO *n.v.*). QUEENSLAND: 23 km SE Wallinderry Out Station towards Keeroongooloo SE Channel, Cooper Creek, 23 Nov. 1981, *S. Midgley* 316 (PERTH). NEW SOUTH WALES: none seen.

Distribution. *Acacia aptaneura* is widespread in Western Australia; it also occurs in the Northern Territory, South Australia, Queensland and New South Wales (Pedley 2001, as *A. aneura* var. *tenuis* and var. *pilbarana*). In Western Australia the species extends from near Karratha south through Gascoyne Junction and Yalgoo to Paynes Find and extends eastwards to the Northern Territory border. It is common in the western part of its range with many records from the Pilbara, Gascoyne and Murchison IBRA bioregions, and also further east in the Central Ranges bioregion. It is scattered and seemingly uncommon in the eastern Carnarvon, northern Coolgardie, Little Sandy Desert, southern Great Sandy Desert, Gibson Desert, Great Victoria Desert, Hampton and Nullarbor bioregions but this might possibly reflect the relative dearth of collecting activity in at least some of these areas. In the Pilbara, *A. aptaneura* is common in the Hamersley Range (especially on the Coondewanna Flats near West Angelas) and in the valley of the Fortescue River where it often forms rather dense populations (Maslin *et al.* 2010) (Figure 18).

Habitat. *Acacia aptaneura* grows in a wide range of habitats. It has been recorded from sometimes stony or gravelly red-brown sandy loam, clay-loam or clay, commonly over hardpan. It occurs on alluvial flats and other water-gaining sites, and on slopes and crests of low rocky hills (including banded ironstone). Judging from herbarium records it is seemingly less common on laterite, quartz or gibber plains, laterite breakaways, unconsolidated red-brown sand or stabilised sand dunes and in areas of granite. It often occurs in mixed Mulga communities and is often common in the places where it occurs.

Flowering and fruiting period. As best can be judged from herbarium records the species has two main flowering flushes, March to May and June to August. However, sporadic flowering has also been recorded for all other months of the year except January. Pods with mature seeds have been collected from September to December, but on some plants the pods are often not fully developed in September. Notwithstanding the above, sterile plants have also been collected in most months of the year.

Taxonomy. *Acacia aptaneura* is a member of the Green Alliance and is most closely related to the only other member of this alliance, *A. macraneura* (see this species for discussion and differences). In the absence of pods it can sometimes be difficult distinguishing these two species, and distinguishing *A. aptaneura* from certain members of the Grey-green Alliance, especially *A. paraneura* and *A. pteraneura* when its phyllodes are terete, and narrow-phyllode forms of *A. aneura* when its phyllodes are flat (see these three species for discussion and differences).

As discussed below, *A. aptaneura* is a variable species; it is relevant to note that the relatively few specimens with bevel-edged pods are not included within the circumscription of this species (see discussion under *Variation* below).

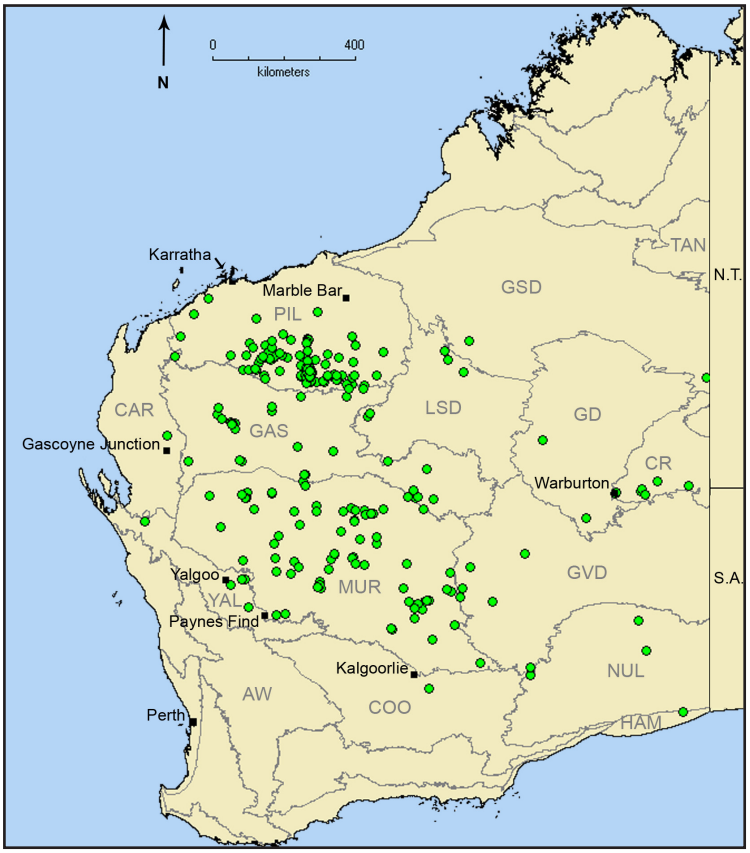


Figure 18. Distribution of *Acacia aptaneura* (●) based on specimens examined at the Western Australian Herbarium (PERTH). Boundaries and name abbreviations for IBRA bioregions (Department of Environment, Water, Heritage and the Arts 2008) are shown in grey.

Although Maslin *et al.* (2010) recognised *A. aneura* var. *pilbarana* and *A. aneura* var. *tenuis* for the Pilbara region these taxa are now regarded as conspecific with *A. aptaneura* (see discussion under *Variation* below).

The specimen *B.R. Maslin* 7074 which was cited by Pedley (2001) under *A. aneura* var. *tenuis* is referable to *A. pteraneura*, and the specimen *M.E. Trudgen* 440 that he cited under *A. aneura* var. *aneura* is *A. aptaneura*. The specimens *B.R. Maslin* 2220 and *A. Kalotas* 1128, both which were cited by Randell (1992) in the protologue of *A. aneura* var. *conifera* (and the latter mistakenly placed under Northern Territory listing), are referable to *A. aptaneura*.

Morphology. Juvenile plants of this species sometimes have some phyllodes arranged in clusters of two to four; these clusters are absent or very infrequent on adult plants. Plants possessing a conifer (all lateral branches horizontal) (Figure 2C) or pseudo-conifer (lower lateral branches horizontal) growth form sometimes occur in *A. aptaneura*; these individuals normally also have some clustered phyllodes and are scattered throughout the range of the species. Plants with bevel-edge pods provisionally referred to *A. aptaneura* can also possess conifer and pseudo-conifer growth forms.

The pods of *A. aptaneura* are normally distinctive in being glabrous, smooth and often with a slight sheen, often orange-brown (but colour ranges from yellow-brown to light or mid-brown), nerveless or very obscurely reticulately nerved (the nerves ±transverse, not longitudinally trending) and rimmed by a longitudinal nerve that extends along the ventral and dorsal sides; the margins of these pods are more or less rounded (see Figure 16Fa–c). In mature pods the nerve comprising the rim is normally obscure (and is often overtopped by a layer of resin) but in immature pods it is normally very pronounced (see Figure 16Hd). Rimmed pods can resemble bevel-edged pods (see under *Variants* and *Hybridity* below) and care is needed to not confuse the two structures.

Variation. *Acacia aptaneura* is a variable species. It is clear from both herbarium and field studies that its phyllodes vary from terete to flat with populations containing either terete or flat phyllodes, or both types together, in which case intermediates (i.e. phyllodes sub-terete to compressed) may also occur. For example, in the West Angelas area of the Pilbara region *B.R. Maslin* 8051A and 8053 (phyllodes flat) were sympatric with *B.R. Maslin* 8055 (phyllodes terete). Field observations and preliminary, unpublished, ontogeny studies of glasshouse plants also suggest that phyllode transverse sectional shape does not vary significantly with plant age. So, unlike phyllode length (see below) the transverse sectional shape of phyllodes is much the same on juvenile, adolescent and adult individuals of the one plant.

The phyllodes of mature plants of *A. aptaneura* are normally 40–100 mm long but on juvenile plants they are commonly shorter (*c*. 25–40 mm long). There are, however, occasional mature, arborescent plants that have short phyllodes like those found on juvenile plants. Short-phyllode forms are scattered throughout the range of the species and the phyllodes on these plants may be either flat or terete. Field observations suggest that short-phyllode forms are normally sympatric with the typical (long-phyllode) form of the species. For example, in the West Angelas population noted above *B.R. Maslin* 8051 (a tree 4 m tall with flat phyllodes 30–40 mm long) was sympatric with plants of typical *A. aptaneura* (i.e. *B.R. Maslin* 8051A, 8053, 8055). In some cases at least we suspect that mature arborescent plants with atypically short phyllodes represent examples of neoteny and there is some genetic support for this contention (J. Miller, unpublished data). A few specimens with slightly longer than normal phyllodes (to *c*. 130 mm) are scattered in the Pilbara; the phyllodes on these plants are either flat or terete (e.g. *B.R. Maslin* 8084c).

When phyllodes are flat their shape is normally narrowly linear. However, on short-phyllode morphotypes they are narrowly oblong. Also, on atypical plants in the Sandstone to Paynes Find area the phyllodes are linear-elliptic (e.g. *B.R. Maslin & J.E. Reid* BRM 9730).

Acacia aptaneura is very common and particularly variable in the Pilbara region. Plants predominating in the Fortescue River valley and other water-gaining sites such as the Coondewanna Flats near West Angelas attain arborescent stature, are often single-stemmed and normally have terete to compressed phyllodes. These rather handsome plants were treated as *A. aneura* var. *pilbarana* by Maslin *et al.* (2010). Higher in the landscape, on generally shallower and often rocky soils, the plants are normally of lower stature and divide at ground level into two to several main stems; their phyllodes are flat. This entity was called *A. aneura* var. *tenuis* in Maslin *et al.* (2010). Subsequent study now suggests that there is no strong and reliable correlation between these habitat, habit and phyllode characters. The two varieties are therefore considered conspecific with *A. aptaneura*, but they possibly represent ecotypes. Also, in the West Angelas area there exists a wide phyllode morphotype of *A. aptaneura* which forms dense woodland communities on alluvial flats with other species of Mulga. The plants are single- or multi-stemmed, reach 5–8(–9) m in height and the phyllodes are flat but very variable in size. For example, in the population represented by *B.R. Maslin & J.E. Reid* BRM 10034 a range

of phyllodes from a number of adult plants varied from 25–60 mm long and 2–5 mm wide (see Figure 16Aa–j). The narrowest of these phyllodes is within the normal range for *A. aptaneura*, but the widest phyllodes (3–5 mm) exceed the known width range for the species. Also, most of the wide phyllodes are at the lower end of the length range for the species, with the shortest being somewhat similar to those on juvenile plants in the same population. As best can be judged from vegetative characters (flowers and pods are unknown for these plants) it is probable that they are all referable to *A. aptaneura*, and unpublished genetic data (J. Miller, unpublished data) supports this notion. Clearly, more study of Pilbara populations of *A. aptaneura* is needed, especially when flowers and pods are present. In the meantime the above conclusions concerning the taxonomic status of these plants is provisional.

Variants. In a few specimens that otherwise seem ±typical for *A. aptaneura* the marginal nerve is fractionally displaced internally from the outer edge of the pod and the very narrow band of tissue between this nerve and the edge is obliquely deflexed relative to the surface of the pod so that the overall effect is that the pod has a bevel-edged margin (see Figure 16Hc). This bevel-edging sometimes occurs along both margins of the pods but more commonly one margin is bevel-edged while the other is rimmed. Individuals with bevel-edged pods are scattered throughout the range of the species in Western Australia but are most common in some Pilbara plants, e.g. *B.R. Maslin & J.E. Reid* BRM 10051 (N.B. normal rimmed pods are also found on plants of *A. aptaneura* in areas where bevel-edged morphotypes occur). As discussed in Maslin *et al.* (2012) there is uncertainty concerning the taxonomic significance of bevel-edged pods (this character may be indicative of hybridity). For this reason and also because (unlike in *A. fuscaneura*) there are no correlated features that characterise these bevel-edged individuals they are provisionally excluded from the circumscription of *A. aptaneura*. Also, a slightly different bevel-edged variant of *A. aptaneura* occurs in vicinity of Mt Augustus (e.g. *B.R. Maslin & J.E. Reid* BRM 9602) and with scattered occurrences in the Pilbara (e.g. *J.E. Reid* 8A). This entity is characterised by pods that are consistently at the lower end of the length range (15–35 mm long), dull (not at all shiny), brown to grey-brown (not tinged orange), scurfy and/or sparsely appressed-hairy, and which are bevel-edged along both margins. The taxonomic status of this entity requires further investigation and it too is excluded from the circumscription of *A. aptaneura*. All the bevel-edged variants discussed above have been determined as *A.* ? *aptaneura* at PERTH. Other morphotypes with bevel-edged pods are discussed below under *Hybridity*.

Affinities. See notes under *Taxonomy* above.

Hybridity. *Acacia aptaneura* and *A. aneura* possibly hybridise in a few areas including the Pilbara region (e.g. *B.R. Maslin et al.* BRM 9214; *E. Thoma* 1214) and in the Laverton–Leonora district (e.g. *B.R. Maslin et al.* BRM 9344, 9352). In these two regions both typical *A. aneura* (pods with both margins winged) and *A. aptaneura* (pods rimmed) also occur, and in some cases are sympatric with the suspect hybrid plants. The putative hybrids have flat, narrowly elliptic phyllodes similar to those of *A. aneura* but their pods are bevel-edged along one margin and very narrowly winged along the other (both pod margins are winged in Western Australian plants of typical *A. aneura* whereas in *A. aptaneura* both margins are rimmed or occasionally bevel-edged). Although a bevel-edge and a marginal wing look (subtly) different, Rutishauser *et al.* (2010) interprets these marginal structures as homologous with the bevel-edge being a highly reduced wing.

A morphotype with bevel-edged pods occurs near the Robinson Range about 90 km north of Meekatharra (e.g. *B.R. Maslin & J.E. Reid* BRM 9629). These plants are substantial trees to about 8 m tall with pods *c.* 14 mm wide which are broader than normal for *A. aptaneura* with which they grow (e.g. *B.R. Maslin* 9091). A similar-looking entity (e.g. *B.R. Maslin et al.* BRM 9183) occurs on Gifford Creek

Station (*c*. 300 km NW of the Robinson Range) but it is not known if the two represent the same taxon. Further study is needed to elucidate these entities which may possibly be hybrids involving *A. aptaneura* and *A. macraneura* or *A. aneura*.

Acacia aptaneura may occasionally hybridise with *A. paraneura* and *A. pteraneura* from the Grey-green Alliance (see these species for notes). Also, a rare putative hybrid between *A. aptaneura* and the Mulga relative, *A. ramulosa* var. *ramulosa*, occurs between Sandstone and Paynes Find (e.g. *B.R. Maslin* 9909, 9911; both putative parents occurred in this same population).

A rare putative hybrid between *A. aptaneura* and *A. incurvaneura* (Blue Alliance) occurs south-west of Tom Price in the Pilbara; both putative parents occurred in this population. The putative hybrid (*B.R. Maslin et al.* BRM 9210) has pods reminiscent of *A. incurvaneura* (*B.R. Maslin & J.E. Reid* BRM 10061) and phyllodes reminiscent of *A. aptaneura* (*B.R. Maslin et al.* BRM 9209).

Conservation status. Not considered rare or endangered.

Common name. Slender Mulga.

Etymology. The species name is derived from the Greek *a-* (without) and *pteron* (a wing) in allusion to the rimmed (wingless) pods, with 'aneura' as the stem of the epithet.

Acacia ayersiana Maconochie, *J. Adelaide Bot. Gard.* 1(3): 182 (1978). *Type citation*: '*J.R. Maconochie* 1930, Ayers Rock (25°23'S, 131°05'E), 19.x.1973.' *Type*: Ayers Rock, Northern Territory, 19 October 1973, *J.R. Maconochie* 1930 (*holo*: DNA *n.v.*; *iso*: AD *n.v.*, BRI *n.v.*, DNA *n.v.*, NSW *n.v.*, PERTH 00741566).

Acacia aneura var. *latifolia* J.M.Black, *Trans. & Proc. Roy. Soc. South Australia* 47: 370 (1923). *Type citation*: No type cited. *Type*: Ooldea, South Australia, August 1918, *Dr Cameron*, Herb. R. Tate (*lecto*: AD 97650519, *fide* L. Pedley, *Fl. Australia* 11B: 490 (2001), *non* B.R. Randell, *J. Adelaide Bot. Gard.* 14(2): 124 (1992)): *A. ayersiana* var. *latifolia* (J.M.Black) Randell, *J. Adelaide Bot. Gard*. 14: 24 (1992).

Dense, rounded or obconic, multi-stemmed, large *shrubs* 3–6 m tall and about the same across, maturing to sometimes single-stemmed *trees* 7–12 m tall, the stems and major branches straight to sub-straight, the upper branches obliquely ascending to erect; crowns silvery grey-green. *Bark* grey to black, coarsely fibrous on main stems, smooth on upper branches. *Branchlets* finely ribbed, densely silvery sericeous between the often red-brown ribs at extremities, the ribs not resinous or sometimes with a veneer or slight overburden of translucent resin; mature branchlets glabrous or indumentum sparse and ribs obscure or absent. *New shoots* usually not resinous or slightly resinous; *youngest phyllodes* usually covered by a dense layer of ±pale yellow or sometimes white, appressed hairs often intermixed with a few reddish glandular hairlets that completely or partially obscure the underlying longitudinal nerves of the lamina, rarely striate (see *Variation* below), the marginal nerve resinous and red-brown; *expanding phyllodes* striate by fine, slightly resinous nerves with a dense indumentum of silvery, appressed hairs in between. *Phyllodes* (30–)50–80(–100) mm long, (4–)7–12(–18) mm wide, l: w = (4–)5–10(–25), narrowly elliptic to lanceolate, often slightly dimidiate, straight but often shallowly recurved at apex or occasionally over their entire length, mostly ascending to erect, not rigid, silvery light grey-green (sometimes tinged bluish) or sometimes silvery light grey, the oldest

phyllodes dull green, minutely sericeous between the nerves; parallel *longitudinal nerves* numerous, slightly resinous and shiny, comparatively wide (about 0.1 mm), of uniform prominence or (towards ends of branchlets) some more pronounced than others, the inter-nerve space *c.* 0.1–0.2 mm wide; *marginal nerve* resinous, often well-marked, light brown to red-brown and commonly shiny (most evident on uppermost phyllodes) but often ageing dull yellow; *apices* acute to acuminate, straight to sub-uncinate, innocuous. *Gland* situated on adaxial margin of phyllode at or near distal end of pulvinus, obscure. *Inflorescences* simple; *peduncles* 3–6(–8) mm long, minutely silvery appressed-hairy; *spikes* (10–)15–35 mm long when dry, bright light golden. *Bracteoles* more or less sub-peltate, *c.* 0.5 mm long, equal in length to sepals. *Flowers* 5-merous; *sepals* free or more commonly shortly united at base, very short (¼–⅓ length of petals), oblong but sometimes slightly expanded at apices; *petals* c. 1.5 mm long. *Pods* 10–40 mm long, usually 10–14(–17) mm wide including wing, oblong or sometimes elliptic, chartaceous, flat, dull mid-brown to dark brown but often tinged grey, glabrous or minutely appressed-hairy, ±obscurely openly reticulate, short-stipitate; *marginal wing* 1–2 mm wide. *Seeds* (few seen) transverse to oblique in the pods, 5–6 mm long, 2.5–3 mm wide, obloid to ellipsoid, flat, mid-brown to dark brown, shiny; *aril* small. (Figures 19–22)

Characteristic features. Large, rounded or obconic, multi-stemmed *shrubs* 3–6 m tall and about the same across, maturing to sometimes single-stemmed *trees* 7–12 m tall. *Branchlets* densely silvery sericeous between the often red-brown ribs at extremities, the ribs sometimes with a thin veneer of translucent resin. *Youngest phyllodes* on *new shoot* not or scarcely resinous except for prominent marginal nerve, invested with a dense indumentum of normally pale yellow hairs that ±completely obscure the underlying nerves (youngest phyllodes often striate in narrow-phyllode variant of this species). *Phyllodes* normally rather large (mostly 50–80 × 7–12 mm), narrowly elliptic to lanceolate and acute to acuminate, straight but often shallowly recurved at apex or occasionally over entire length, commonly silvery light grey-green ageing dull green; *marginal nerve* discrete and resinous, light brown to red-brown but often ageing dull yellow. *Pods* short and broad (mostly 10–40 × 10–14 mm); *marginal wing* 1–2 mm wide.

Selected specimens seen. WESTERN AUSTRALIA: Gibson Desert, 7 km SSE of E end of Clutterbuck Hills, 14 June 1983, *S.D. Hopper* 2880 (PERTH); Walter James Range, 10 Sep. 1978, *P.K. Latz* 8006 (PERTH ex NT: narrow-phyllode variant); Young Range, Gibson Desert Nature Reserve, 17 July 2001, *P.K. Latz* 17910 (PERTH ex NT: narrow-phyllode variant); 80 km SSW of Kintore, Mu Hills, 1 May 2005, *P.K. Latz* 20892 (PERTH ex NT); 75 km SE of Mount Everard on Gunbarrel Highway to Warburton, Gibson Desert, 8 Sep. 1984, *B.R. Maslin* 5658 (PERTH: short-phyllode variant); Gibson Desert, 110 km by road S of Warburton on road to Rawlinna, 10 Sep. 1984, *B.R. Maslin* 5687 (CANB, PERTH); Hamersley Range, *c.* 59 km W of Newman on road to Port Hedland, 12 July 2000, *B.R. Maslin* 8031 (CANB, PERTH); Hamersley Range, West Angelas area, 19 km W of Coondewanna Hill, 15 July 2000, *B.R. Maslin* 8076A (PERTH: narrow-phyllode variant); 66.5 km N of Leinster turnoff on Goldfields Highway to Wiluna, 8 Sep. 2006, *B.R. Maslin* 9014 (PERTH: narrow-phyllode variant); 88 km E of Wiluna on Gunbarrel Highway to Carnegie Station, 8 Sep. 2006, *B.R. Maslin* 9023 (PERTH: narrow-phyllode variant); Milly Milly Station, 22 km NE of Erong Springs–Milly Milly Road on road to Yunda Outstation, 4 Oct. 2007, *B.R. Maslin, J. Miller & J.E. Reid* BRM 9147 (PERTH); Lorna Glen Conservation Park (*c.* 150 km ENE of Wiluna), 3 km W of No. 9 Well, 19 km due SW of old homestead building, 23 Oct. 2007, *B.R. Maslin, J. Miller & J.E. Reid* BRM 9314 (PERTH: short-phyllode variant); Fortescue River floodplain, 10 km due SW of Newman, 2.4 km N of Capricornia Roadhouse, 100 km W of Great Northern Highway, 26 May 2009, *B.R. Maslin & J.E. Reid* 10074 (PERTH: narrow-phyllode variant); site number 230, 1 km E of Four Corners Bore, Hamersley Station, Fortescue Botanical District, 25 Apr. 1997, *M.E. Trudgen* 17620 (PERTH). NORTHERN TERRITORY: Docker River airstrip, Petermann Range, 9 Oct. 1979, *T.S. Henshall* 2778 (PERTH ex

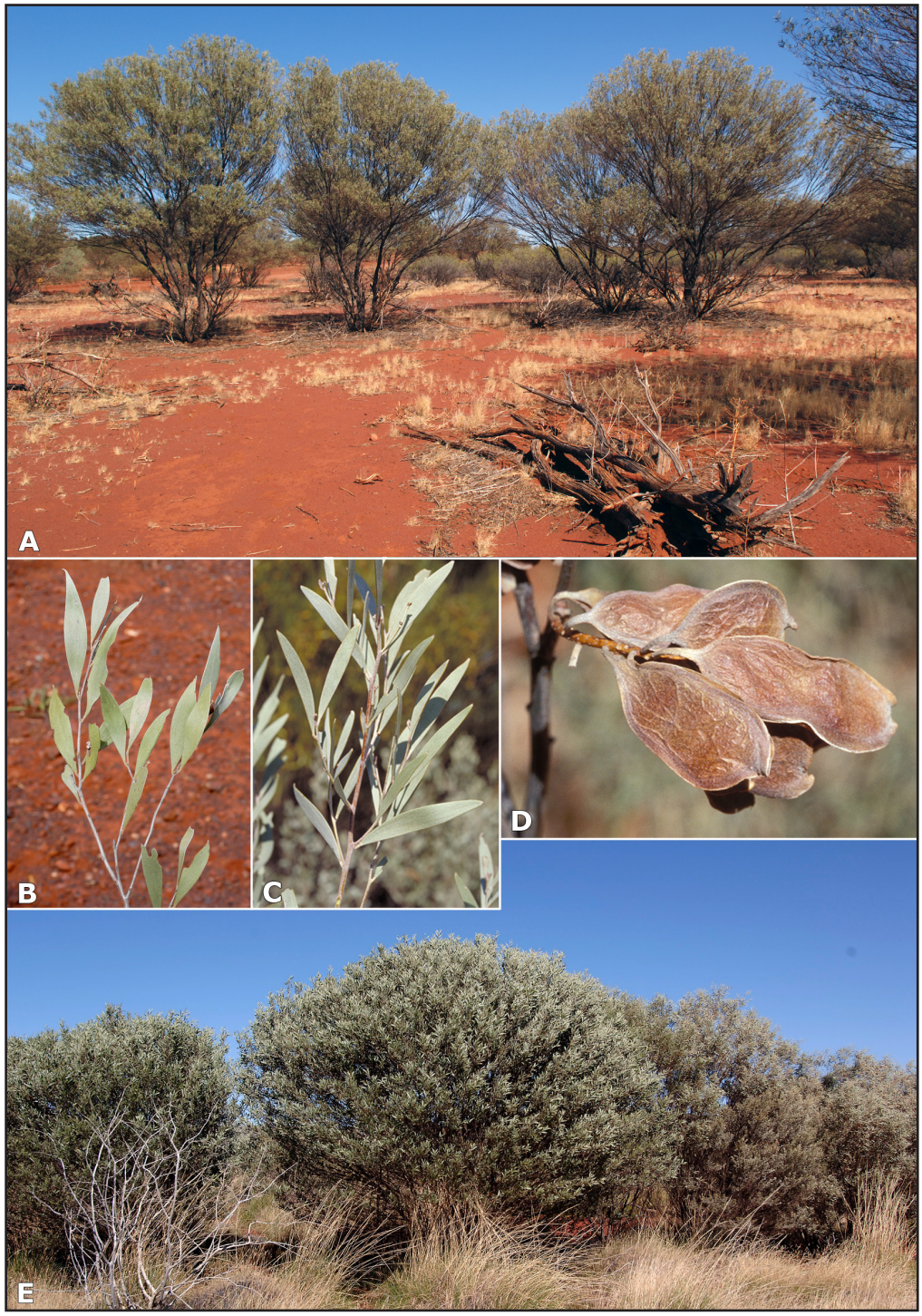


Figure 19. *Acacia ayersiana*. A – mature plants showing obconic habit; B, C – branchlets showing silvery, light grey-green phyllodes; D – mature pods with marginal wings; E – adolescent plants showing rounded habit. Photographs by B.R. Maslin.

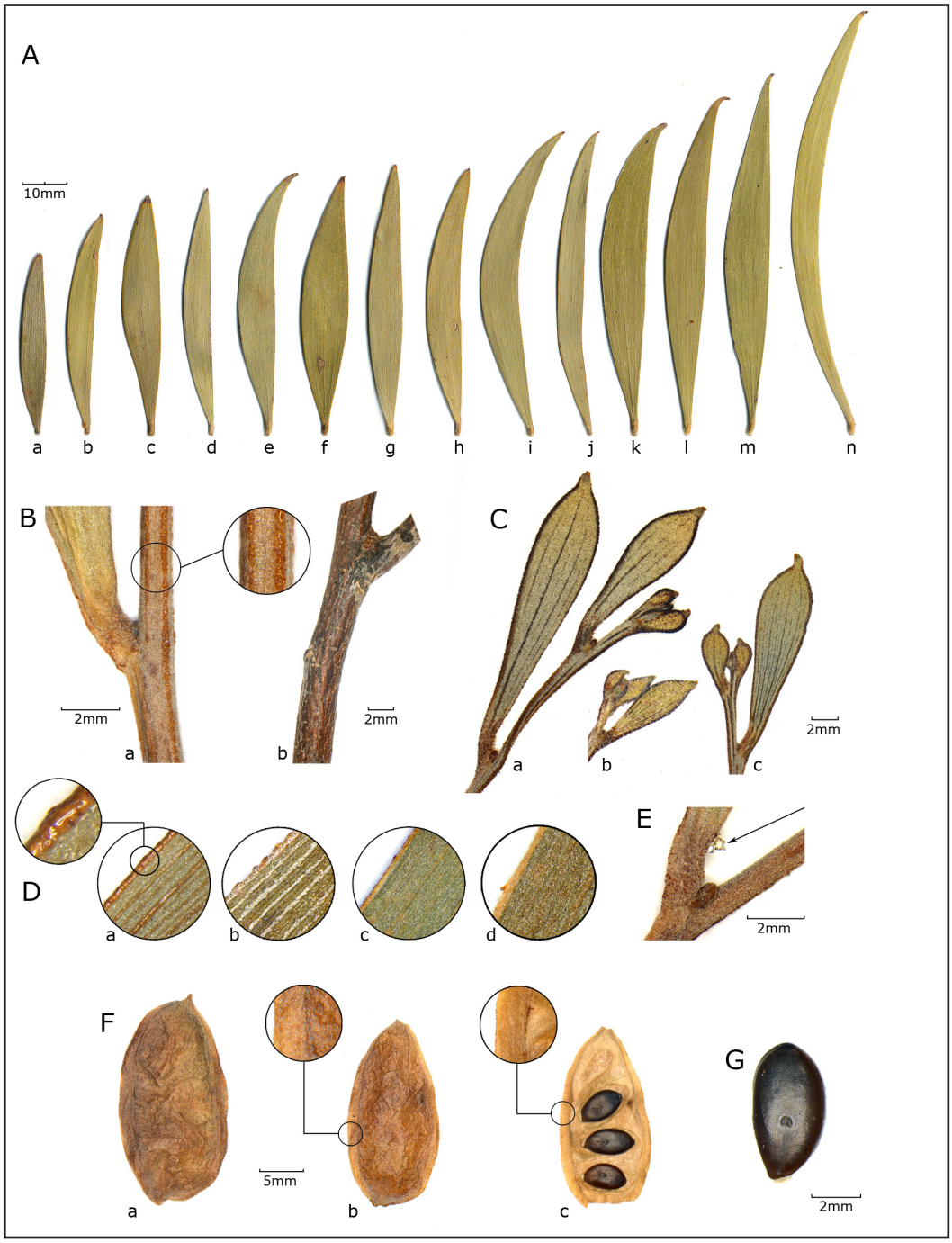


Figure 20. *Acacia ayersiana*. A – phyllode variation from a range of specimens; B – branchlets, a) penultimate branchlet with close-up showing minimal translucent resin on ribs, b) mature branchlet ribless; C – new shoots not resinous, the young phyllodes pale yellow-hairy with dark-coloured margins; D – phyllodes showing close-ups of resinous margins, a) immature phyllode with shiny marginal resin, b) mature phyllode with mealy marginal resin, c–d) mature phyllodes with yellowish, not shiny marginal resin; E – phyllode gland (arrowed); F – pods, a) exterior, b) exterior with close-up showing marginal wing, c) interior with seeds and close-up showing marginal wing; G – seed with small aril. Scale bars shown on figure; vouchers are listed in Appendix 1.

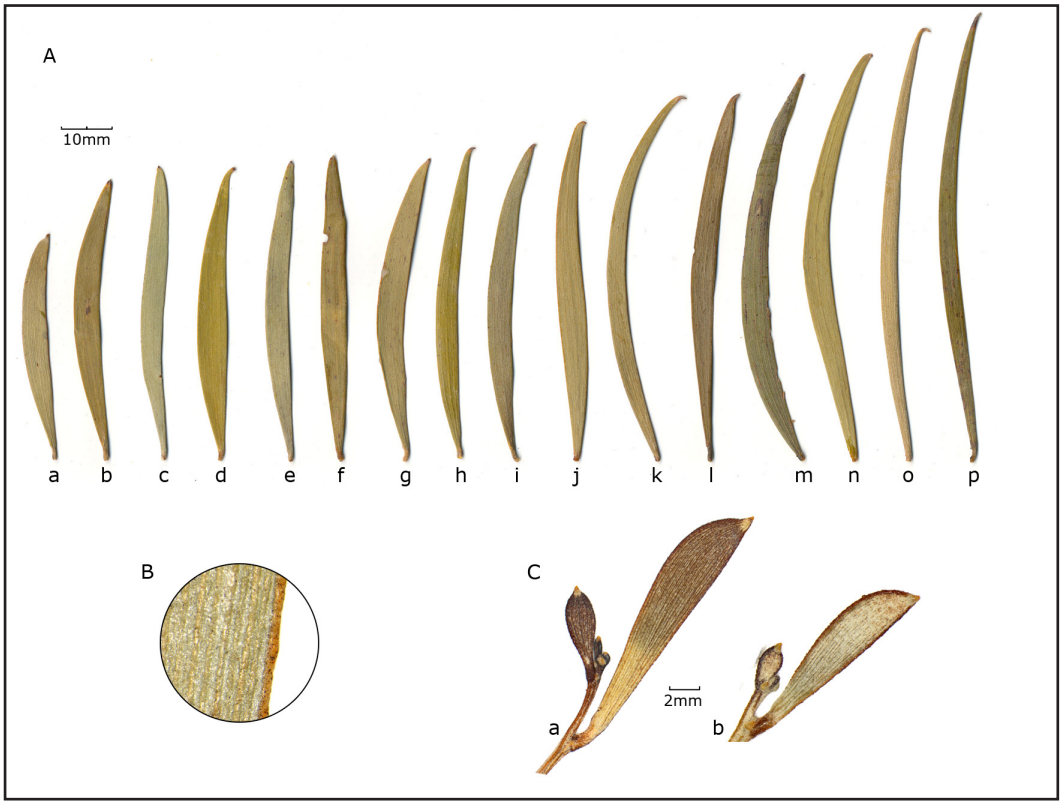


Figure 21. *Acacia ayersiana* (narrow-phyllode variant). A – phyllode variation from a range of specimens; B – phyllode margin well developed and obviously resinous; C – new shoots, a) resinous, first phyllodes dark-coloured by dense glandular hairlets, expanding phyllode striate, b) not resinous, first phyllodes densely pale-yellow hairy, expanding phyllodes finely striate, marginal nerve dark-coloured. Scale bars shown on figure; vouchers are listed in Appendix 1.

NT); 25 km WNW Central Mount Wedge Homestead, 8 Oct. 2000, *P.K. Latz* 16952 (PERTH ex NT). SOUTH AUSTRALIA: 60 km NW of Port Augusta on Stuart Highway, 14 Oct. 1984, *L. Thomson* LAJT 51 (PERTH: narrow-phyllode variant).

Distribution. *Acacia ayersiana* has a scattered distribution in the central part of Western Australia (between 22°S and 27°S) from about 116°E eastwards to the southern part of the Northern Territory; it also occurs in South Australia (Pedley 2001). In Western Australia most collections of *A. ayersiana* are from the southern Pilbara, Gascoyne, northern Murchison and Gibson Desert IBRA bioregions. There are very few collections of the species from the Great Victoria Desert, Little Sandy Desert and Central Ranges bioregions but in the latter case at least this may reflect the dearth of collecting activity in this area. In the Pilbara *A. ayersiana* is most common in the Hamersley Range between Tom Price and Newman, but there are scattered occurrences to the east of Newman (Maslin *et al.* 2010) (Figure 23).

Habitat. In the eastern part of its range (e.g. Gibson Desert) *A. ayersiana* commonly grows in red or red-brown sand on plains and among dunes; the soils are sometimes gravelly. In the Pilbara region, however, it grows in often stony red-brown loam or loamy clay on colluvial flats, gentle slopes or low rocky hills. It is commonly found in mixed Mulga communities with Spinifex (*Triodia* spp.) ground cover.

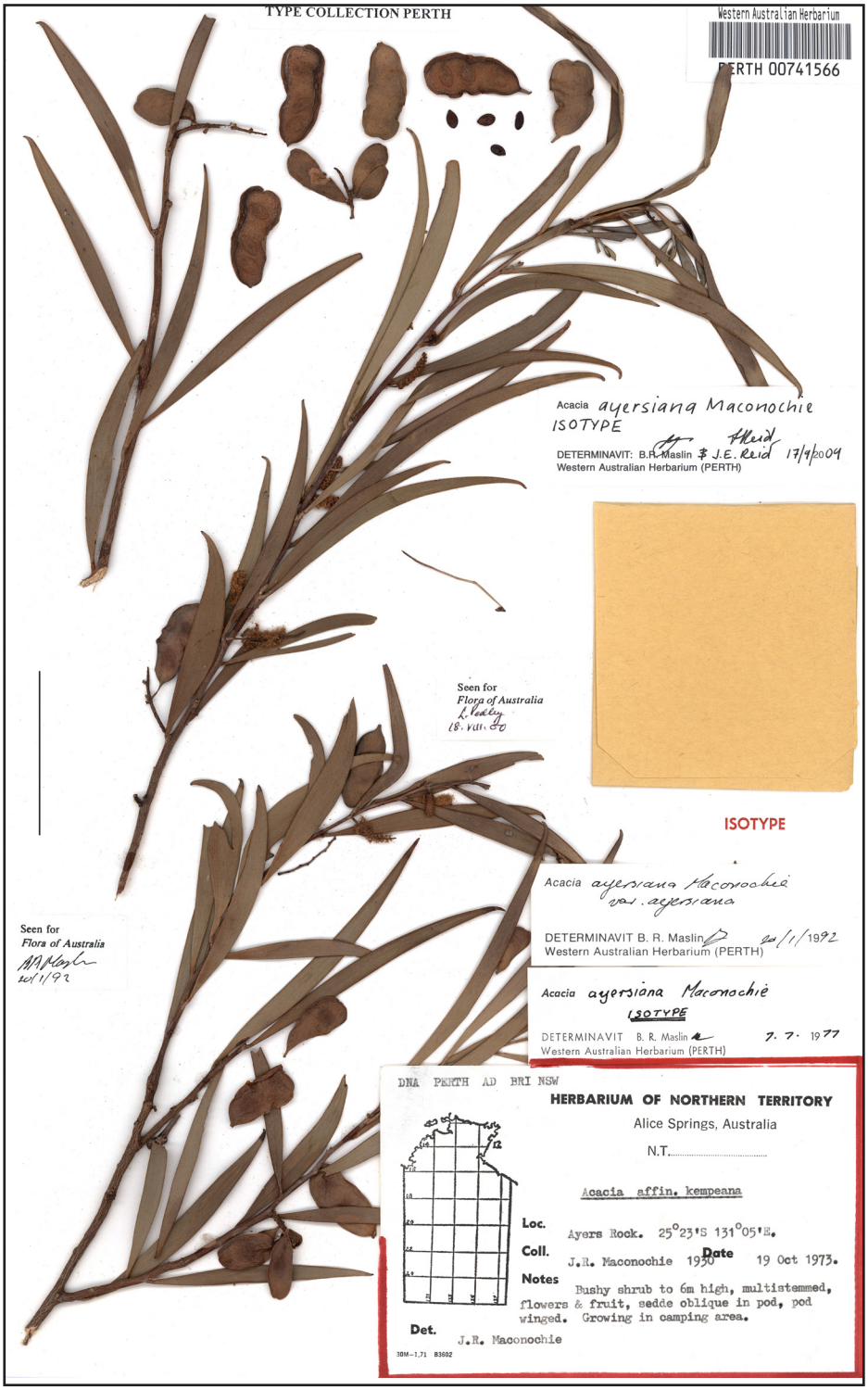


Figure 22. Isotype of *Acacia ayersiana* (PERTH 00741566), scale = 5 cm.

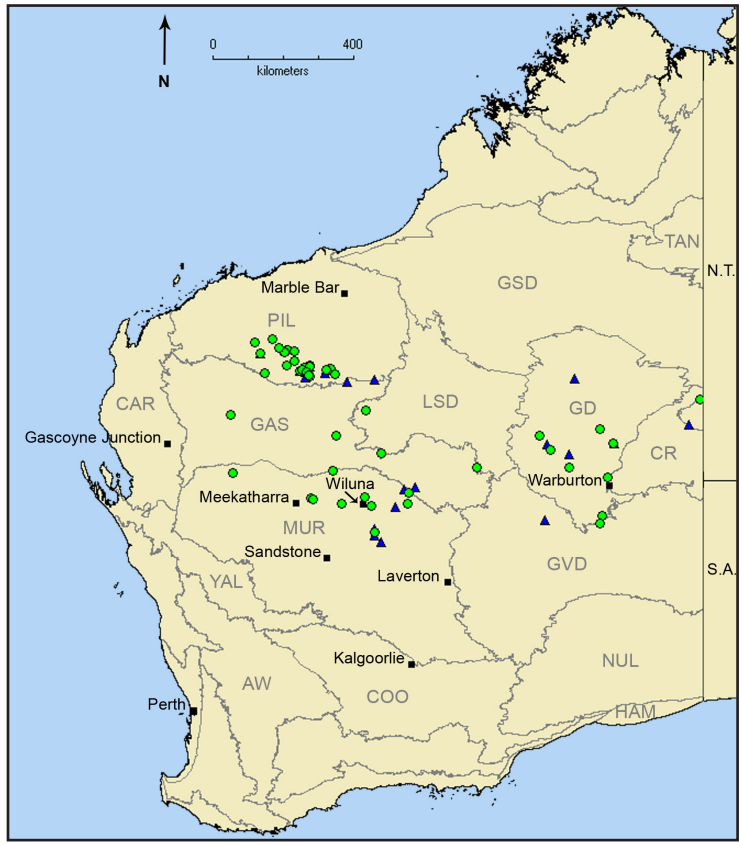


Figure 23. Distribution of *Acacia ayersiana* (●) and *A. ayersiana* (narrow-phyllode variant) (▲) based on specimens examined at the Western Australian Herbarium (PERTH). Boundaries and name abbreviations for IBRA bioregions (Department of Environment, Water, Heritage and the Arts 2008) are shown in grey.

Flowering and fruiting period. Plants with inflorescences at anthesis have been collected from April to June and also in February. Pods with mature seeds have been collected from early October to early November, and occasionally mid-September.

Taxonomy. *Acacia ayersiana* is a member of the Grey-green Alliance and is most closely related to *A. aneura* (see discussions below). It is a variable species, and as discussed under *Variation*, two main variants are recognised based on phyllode dimensions. Specimens of *A. ayersiana* can sometimes be difficult to distinguish from *A. caesaneura* in the Blue Alliance (especially the narrow-phyllode variants of these two species).

The Maslin specimen from 13.3 km east of Wiluna that Pedley (2001) cited under *A. ayersiana* is *B.R. Maslin* 5598 (which we provisionally regard as *A. caesaneura*), not 5594 as listed by Pedley (5594 is *Eremophila spinescens* from a different locality). We have not seen the other Western Australian specimen (*B.A. Barlow* 343) that Pedley cited under *A. ayersiana*.

Synonymy. Pedley (2001: 490) re-typified *A. aneura* var. *latifolia* based on a Cameron specimen collected from Ooldea in the Nullarbor Region of South Australia, and treated this name as synonymous

with *A. ayersiana*. The lectotype is a fruiting specimen (pods winged) with striate new shoots and slightly falcate phyllodes measuring 35–55 long and 4–7 mm wide. While this specimen does seem to be referable to *A. ayersiana* it appears to combine characters of both the short-phyllode and narrow-phyllode variants of the species that are discussed under *Variation* below. Further study of the entity is warranted, including its possible relationship to *A. caesaneura*.

Morphology. Plants possessing a conifer (all lateral branches horizontal) growth form are rare in *A. ayersiana* and have been recorded from a single population in the Great Victoria Desert, South Australia; individuals with both conifer (*H. Hewitson* 679; AD99637085) and non-conifer growth forms (*H. Hewitson* 847; AD99636126) were collected from this population.

Variation. Typical representatives of *A. ayersiana* have rather large phyllodes (mostly 50–80 mm long and 7–12 mm wide), the youngest phyllodes on the new shoots are invested with a dense, normally non-resinous indumentum of normally pale yellow (rarely white) hairs that completely or almost completely obscure the underlying nervation, and the pods are 10–14(–17) mm wide. However, as discussed below some specimens differ from typical representatives of the species in these characters.

Specimens with the shortest phyllodes (mostly 35–50 mm long) are most common in the area from Wiluna east to the Gibson Desert but a few are also found in the Pilbara; plants with normal phyllode dimensions also occur in both these areas. The new shoots on these short-phyllode morphotypes are often slightly more resinous than those of typical *A. ayersiana* and their pods are 6–10 mm wide which is narrower than normal (however, very little fruiting material has been seen). The status of these short-phyllode morphotypes requires further study. Representative specimens at PERTH include: *S. van Leeuwen* 694 (Pilbara); *B.R. Maslin* 5658 (Gibson Desert) and *B.R. Maslin et al.* BRM 9288 (near Wiluna).

A narrow-phyllode variant of *A. ayersiana* (phyllodes 4–6 mm wide) is scattered throughout the geographic range of the species in Western Australia and, judging from current records, most likely also occurs in the Northern Territory and perhaps South Australia (Figure 23). To some extent *A. ayersiana* (narrow-phyllode variant) is an entity of convenience, bringing together individuals that possess many of the characteristic features of *A. ayersiana* but which otherwise have unusually narrow phyllodes that are commonly falcately recurved. Admittedly, 6 mm is an arbitrary division between the typical and narrow-phyllode variants of *A. ayersiana*, but it is one that facilitates discussion of variation within the species and its relationship to other Mulga taxa. This same measure has been used for the same reasons in *A. caesaneura.* Judging primarily from new shoot characteristics it seems that *A. ayersiana* (narrow-phyllode variant) contains discordant elements. In some specimens the youngest phyllodes on new shoots are the same as those of typical *A. ayersiana*; these individuals are scattered throughout the range of the species in Western Australia. Representative specimens at PERTH include: *C.P. Campbell* 2585 (Patience Well, Gibson Desert), *A. Chant* LG 257 (Lorna Glen Station, NE of Wiluna), *P.K. Latz* 8006 (Walter James Range), *B.R. Maslin* 8076A and *M.E. Trudgen* 17657 (both Pilbara). In other specimens, however, the youngest phyllodes on new shoots dry dark reddish brown on account of being moderately resinous and are often striate with appressed white hairs between the rather obvious nerves. This type of new shoot is never found in typical *A. ayersiana*, but similar shoots do occur in the short-phyllode variant that is noted above; these resinous morphotypes of the narrow-phyllode variant occur in the Pilbara and Gibson Desert, and are sometimes implicated in hybridity or intergradation with *A. aneura* (see *Hybridity* below). Representative specimens at PERTH include: *D.E. Albrecht* 11399; *B.R. Maslin et al.* BRM 9208C, 9218; *M.E. Trudgen* 17655 (all Pilbara) and *S.D. Hopper* 2807 (Lake Gruszka, Gibson Desert). *Acacia ayersiana* (narrow-phyllode variant) is illustrated in Figure 21.

Affinities. *Acacia ayersiana* is related to *A. aneura* which is most readily distinguished by its narrower phyllodes that do not possess a clearly discrete, resinous marginal nerve (see *Hybridity* below for further discussion). It also seemingly has some affinities with *Acacia mulganeura* in the Blue Alliance. These species share the important characters of a very short calyx, broadly winged pods and resinous phyllode margins. Plants of *A. ayersiana* with short phyllodes are sometimes similar to elongate-phyllode morphotypes of *A. mulganeura* which are most readily distinguished by the thick, opaque (not translucent) resin on their branchlet ribs.

Specimens of *A. ayersiana* (narrow-phyllode variant) with falcately recurved phyllodes are sometimes difficult to distinguish from the narrow-phyllode variant of *A. caesaneura* (see *A. caesaneura* for discussion). These specimens are also similar to a presumed new species of Mulga that occurs in the Northern Territory that is locally called Blue Mulga and which has the phrase name *Acacia* sp. Mulga blue crown (*D.E. Albrecht* 9573). Blue Mulga occurs in the Petermann Range area (not far from the Western Australian border) and in the vicinity of Uluru National Park. It grows into trees 5–8 m tall that resprout from the base following fire. The phyllodes are 60–130 mm long, 4–6(–8) mm wide, moderately to strongly falcate, silvery grey to blue-grey and like *A. ayersiana* have a discrete (but often not prominent) resinous marginal nerve. Blue Mulga is most readily distinguished from *A. ayersiana* (which occurs in the same general region) by its longer sepals (greater than half the length of the petals) and its pods which are very narrowly winged (wing 0.5–0.7 mm wide, easily misinterpreted as being absent). Further study is needed to determine the taxonomic status of Blue Mulga and whether or not it occurs in Western Australia.

Hybridity. In the Pilbara, Gibson Desert and Central Ranges (east of Warburton) putative hybrids or intergrades involving *A. ayersiana* and *A. aneura* seem to occur. For example, *B.R. Maslin* 7235 (31 km E of Newman, Pilbara) that was provisionally referred to *A. aneura* var. *major* by Pedley (2001: 321) is regarded here as *A. aneura* × *ayersiana*; Pedley (2001: 324) considered *S.D. Hopper* 2906B (67 km SSE of the Clutterbuck Hills, Gibson Desert) as an intergrade between *A. aneura* and *A. ayersiana*. Judging solely from phyllode morphology some populations can contain a complex mix of individuals that appear to form a more or less continuum from *A. ayersiana* (phyllodes broad with resinous margins) through *A. ayersiana* (narrow-phyllode variant) and *A. ayersiana* (hybrid) (phyllodes narrower with resinous margins) to *A. aneura* (phyllodes narrow with non-resinous or slightly resinous margins).

Putative hybrids between *A. ayersiana* and *A. incurvaneura* also occur in the Pilbara near West Angelas (e.g. *M.E. Trudgen* 17615) and in a few other places where both putative parents co-occur (e.g. 16 km S of Kumarina Roadhouse just S of the Pilbara region, *B.R. Maslin et al.* BRM 9270). *Acacia ayersiana* possibly also hybridises with *A. mulganeura* in the West Angelas area (see under *A. mulganeura* for discussion).

Notes. *Acacia ayersiana* is generally killed by fire but it can regenerate from the base of the trunk. Aboriginal peoples of the Pilbara used the timber from this species to make digging sticks, clubs and other tools. *Fide* Maslin *et al.* (2010).

Conservation status. Not considered rare or endangered.

Common names. Broad-leaf Mulga (Maslin *et al.* 2010); Blue Mulga (Randell 1992: 124); Uluru Mulga (Miller *et al*. 2010).

Etymology. The botanical name is derived from the location of the type specimen which was collected in 1973 at Ayers Rock (now Uluru), Central Australia.

Acacia caesaneura Maslin & J.E.Reid, *sp. nov.*

Frutices multi-caules, in statu maturo *arbores* formosae obconicae 3–8(–10) m altae; coronae densae, argenteo-caesiae vel cinereae vel cinereo-virides suffuso cyaneae. *Ramuli* apicem versus dense appresso-pubescenti inter costae obscurae resinosae. *Surculi novi* non vel vix resinosi; phyllodia prima dense tomentulosa vel interdum striato-nervosa marginis fuscis resinosis. *Phyllodia* plerumque 30–70 × 2.5–10 mm, recto-dimidiata vel falcato-recurvata, nervo resinoso marginali plerumque non prominenti. *Legumina* brevia, lata (plerumque 15–35 × 10–15 mm), cinereo brunnea, ala marginali 1–2(–2.5) mm lata.

Typus: Vermin Proof Fence along the Paynes Find to Sandstone Road, Western Australia, 26 June 2007, *G. Byrne* 2708 (*holo*: PERTH 07788134; *iso*: K).

Acacia aneura var. *argentea* Pedley, *Fl. Australia* 11B: 490, Fig. 67G–H (2001), *Racosperma aneurum* var. *argenteum* (Pedley) Pedley, *Austrobaileya* 6: 450 (2003). *Type citation*: 'near Edah, W.A., Mar. 1938, *A. Stewart* 197.' *Type*: near Edah [Station], Western Australia, March 1938, *A. Stewart* 197 (*holo*: PERTH 00602582).

Acacia aneura var. *argentea*, L.Pedley (ms) in B.R.Maslin (co-ordinator), *WATTLE Acacias of Australia* (2001), *nom. inval.*

Multi-stemmed *shrubs* maturing to shapely, obconic, single- or few-stemmed *trees* 3–8(–10) m tall, with stems to *c.* 20 cm dbh and ±straight, the major branches obliquely ascending to erect and ±straight; crowns dense, spreading, round to sub-round and silvery bluish grey, grey or grey-green tinged blue. *Bark* grey, longitudinally fissured on main stems, smooth on upper branches. *Branchlets* densely appressed-pubescent between the rather obscure, normally resinous ribs at extremities, mature branchlets glabrous or obscurely hairy and the resin ribs absent or very obscure; *resin* usually yellowish and opaque (occasionally interspersed small patches of translucent or semi-translucent, reddish resin) and often with a surface bloom, occurring as a thin or sometimes (especially on juvenile and adolescent plants) moderately thick overburden and generally most prominent immediately below insertion of phyllodes, on mature branchlets the resin residual (as beaded lines) or more usually absent. *New shoots* not resinous or slightly resinous; *youngest phyllodes* either densely tomentulose (hairs normally white or silvery and sometimes with a few red glandular hairlets) with the indumentum completely obscuring the underlying nerves, or (in the narrow-phyllode variant) hairs less prominent and confined to between the sometimes obvious longitudinal nerves and the glandular hairlets more numerous; *expanding phyllodes* finely striate; *margins of young phyllodes* discrete, resinous and dark-coloured. *Phyllodes* (20–)30–70(–80) mm long, (2–)2.5–10(–12) mm wide, narrowly oblong to elliptic or sometimes oblanceolate, almost linear when very narrow, flat, shallowly to moderately falcately recurved and/or straight and dimidiate (often interspersed with a few straight and symmetric ones), ascending to erect or wide-spreading, not rigid, silvery grey to grey-green, blue-grey or sub-glaucous, often with a sheen, minutely appressed-hairy between the normally slightly resinous nerves, the broadest phyllodes sometimes felty due to indumentum; parallel *longitudinal nerves* numerous and fine; *margins* resinous and discrete but often not especially prominent (most evident on young phyllodes), the resin thin or thick, mostly milky white or yellow (sometimes to light brown on oldest phyllodes); *apices* obtuse to

acute or rarely acuminate, innocuous. *Gland* situated on adaxial margin of phyllode at distal end of pulvinus, indistinct. *Inflorescences* simple; *peduncles* 2–10 mm long, often densely appressed-hairy with scattered glandular hairlets when in flower, occasionally glabrous or sub-glabrous and glandular hairlets commonly absent when in fruit; *spikes* 10–20 mm long when dry, golden. *Bracteoles* sub-peltate, 0.8–1(–1.2) mm long, the claws linear, mostly 0.5–0.6 mm long and glabrous, expanded into inflexed laminae *c.* equal in length to sepals but differing in having wider laminae. *Flowers* 5-merous; *sepals*, free, ½ or slightly more than ½ length of petals, narrowly oblong to linear but slightly expanded at their sparsely hairy apices. *Pods* 15–35(–45) mm long, (7–)10–15(–20) mm wide including the wing, oblong, sometimes shallowly constricted between the seeds, firmly chartaceous, flat, greyish brown, obscurely and ±sparsely hoary with minute, appressed hairs often confined to the margins and stipe, not resinous, obscurely reticulately nerved, obtuse; *marginal wings* 1–2(–2.5) mm wide. *Seeds* oblique to transverse in the pods, 4–6(–7) mm long, 2–3(–3.5) mm wide, obloid to ±ellipsoid, mid- to dark brown, shiny; *aril* small and whitish to cream when dry. (Figures 24–27)

Characteristic features. Multi-stemmed *shrubs* maturing to shapely, obconic *trees* 3–8(–10) m tall; crowns dense and silvery bluish grey, grey or grey-green tinged blue. *Branchlets* densely appressed-pubescent between rather obscure resinous ribs towards apices, the resin normally yellowish and opaque (occasionally some ±translucent). *New shoots* not resinous or scarcely so, the *youngest phyllodes* densely tomentulose (hairs normally white) with indumentum obscuring underlying nerves, or sometimes striate with hairs between nerves, phyllode margins dark-coloured and resinous. *Phyllodes* variable in size but commonly 30–70 × 2.5–10 mm, straight and dimidiate to falcately recurved; discrete resinous marginal nerve often not especially prominent. *Pods* short and broad (mostly 15–35 × 10–15 mm), greyish brown, the marginal wing 1–2(–2.5) mm wide.

Selected specimens seen. WESTERN AUSTRALIA: 8 km ENE of Yuinmery Homestead, 16 Sep. 1986, *J. Dell* JD46 (PERTH); 10 miles [16 km] E of Paynesville, 27 Aug. 1957, *J.W. Green* 1626 (PERTH); Quadrat 5 NA5, western boundary of Kananda[h] Station, 20 Oct. 1986, *G.J. Keighery & J.J. Alford* 562 (PERTH); 21.5 km N of Sandstone on road to Meekatharra, 4 Sep. 2006, *B.R. Maslin* 8959A (PERTH); 19.5 km W of Mt Magnet on road to Yalgoo, 12 Sep. 2006, *B.R. Maslin* 9098 (BRI, PERTH); 44 km E of Mt Magnet on road to Sandstone, 12 Nov. 2008, *B.R. Maslin* 9934 (NSW, PERTH); 4.5 km N of Paynes Find on Great Northern Highway, at intersection of Paynes Find–Thundellara road, 10 Nov. 2009, *B.R. Maslin* 10149 (PERTH); 4.5 km N of Paynes Find on Great Northern Highway, at intersection of Paynes Find–Thundellara road, 10 Nov. 2009, *B.R. Maslin* 10147 (BRI, NSW, PERTH: narrow-phyllode variant); *c.* 55 km S of Laverton, around dining area Anglogolds Sunrise Dam Mine camp, 18 Oct. 2008, *B.R. Maslin & J.E. Reid* BRM 9699 (CANB, K, MEL, PERTH: narrow-phyllode variant); 18.5 km N of Menzies on Goldfields Highway to Leonora, 20 Oct. 2008, *B.R. Maslin & J.E. Reid* BRM 9723 (CANB, PERTH); 2.5 km W of Sandstone–Paynes Find road on Sandstone–Mt Magnet road, 22 Oct. 2008, *B.R. Maslin & J.E. Reid* BRM 9745 (NY, PERTH: narrow-phyllode variant); 66 km W of Sandstone on road to Mt Magnet, 23 Oct. 2008, *B.R.Maslin & J.E. Reid* BRM 9753 (CANB, K, MEL).

Distribution. *Acacia caesaneura* is endemic to Western Australia where most collections are from an area approximately bounded by Yalgoo, Meekatharra, Lorna Glen Station (*c*. 150 km ENE of Wiluna), Laverton and Kalgoorlie. The species is mainly confined to the Murchison and southern part of the Yalgoo IBRA bioregions, but extends to the margins of the adjacent Coolgardie, Gascoyne and Great Victoria Desert bioregions, and the Nullarbor bioregion. The most easterly record of *A. caesaneura* in Western Australia is *G.J. Keighery & J.J. Alford* 562 from Kanandah Station (*c*. 330 km E of Kalgoorlie) on the northern edge of the Nullarbor Plain. The typical and narrow-phyllode variants of the species (discussed below) commonly co-occur, but they can both also grow separately (Figure 28).

Figure 24. *Acacia caesaneura*. A, E – mature plants showing dense, bluish grey crowns; B – mature pods with marginal wings; C – new shoot not resinous and densely white tomentulose; D – branchlet showing phyllode variation. Photographs by B.R. Maslin.

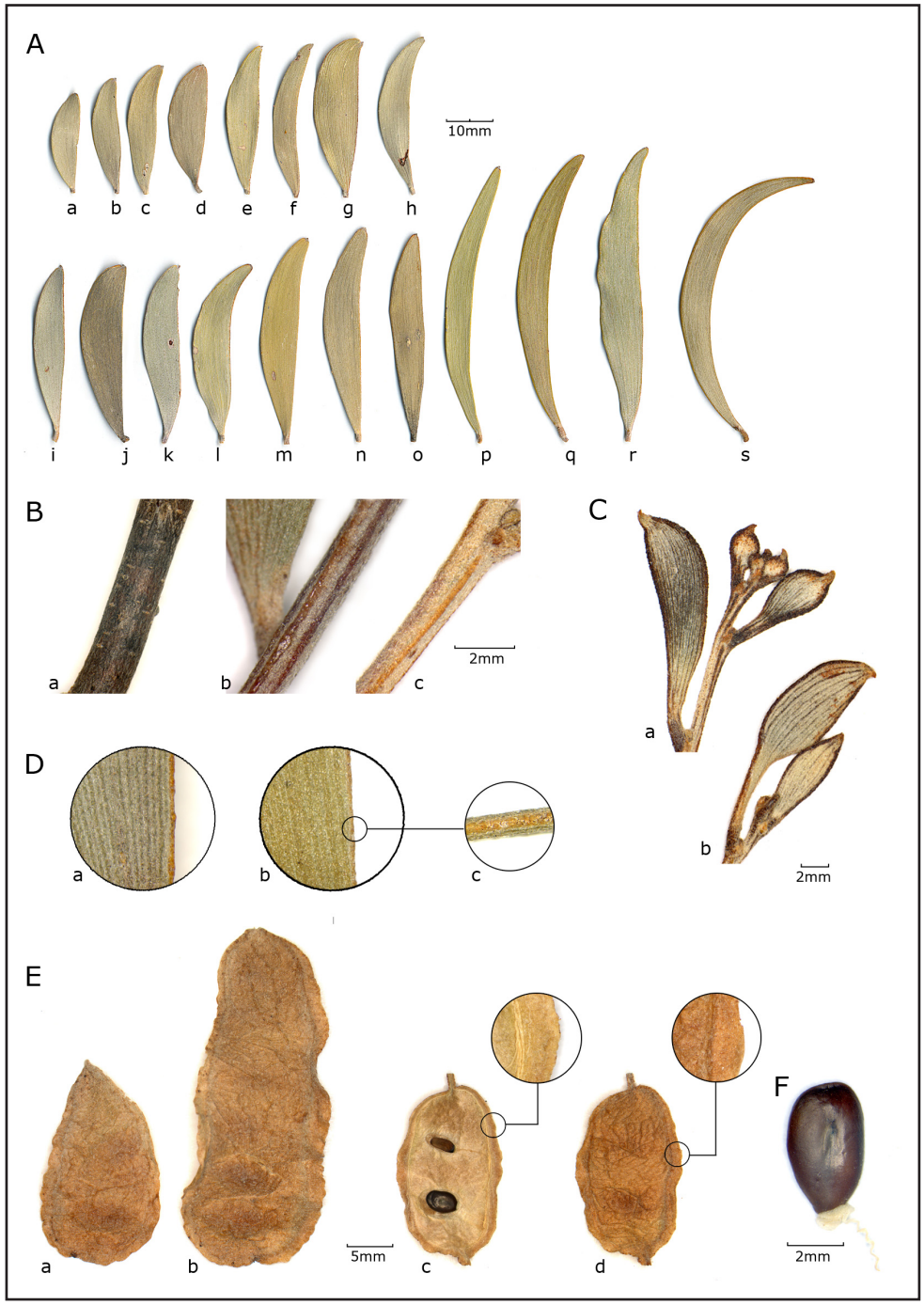


Figure 25. *Acacia caesaneura*. A – phyllode variation from a range of specimens; B – branchlets, a) mature branchlet ribless, b) penultimate branchlet with uncommon semi-translucent resin on ribs, c) penultimate branchlet with minimal opaque resin on ribs; C – new shoots, a–b) not resinous, first phyllodes densely white-tomentulose, expanding phyllodes finely striate; D – phyllodes showing resinous margins, a) well-pronounced, b) less pronounced (with close-up showing end view of margin); E – pods, a–b) pod size variation, c) interior with seeds and close-up showing marginal wing, d) exterior with close-up showing marginal wing; F – seed with small aril. Scale bars shown on figure; vouchers are listed in Appendix 1.

Habitat. Commonly grows on plains or in gently undulating country in red-brown sandy loam to clay, often over hardpan at a relatively shallow depth. It has also been recorded from a variety of other soils ranging in texture from sand to clay. The soils are not commonly rocky but sometimes have stony rubble (often quartz or banded ironstone) on the surface. The species is sometimes found in skeletal soil on low rocky hills or kaolinized breakaways, or on sand dunes. *Acacia caesaneura* grows in mixed *Acacia* shrubland or woodland communities in which it and other members of the Blue Alliance (especially *A. incurvaneura*) are often the dominant species. These communities may cover large areas and are a conspicuous element within the landscape in which they occur. The ground cover is often Spinifex (*Triodia* spp.) but Chenopods or Bunch Grass (*Aristida contorta*) have also been recorded.

Flowering and fruiting period. Plants with inflorescences at anthesis have been collected in March and August. However, plants with sporadic inflorescences have also been collected in July, August, October and November, with some plants in the latter two months possessing both inflorescences at anthesis and mature pods. Pods with mature seeds have been collected from mid-October to mid-

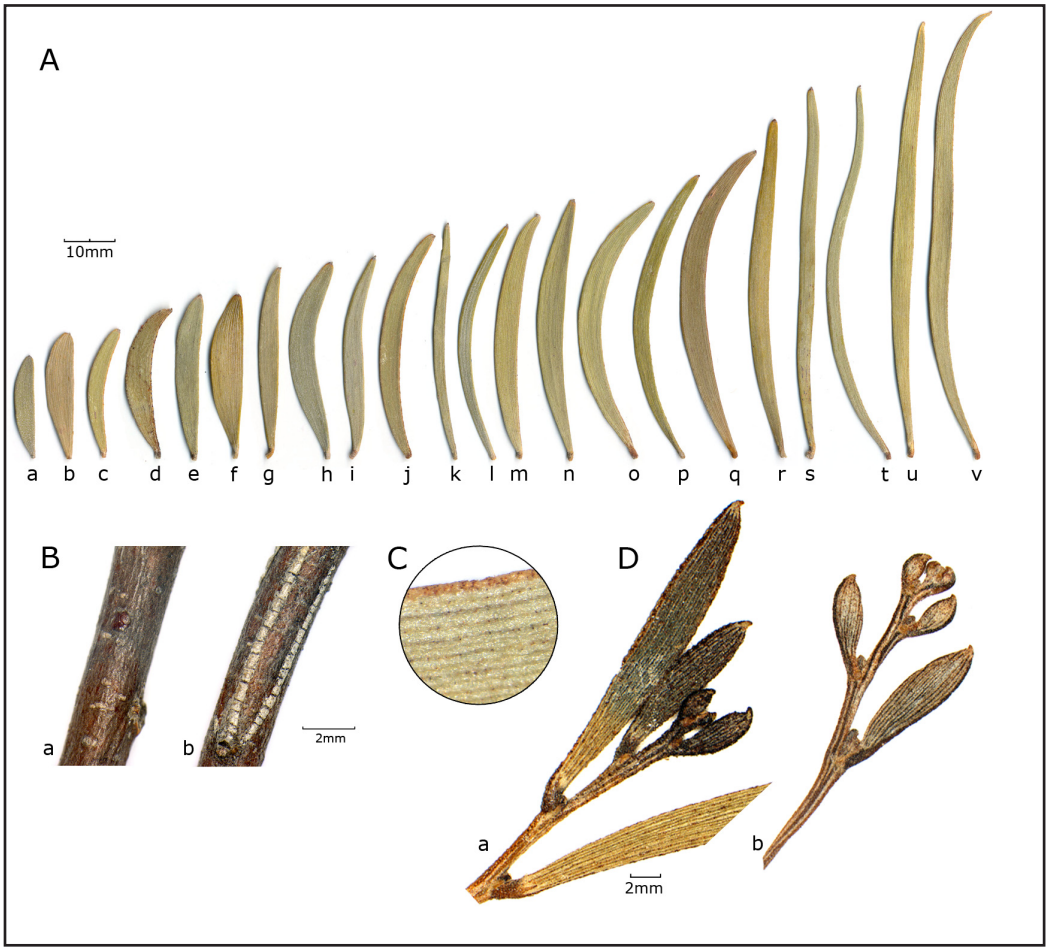


Figure 26. *Acacia caesaneura* (narrow-phyllode variant). A – phyllode variation from a range of specimens; B – mature branchlets, a) ribless, b) mealy, segmented opaque resin on ribs; C – phyllode margin resinous and well pronounced; D – new shoots, a) not resinous, first phyllodes striate with white appressed hairs confined to between the nerves (more striate and darker-coloured than typical *A. caesaneura*), b) not resinous, first phyllodes densely white-tomentulose, expanding phyllodes finely striate (similar to typical *A. caesaneura*). Scale bars shown on figure; vouchers are listed in Appendix.

Figure 27. Holotype of *Acacia caesaneura* (PERTH 07788134), scale = 5 cm.

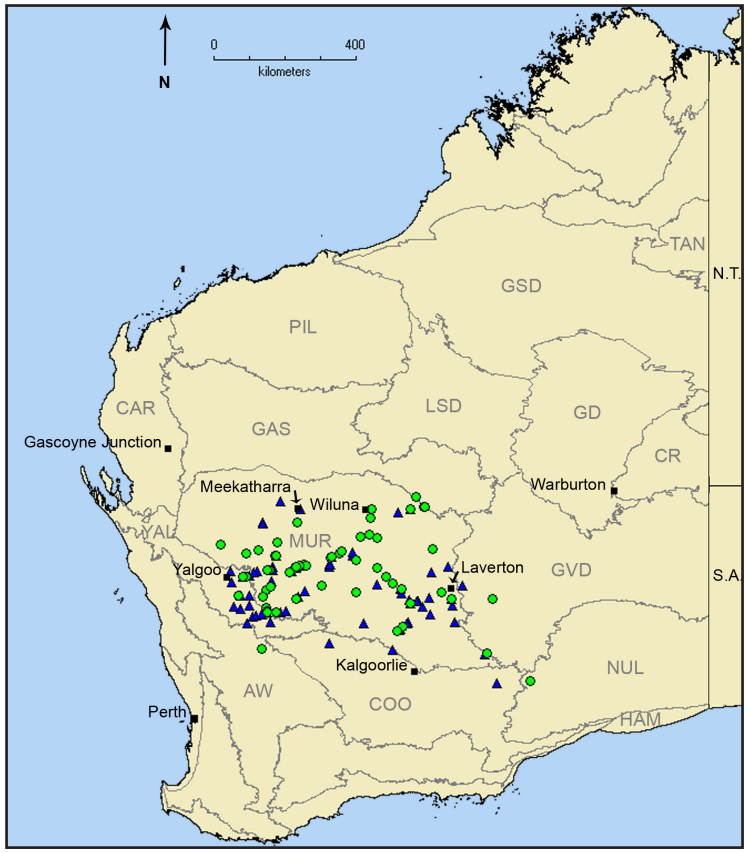


Figure 28. Distribution of *Acacia caesaneura* (●) and *A. caesaneura* (narrow-phyllode variant) (▲) based on specimens examined at the Western Australian Herbarium (PERTH). Boundaries and name abbreviations for IBRA bioregions (Department of Environment, Water, Heritage and the Arts 2008) are shown in grey.

November. The quantity of pods produced is variable, even within the one population where some plants may have large pod crops while adjacent plants may have few or none. The phenology of this species is very similar to that of *A. incurvaneura*.

Taxonomy. *Acacia caesaneura* is member of the Blue Alliance and is normally distinguished from other members of this group by a combination of its usually non-resinous new shoots, reduced branchlet resin and relatively large, straight and dimidiate or falcately recurved (never incurved) phyllodes. *Acacia caesaneura* is a variable species and as discussed below under *Variation* contains two main variants.

The specimen *A.A. Burbidge* 4 that Pedley (2001) cited under *A. aneura* var. *argentea* is *A. mulganeura*.

Variation. Unlike other members of the Blue Alliance the resin on the branchlet ribs of *A. caesaneura* is normally not very well developed (sometimes it is completely absent) and it is often hard to confidently assess this character. Typically the resin is opaque (occasionally interspersed with small patches of translucent or semi-translucent resin) and on adult plants it occurs as a relatively thin layer

over the ribs; the resin is best observed on new shoots and penultimate branchlets, especially in the region more or less immediately below the insertion of the phyllodes. Juvenile plants normally have thicker resin than adults.

The colour of new shoot indumentum on most specimens of *A. caesaneura* is white or silvery white. However, on a very few specimens in the eastern part of the species range the new shoots are very pale yellow, e.g. *P.G. Wilson* 7497 (*c*. 65 km NNE of Leonora) and *J.G. & M.H. Simmons* 2452 (*c*. 25 km S of Laverton).

Juvenile phyllodes in *A. caesaneura* are rather short, straight and dimidiate and these give way to longer, falcately recurved mature phyllodes. Individuals may have one or other of these shapes, or a mixture of the two, depending upon their age. However, some adult plants (5 m or more tall), have only the juvenile phyllode form and these plants could represent examples of neoteny.

Acacia caesaneura varies considerably in width of phyllodes which range from (2–)2.5–10(–12) mm. A narrow-phyllode variant (phyllodes 2–6 mm wide) is scattered throughout the geographic range of the species and is commonly sympatric with the typical variant (phyllodes some or all more than 6 mm wide) (Figure 28). Admittedly, 6 mm is an arbitrary division between typical and narrow-phyllode variants of *A. caesaneura*, but it is one that facilitates discussion of variation within the species and its relationship to other Mulga taxa. (This same measure has been used for the same reasons in *A. ayersiana.*) The salient features of the two variants are as follows:

Typical variant (Figure 25). Youngest phyllodes of *new shoots* covered by a dense indumentum of normally white hairs (occasionally with a scattering of red glandular hairlets) that ±obscures the underlying nervation; dark-coloured resinous margins obvious. *Phyllodes* (25–)40–60(–80) mm long, 6–10(–15) mm wide, l: w = 4–9(–11). *Pods* (9–)10–15(–20) mm wide.

Narrow-phyllode variant (Figure 26). *New shoots* as in the typical variant or the youngest phyllodes with a greater abundance of red glandular hairlets and/or the underlying nerves more pronounced thus creating a ±striate effect and an overall darker-coloured new shoot. *Phyllodes* (20–)30–70(–80) mm long, (2–)2.5–6 mm wide, l: w = (8–)10–20(–30). *Pods* (7–)8–10(–13) mm wide.

We have not pre-empted future taxonomic decisions regarding these entities by attributing formal rank to them here. Also, we have retained current taxon concepts by regarding typical *A. caesaneura* as being those specimens with broad phyllodes because these correspond to Pedley's (2001) *A. aneura* var. *argentea*.

Affinities. *Acacia caesaneura* is related to *A. incurvaneura* with which it is commonly sympatric; putative hybrids or intergrades occur between these two species. Normally, *A. caesaneura* is readily distinguished from *A. incurvaneura* by its broader phyllodes; however, when its phyllodes are very narrow (i.e. 2–3 mm wide) and ±linear they may resemble those of *A. incurvaneura*. Apart from phyllode width *A. incurvaneura* is recognised by its mostly shallowly incurved (never recurved) phyllodes and more obviously resinous new shoots and branchlet ribs.

Acacia caesaneura is also related to *A. mulganeura* which again is distinguished by its very resinous new shoots and also by its phyllodes which are straight (never recurved), mostly symmetrical (never dimidiate) and often shorter, its smaller sepals and bracteoles, generally narrower pods and its commonly lower stature. Possible intergrades between these two species are discussed under *A. mulganeura.*

The few specimens of *A. caesaneura* (narrow-phyllode variant) with atypically small phyllodes (20–30 × 3–4 mm) can resemble *A. minyura* which is distinguished by its new shoots possessing a distinct overburden of resin and its resinous phyllode margins being less well-developed; *A. minyura* normally has a lower stature than *A. caesaneura*.

The narrow-phyllode variants of *A. caesaneura* and *A. ayersiana* (Grey-green Alliance) can sometimes be difficult to separate because both taxa have relatively wide, winged pods and often falcately recurved phyllodes which always possess a discrete, resinous marginal nerve (but in *A. ayersiana* this nerve is normally darker-coloured and more prominent; best observed on young phyllodes). *Acacia ayersiana* is more widespread than the generally more southerly distributed *A. caesaneura*, but their geographic ranges overlap in the Meekatharra – Wiluna area (compare Figures 23 and 28). The most reliable character for distinguishing *A. ayersiana* from *A. caesaneura* is their sepals which are shorter in the former species. Although *A. ayersiana* has translucent resin on its branchlet ribs and *A. caesaneura* has mainly opaque resin this character cannot always be used to distinguish the species because the resin is sometimes not developed in both.

Hybridity. Plants that are seemingly hybrids or intergrades between *A. caesaneura* and *A. mulganeura* and between *A. caesaneura* and *A. incurvaneura* are discussed under *A. mulganeura* and *A. incurvaneura* respectively.

Conservation status. Not considered rare or endangered.

Common name. Western Blue Mulga.

Etymology. The species name is derived from the Latin *caesius* (blue-grey, in allusion to the colour of the phyllodes) with 'aneura' as the stem of the epithet.

Acacia craspedocarpa F.Muell., *Australas. Chem. Druggist* 2: 73 (1 March 1887). *Type citation*: 'In the vicinity of Lake Austin, *H.S. King*, Esq; between Yuin and the Murchison River, Chev. *Ernest Giles*.' *Type*: Lake Austin, Western Australia, *s. dat.*, *H.S. King s.n.* (*lecto*: NSW, leafy specimen with attached pods, *fide* B.R. Randell, *J. Adelaide Bot. Gard*. 14(2): 127 (1992); *isolecto*: MEL, 2 sheets *n.v., fide* Randell *l.c.*); *paralecto*: between Yuin and Murchison River, *s. dat.*, *E. Giles s.n.* (MEL *n.v., fide* Randell *l.c.*), PERTH 00745774).

Acacia euphleba W.Fitzg., *J. Western Australian Nat. Hist. Soc*. 2: 16 (1904). *Type citation*: 'Milly's Soak and Jack's Well, Sept. 1903; Gwalia, Nov. 1903 – W.V.F.' *Type*: near Millys Soak, near Cue, Murchison River District, Western Australia, September 1903, *W.V. Fitzgerald s.n*. (*lecto*: NSW, *fide* B.R. Randell, *J. Adelaide Bot. Gard.* 14(2): 127 (1992); *isolecto*: NSW, PERTH 00751561, PERTH 00694312, fragment). *Paralecto*: Gwalia, Western Australia, November 1903, *W.V. Fitzgerald s.n.*; *n.v.*).

Rounded or obconic, dense *shrubs* 1–4 m tall and about the same across, occasionally small *trees* to *c.* 5 m tall, single- or multi-stemmed, the stems and branches obliquely ascending; crowns grey-green to greyish and often compact. *Bark* grey. *Branchlets* often resin-ribbed at extremities, the resin translucent (but sometimes mealy therefore appearing opaque) and forming a thin veneer or a thick, segmented overburden, sometimes persisting as low profile, beaded, white lines on mature branchlets. *New*

shoots resinous, dark brown to black and dull or slightly shiny when dry; *youngest phyllodes* normally completely covered by a dense layer of dull, glandular hairlets that obscure the underlying nervation and indumentum. *Phyllodes* (10–)15–30(–40) mm long, 7–13(–18) mm wide, l: w = 1–3(–4), elliptic to oblong-elliptic, obovate or occasionally orbicular, sometimes slightly undulate, dull green to grey-green or greyish; 1–3 main *longitudinal nerves* sometimes evident, secondary nerves anastomosing to form an obvious, net-like reticulum; *margins* resinous but not especially pronounced; *apices* obtuse, innocuous, mucronulate with a central mucro. *Gland* situated on adaxial margin of phyllode at distal end of pulvinus, not prominent. *Inflorescences* simple; *peduncles* (4–)6–15(–20) mm long, often sub-stout and slightly resinous; indumentum a mixture of dark-coloured glandular hairlets and appressed, white hairs, the hairlets often sparse when in fruit; *spikes* cylindrical to ±obloid, 7–20 mm long when dry, light golden. *Bracteoles* sub-peltate or linear-spathulate, 0.5–0.7 mm long, about equal in length to sepals but morphologically dissimilar to them, the claws short and narrow, the laminae thickened. *Flowers* 5-merous; *sepals* free, half to two-thirds length of petals, oblong but slightly expanded at their scarcely thickened apices, the claws broad; *petals* 1.5–2 mm long. *Pods* 20–60(–75) mm long, 15–30 mm wide including the wing, narrowly oblong to ±circular, not or scarcely constricted between the seeds, indehiscent, thick-coriaceous to sub-woody, straight or shallowly curved, flat, yellowish to light brown, sub-glabrous to sparsely appressed-hairy between the nerves, the indumentum sometimes obscured by resin, openly reticulate with nerves raised or plane, short-stipitate; *marginal wings* broad, 1.5–4(–5) mm wide, often obvious on outer surface of valve. *Seeds* transverse in the pods, 8.5–10.5 mm long, 7–9 mm wide, ±orbicular, flat, dark brown; *aril* small and cream or pale yellow when dry. (Figures 29–31)

Characteristic features. Rounded or obconic, dense *shrubs* 1–4 m tall and about the same across, occasionally small *trees* to *c.* 5 m tall. *Branchlets* often resin-ribbed at extremities, the resin translucent. *New shoots* resinous and dark-coloured. *Phyllodes* relatively short and broad (mostly 15–30 × 7–13 mm with l: w = 1–3), elliptic to oblong-elliptic, obovate or occasionally orbicular, obtuse; nerves anastomosing to form a net-like reticulum. *Pods* rather wide (15–30 mm), indehiscent, thick-coriaceous to sub-woody, yellowish to light brown, openly reticulate with nerves raised or plane; *margins* with a broad wing 1.5–4(–5) mm wide. *Seeds* large (8.5–10.5 × 7–9 mm), ±orbicular and flattened.

Selected specimens seen. WESTERN AUSTRALIA: 1.8 km from the Doolgunna homestead on the Mooloogool road, 14 July 2007, *G. Byrne* 2760 (CANB, PERTH); Ballan Rock, between Mt Magnet and Yalgoo, Austin District, 23 Aug. 2000, *M. Hancock* 831 (PERTH, dup. of NSW 447625); Joyners Find Greenstone Belt on Lake Way Station *c.* 5 km SW of Linden Bore and 3.9 km N of Coon Well, *c.* 35 km SW of Wiluna, 20 Aug. 2006, *A. Markey & S. Dillon* 4343 (K, PERTH); 3 km N of Mt Magnet towards Cue, Great Northern Highway, 6 July 1980, *B.R. Maslin* 4559 (BRI, MEL, PERTH); 28 km S of Mt Magnet on Great Northern Highway to Wubin, 26 Oct. 2008, *B.R. Maslin & J.E. Reid* BRM 9786 (PERTH); 24 km NNW of Leonora, 15 June 1977, *A.Z. Parker* 64 (PERTH); Mt Narryer, Murchison River, 1897, *I. Tyson s.n.* (PERTH 00604259); near Depot Springs Homestead which is 80 km E of Sandstone, 27 Aug. 1970, *P.G. Wilson* 8906 (MEL, PERTH).

Distribution. *Acacia craspedocarpa* is endemic to Western Australia where it occurs in an area bounded by Yalgoo and Byro Station (*c.* 260 km N of Yalgoo) in the west and Wiluna, Laverton and near Kalgoorlie in the east. The species is mostly confined to the Murchison IBRA bioregion but extends to the periphery of the adjacent Gascoyne and Yalgoo bioregions. It is often quite common in places (Figure 32).

Habitat. Grows in red-brown clay or in loam or sandy clay-loam, often with stony rubble on the surface and normally hardpan at a relatively shallow depth. Most commonly found on flats in low lying

Figure 29. *Acacia craspedocarpa*. A – mature plant showing rounded habit; B – branchlets with inflorescence spikes; C – phyllode showing reticulate nervation; D, E – mature pods prominently reticulate and with broad marginal wings. Photographs by B.R. Maslin.

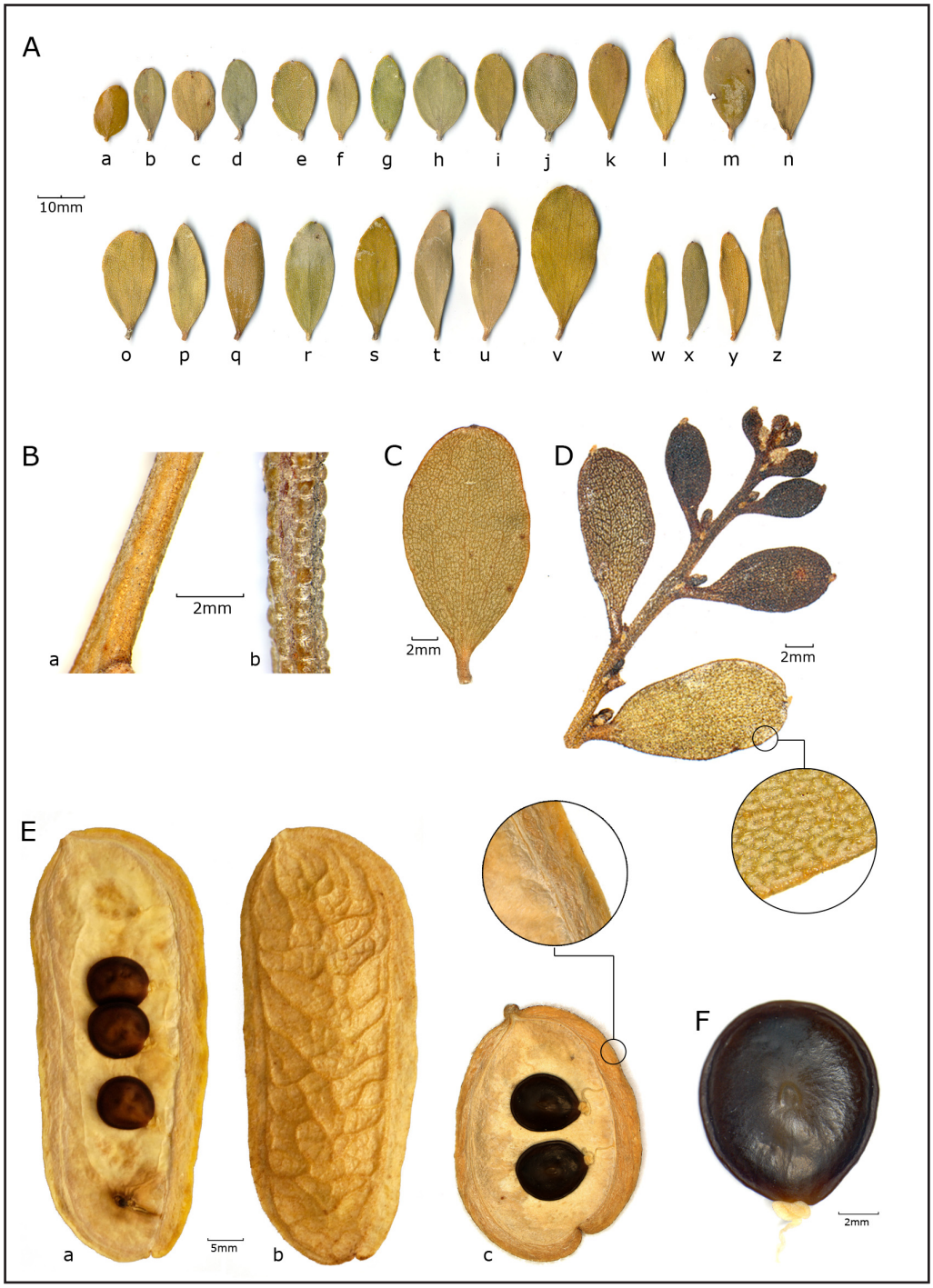


Figure 30. *Acacia craspedocarpa*. A – phyllode variation from a range of specimens, (w–z) phyllodes at upper extremity of length: width ratio; B – penultimate branchlets, a) minimal translucent resin on ribs, b) thick overburden of (mealy) translucent resin on ribs; C – phyllode nervation closely reticulate; D – new shoot dark-coloured and resinous, first phyllodes covered with dense layer of glandular hairlets, expanding phyllodes obviously reticulate; E – pods, a) interior with seeds, b) exterior showing prominent reticulum and marginal wings, c) interior with seeds and close-up showing broad, prominent marginal wing; F – seed with small aril. Scale bars shown on figure; vouchers are listed in Appendix ..

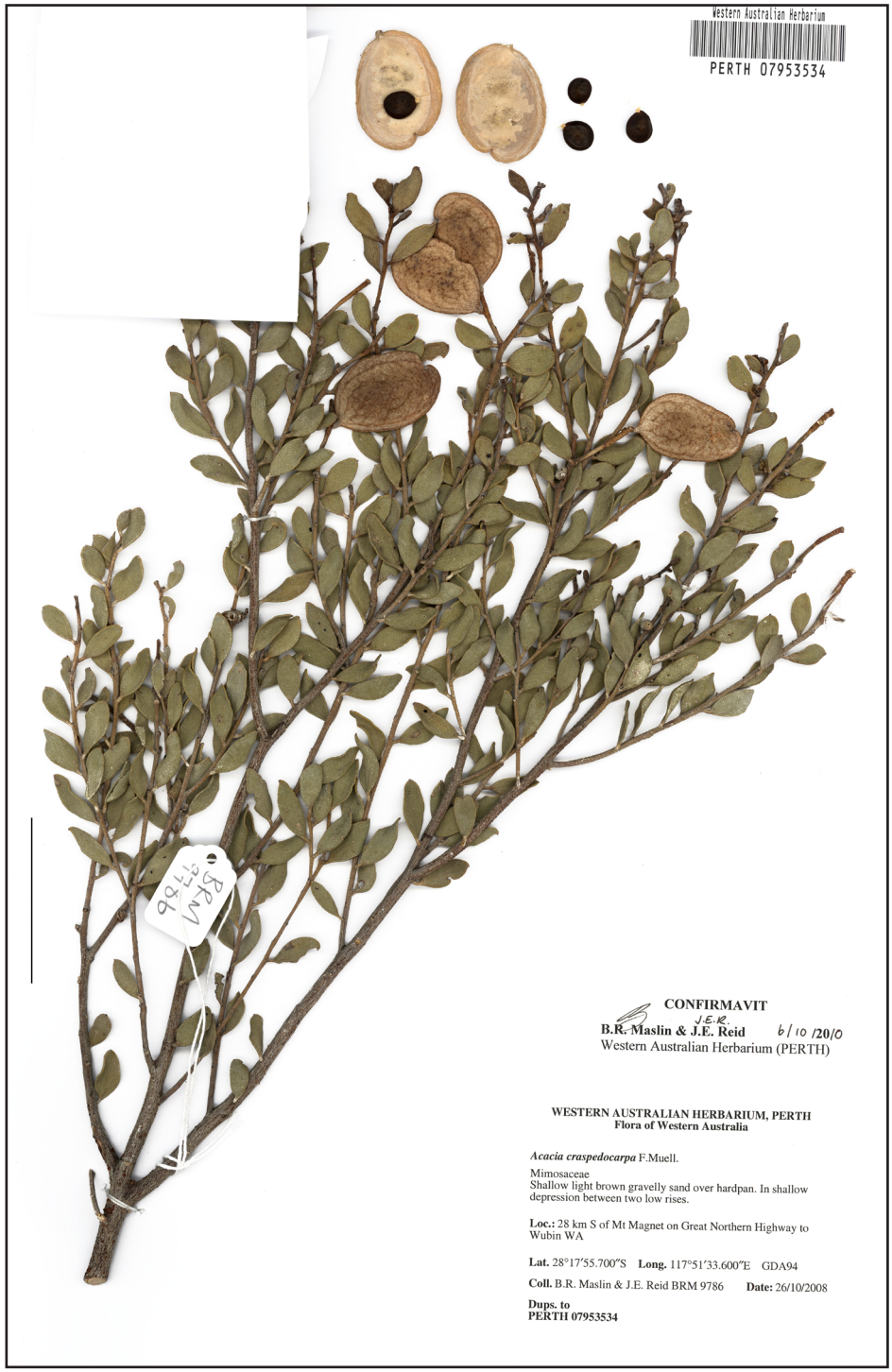


Figure 31. Specimen sheet of *Acacia craspedocarpa* (PERTH 07953534), scale = 5 cm.

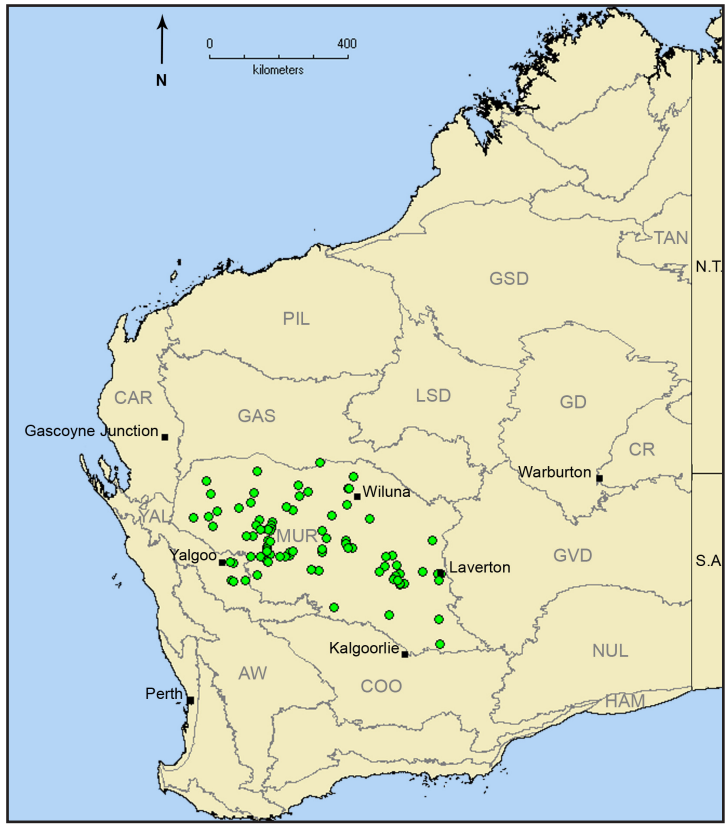


Figure 32. Distribution of *Acacia craspedocarpa* (●) based on specimens examined at the Western Australian Herbarium (PERTH). Boundaries and name abbreviations for IBRA bioregions (Department of Environment, Water, Heritage and the Arts 2008) are shown in grey.

areas, particularly water-gaining sites such as floodplains and along diffuse watercourses and drainage channels. *Acacia craspedocarpa* occasionally occurs higher in the landscape on low rocky hill slopes and at the base of breakaways. It is commonly found in mixed Mulga or *Acacia* shrubland.

Flowering and fruiting period. Plants with an abundance of inflorescences at anthesis have been collected in March, April, June and September to December. However, not all plants in these months possessed flowers. Sterile plants and plants with few flowering inflorescences occur in the June–November period. Further insights into the flowering phenology of *A. craspedocarpa* is obtained from Hellmuth (1969) who reported that in a study area near Cue the species displayed two flowering flushes, one in October 1965 and another in May 1966. As the pods of this species are indehiscent and appear to persist on the plants for some time following maturation of the seed it is somewhat difficult to accurately assess fruiting phenology using herbarium material. However, these records show that pods with mature seed have been collected from July to December and in March, but plants with immature pods also occurred during some of this period. Sometimes pods co-occur on the plants with flowering inflorescences.

Taxonomy. *Acacia craspedocarpa* is a member of the Grey-green Alliance and is unique within the Mulga group in having reticulately-nerved phyllodes.

The Winnecke specimen from 'near Stuarts Range' that was provisionally referred to *A. craspedocarpa* by Mueller (1887) in the protologue of that species is most likely *A. mulganeura* (see under this species for discussion).

Affinities. *Acacia craspedocarpa* can easily be confused with *A. mulganeura* on account of the two species often having phyllodes of a similar shape and size. *Acacia mulganeura*, however, is most easily distinguished by its striate (not reticulate) phyllode nervature and its smaller pods and seeds.

Hybridity. Plants considered to be putative hybrids or intergrades involving *A. craspedocarpa* are normally recognised by their elongate phyllodes (l: w commonly above 4) that possess relatively few anastomosing nerves (nervature is best observed on the young phyllodes). In most cases, however, the identity of the other species involved is unknown. These plants are of common occurrence and therefore are determined at PERTH as *A. craspedocarpa* (hybrid) (Figure 33). While phyllode proportions and a subjective assessment of reticulum development seem somewhat arbitrary ways of distinguishing between typical *A. craspedocarpa* and suspect hybrids/intergrades, they are convenient measures that seem to work in practice and most plants can be confidently identified using these characters. However, Miller *et al.* (2002) were unable to confirm genetically that plants with sparingly anastomosing phyllodes in a mixed Mulga population near Mt Magnet were hybrids involving *A. craspedocarpa*. While there may be several explanations for this unexpected result one possibility suggested by Miller *et al.* (*l.c.*) is that the putative hybrids may fall within the natural range of variation for *A. craspedocarpa.* Further study of this matter is required. Two PERTH specimens collected from Belele Station near

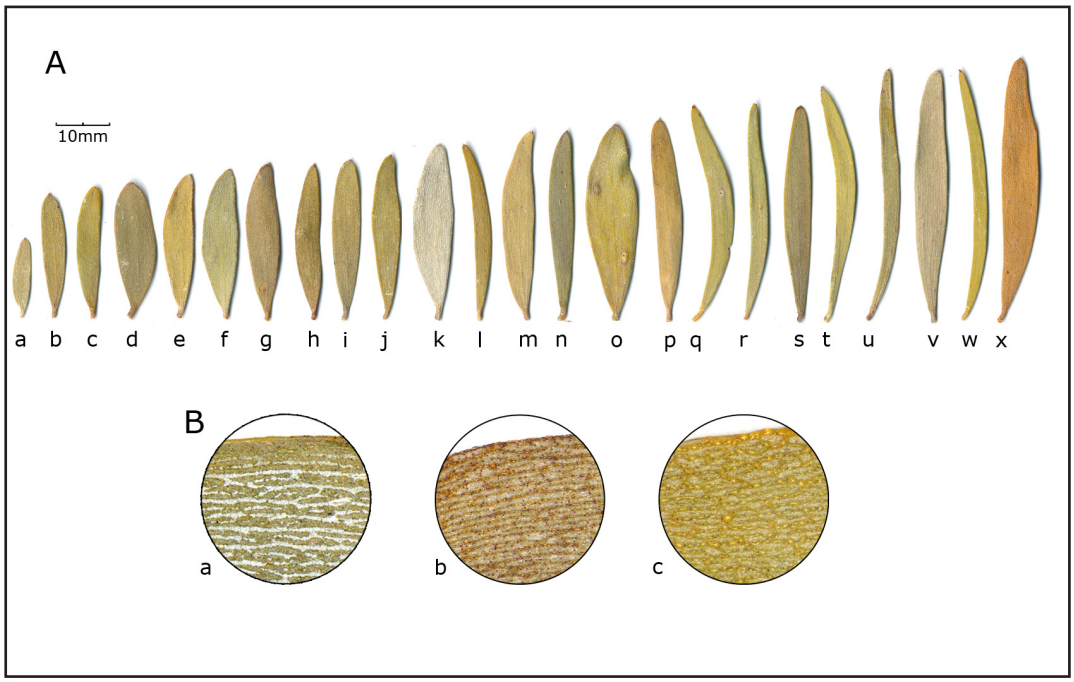


Figure 33. *Acacia craspedocarpa* (hybrid). A – phyllode variation from a range of specimens (phyllodes more elongate than in *A. craspedocarpa*); B – phyllode nervation (reticulum more elongate and often sparser than in *A. craspedocarpa*), a) mature phyllode with few, mealy anastomosing nerves, b) young phyllode with few to moderate anastomosing nerves, c) young phyllode with moderate to numerous, obviously resinous anastomosing nerves. Scale bar shown on figure; vouchers are listed in Appendix 1.

Meekatharra that were cited by Pedley (2001) under *A. aneura* var. *fuliginea* (which is treated below as conspecific with *A. fuscaneura*) belong to this *A. craspedocarpa* hybrid/intergrade complex, namely, *A.W. Humphries* M 31 and *M. Kerkhoff s.n.* (PERTH 00664138).

In addition to the above, and judging from morphological criteria and field observations, it seems likely that *A. craspedocarpa* sometimes hybridises with the Mulga relative *A. ramulosa* var. *ramulosa*, e.g. *B.R. Maslin & J.E. Reid* BRM 9734 from between Sandstone and Paynes Find, and with *A. macraneura*, e.g. *B.R. Maslin et al.* BRM 7897 from Boogardie Station near Mt Magnet (both putative parents occurred with the putative hybrids in both these populations).

Conservation status. Not considered rare or endangered.

Common name. Hop Mulga.

Etymology. The botanical name is derived from the Greek *craspedo-* (edge, border) and *karpos* (fruit) in allusion to the pods having an obvious marginal wing.

Acacia fuscaneura Maslin & J.E.Reid, *sp. nov.*

Arbores obconicae plerumque formosae 3–8(–10) m altae, interdum forma coniferarum vel (in statu juvenili) pseudo-coniferarum. *Ramuli* obscure costati vel ecostati. *Surculi* novi non resinosi, nigelli ad badii vel porphyrei, plerumque facie subtiliter granulosa ob pilos minutos glandulosos persistentes ornati. *Phyllodia* plerumque 50–100 × 1–3 mm, plana, sub-recta ad leviter curvata, sigmoidea vel sinuata, sordido-viridia ad cinereo-viridia. *Glans* plerumque 0–2 mm supra pulvinum. *Legumina* plerumque 8–13 mm lata, inter semina leviter vel moderate constricta, plerumque suffuso purpurea, minute adpresso pilosa, devexo-marginata vel interdum anguste-alata. *Semina* plerumque discoidea vel late ellipsoidea et potius grandis (plerumque 4–7 × 4–6 mm).

Typus: Beringarra Station, 8 km south-east of homestead, 190 km north-west of Cue on Cue–Beringarra Road, Western Australia, 24 October 2008, *B.R. Maslin & J.E. Reid* BRM 9754 (*holo*: PERTH 07933398; *iso*: PERTH 08227314).

Acacia aneura var. *fuliginea* Pedley, *Fl. Australia* 11B: 489 (2001); *Racosperma aneurum* var. *fuligineum* (Pedley) Pedley, *Austrobaileya* 6: 450 (2003). *Type citation*: "2 km W of Mid Shiner Well, Milly Milly Stn, W.A., 25°48'S 116°51'E, 28 Apr. 1986, *R.J. Cranfield* 5383; holo: PERTH." *Type*: 2 km W of Mid Shiner Well, Milly Milly Stn, Western Australia, 28 April 1986, *R.J. Cranfield* 5383 (*holo*: PERTH 00805580).

Acacia aneura var. *fuliginea*, L.Pedley (ms) in B.R.Maslin (co-ordinator), *WATTLE Acacias of Australia* (2001), *nom. inval*.

Acacia sp. Mulga dark shoots (B.R. Maslin & J.E. Reid BRM 9754): *Australian Plant Census*, http://www.anbg.gov.au/chah/apc/index.html; Western Australian Herbarium, in *FloraBase*, http://florabase.dec.awa.gov.au [accessed June 2010].

Obconic, often shapely, single- or few-stemmed *trees* 3–8(–10) m tall, sometimes with a pseudo-conifer (adolescent plants) or rarely a conifer growth form, stems to 20(–30) cm dbh, stems and major branches straight to slightly or obviously crooked, the upper branches obliquely ascending to erect (except some or all horizontal on pseudo-conifer and conifer plants); crowns normally ±rounded, sub-dense and light greyish green. *Bark* charcoal grey to blackish, longitudinally fissured on main stems and branches. *Branchlets* obscurely ribbed or ribless, the ribs not resinous or rarely covered with a thin veneer of translucent resin, sparsely appressed-hairy at extremities but soon glabrous; dark-coloured glandular hairlets present on young branchlets. *New shoots* not resinous, distinctively blackish to chocolate brown (often tinged purple) or rusty brown to dark red-brown when fresh; *youngest phyllodes* (except the mucro) normally completely covered by a dense layer of dark-coloured (often blackish) glandular hairlets that completely obscure the underlying nerves and white, appressed hairs (the hairlets impart a dull, finely granular appearance to the surface of the phyllodes; they become scattered as the shoot elongates but persist and are obvious on expanding phyllodes, young branchlets and often also the first mature phyllodes). *Phyllodes* 50–100(–120) mm long, 1–3(–5) mm wide, narrowly linear or sometimes narrowly elliptic, flat, sub-straight to shallowly incurved, shallowly recurved, sigmoid or wavy, not rigid, single or occasionally clustered in groups of 2 or 3 at each node, dull green to grey-green (often sub-glaucous when young), sometimes with a slight silvery sheen when fresh, appressed-hairy between the nerves but indumentum very obscure; parallel *longitudinal nerves* very fine, close together and of uniform prominence; *margins* not resinous or occasionally with a very narrow band of resin; *apices* normally acute, innocuous. *Gland* situated on adaxial margin of phyllodes normally 0–2(–5) mm above pulvinus, rarely to 8 mm, not prominent, sometimes (especially on narrowest phyllodes) the phyllode slightly swollen and/or slightly kinked at the gland. *Inflorescences* simple; *peduncles* (4–)5–12(–15) mm long, with sparse to dense, appressed, white hairs interspersed with reddish glandular hairlets when in flower, often sub-glabrous with scattered or no glandular hairlets when in fruit; *spikes* 10–30 mm long when dry, golden to light golden. *Bracteoles* sub-peltate to spathulate, 0.5(–1) mm long, the claws short and expanded into thickened, inflexed laminae, morphologically dissimilar to sepals. *Flowers* 5-merous; *sepals* free or shortly united at their base, ⅓–½ length of petals, oblong to narrowly oblong, not or scarcely expanded at their non-thickened apices; *petals* 1.3–1.5 mm long. *Pods* (10–)20–50(–65) mm long, (6–)8–13 mm wide including the wing, oblong to narrowly oblong, mostly shallowly to moderately constricted between the seeds, sometimes some deeply constricted or straight-edged, thinly coriaceous, flat, dull mid-brown or more commonly greyish brown, often with a purplish tinge when fresh, sparsely to ±densely and minutely appressed white-hairy, with reddish glandular hairlets often present (especially on stipe, at apex or on margins), not resinous, obscurely reticulate with at least some nerves trending longitudinally, shortly but distinctly stipitate; *margins* mostly bevel-edged but sometimes narrowly winged, the wing to 1 mm wide. *Seeds* longitudinal to oblique or transverse in the pods, 4–7(–8) mm long, (3–)4–6 mm wide, discoid to widely ellipsoid or sometimes obloid, distinctly flattened, dark brown, shiny; *funicle* and the small aril white or very pale yellow. (Figures 34–36)

Characteristic features. Obconic, often shapely *trees* 3–8(–10) m tall, sometimes with a pseudo-conifer (adolescent plants) or rarely a conifer growth form. *Branchlets* obscurely ribbed or ribless, the ribs not resinous or rarely with a veneer of translucent resin. *New shoots* not resinous, blackish to chocolate or red-brown, the *youngest phyllodes* densely covered with glandular hairlets which often produce a finely granular appearance and which persist (but scattered) on expanding phyllodes, young branchlets and often the first mature phyllodes. *Phyllodes* rather long and narrow (mostly 50–100 × 1–3 mm), flat, sub-straight to shallowly curved, sigmoid or wavy, dull green to grey-green; resinous marginal nerve absent or almost so. *Gland* normally 0–2 mm above pulvinus. *Pods* mostly 8–13 mm wide and shallowly to moderately constricted between the seeds, commonly greyish brown with a purplish tinge, minutely appressed white-hairy, the *margins* bevel-edged or sometimes narrowly winged. *Seeds* normally discoid to widely ellipsoid and rather large (mostly 4–7 × 4–6 mm).

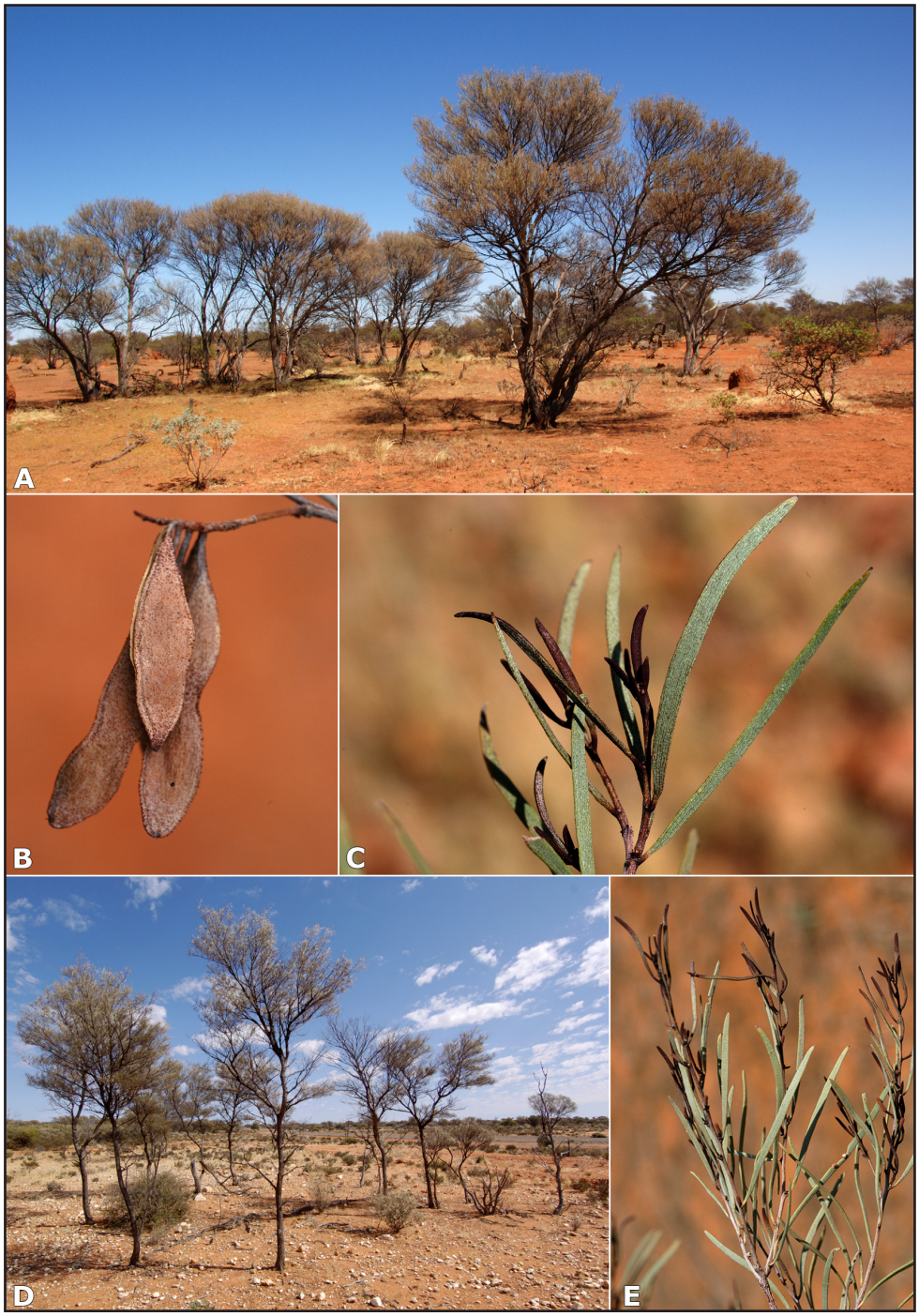


Figure 34. *Acacia fuscaneura*. A – mature plants showing obconic habit; B – pods with narrow, bevel-edged margins; C – new shoots not resinous and distinctively dark-coloured by conspicuous glandular hairlets; D – stand on small quartz plain; E – branchlet showing distinctively dark-coloured new shoots. Photographs by B.R. Maslin.

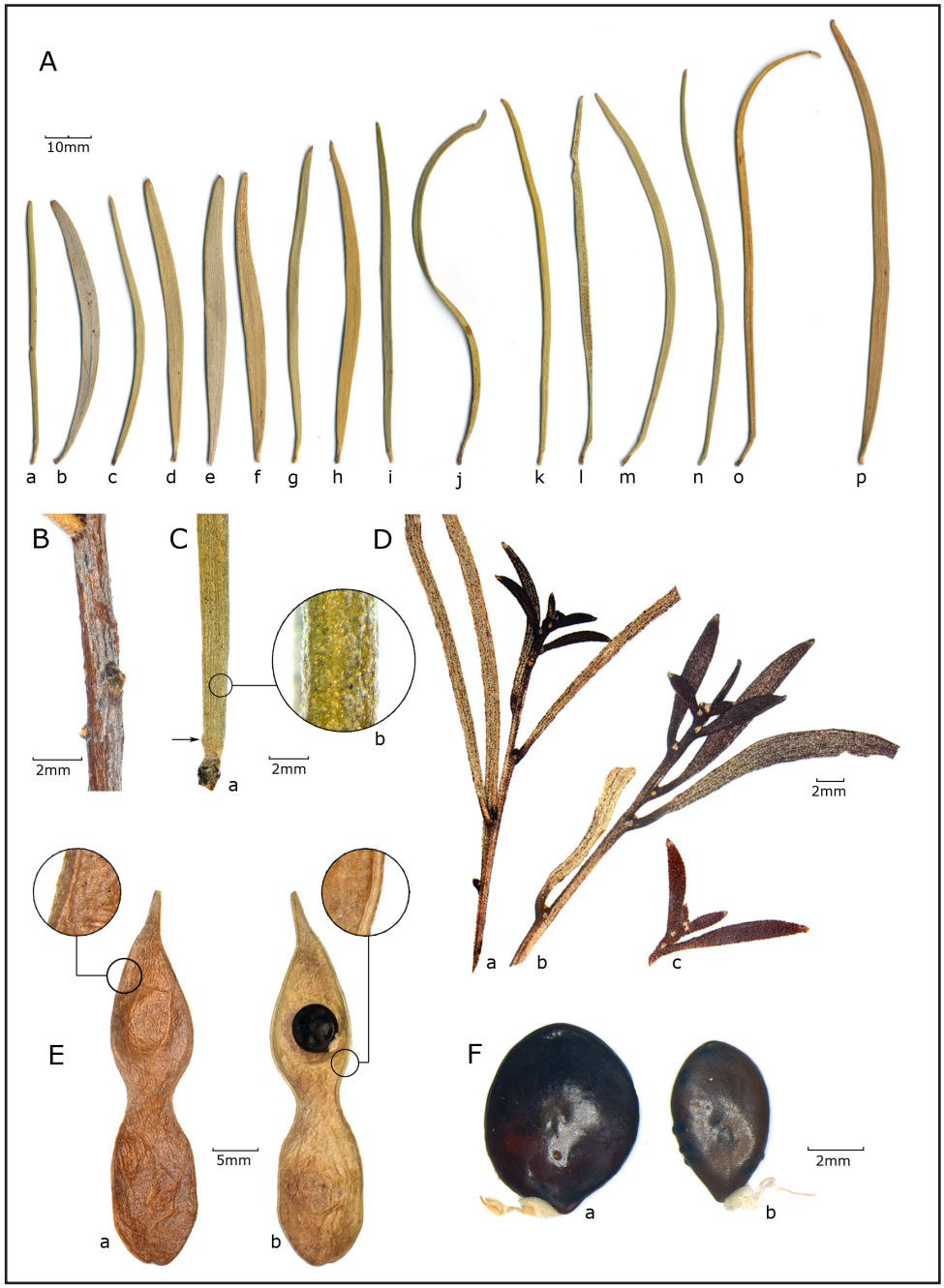


Figure 35. *Acacia fuscaneura*. A – phyllode variation from a range of specimens; B – penultimate branchlet ribless; C – phyllode showing basal gland (arrowed) and non-resinous margin (close-up showing end view of margin); D – new shoots dark-coloured and not resinous, first phyllodes covered with dense layer of glandular hairlets that persist on expanding phyllodes and young branchlets giving shoot a dull, finely granular appearance; E – pods, a) exterior with close-up showing bevel-edged margin, b) interior with seed and close-up showing suture line; F – seeds with small aril, a) typical large seed, b) seed narrower than normal. Scale bars shown on figure; vouchers are listed in Appendix 1.

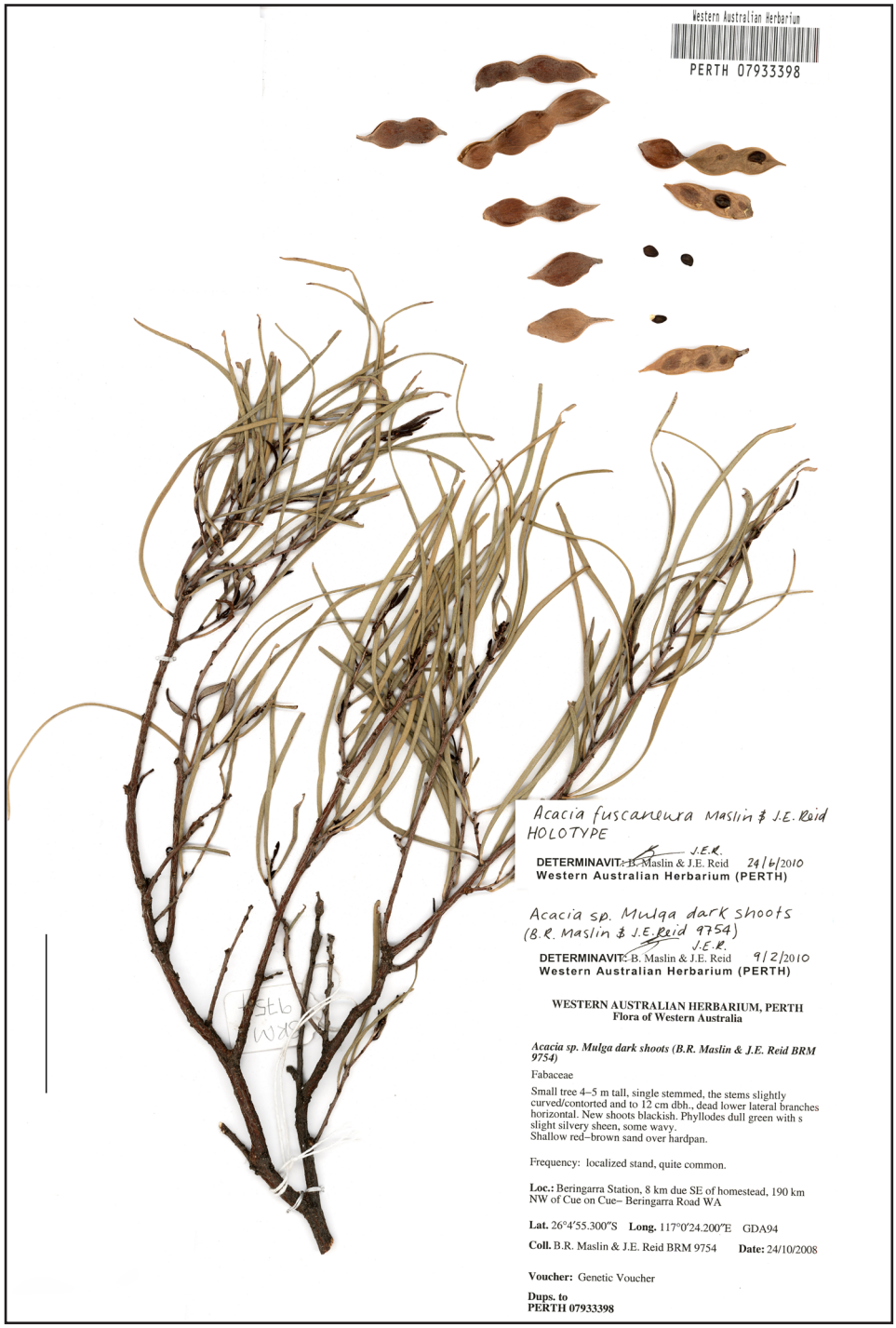


Figure 36. Holotype of *Acacia fuscaneura* (PERTH 07933398), scale = 5 cm.

Selected specimens seen. WESTERN AUSTRALIA: Lake Austin, 31 May 1966, *B.M. Allender* A7 (PERTH); 5 km W of Erong Springs homestead, 25 Apr. 1986, *R.J. Cranfield* 5345 (PERTH, Z); 35 miles [56.3 km] E of Meekatharra, 24 Jan. 1969, *M. de Graaf* K2 (PERTH: pods narrowly winged and gland clearly removed from pulvinus); Barlee Range Nature Reserve, southern boundary, 9.6 km SW of Mt Palgrave, 8.8 km ESE of Mt Maitland, 15.1 km SE of Mt Padbury, 5 Aug. 1993, *S. van Leeuwen* 1412 (PERTH); near Lennonville, *c.* 10 km N of Mt Magnet, 29 July 1974, *B.R. Maslin* 3585 (PERTH); Balfour Downs Station, 14 Aug. 2006, *B.R. Maslin* 8873 (PERTH); 29.5 km N of Meekatharra on Great Northern Highway to Newman, 11 Sep. 2006, *B.R. Maslin* 9096 (K, PERTH); Paynes Find–Sandstone Road, 71.5 km S of Mt Magnet–Leinster road, 11 Nov. 2008, *B.R. Maslin* 9921 (MEL, PERTH: pods atypically narrow); Milly Milly Station, 22 km NE of Erong Springs–Milly Milly Road on road to Yunda Outstation, 4 Oct. 2007, *B.R. Maslin, J. Miller & J.E. Reid* BRM 9145 (PERTH); 19.5 km N of Lake Barlee turnoff 76.5 km E of Leonora on road to Laverton, 27 Oct. 2007, *B.R. Maslin, J. Miller & J.E. Reid* BRM 9335G (CANB, PERTH); 10 km due ESE of Mt Magnet, Boogardie Station 'Mullitor paddock', 14 Oct. 1999, *B.R. Maslin, J. Miller, L. Sweedman & B. Cole* BRM 7897E (BRI, CANB, KPBG, PERTH); Beringarra Station, *c.* 12 km due S of Homestead, on Cue–Beringarra road, 24 Oct. 2008, *B.R. Maslin & J.E. Reid* BRM 9758 (PERTH); 140 km NW of Cue on Beringarra–Cue road, 23 Apr. 2009, *B.R. Maslin & J.E. Reid* 9980 (PERTH: coniferous growth form); on road to Wanna Station (abandoned), 10 km N of Cobra Station–Dairy Creek Station road, 26 Apr. 2009, *B.R. Maslin & J.E. Reid* BRM 10000 (AD, PERTH); Lake Ballard, *c.* 50 km W of Menzies, 30 Apr. 2009, *B.R. Maslin & J.E. Reid* BRM 10028 (PERTH); *c.* 1.5 km E of Ashburton Downs Station turn-off on Munjina–Nanutarra road (*c.* 80 km NW by road of Paraburdoo), 24 May 2009, *B.R. Maslin & J.E. Reid* 10055 (PERTH: coniferous growth form); Woodleigh-Byro [stations] turn-off, North West Coastal Highway, 28 Nov. 1971, *G. Phillips for A.M. Ashby* AMA 4493 (AD, HO, MEL, PERTH).

Distribution. *Acacia fuscaneura* is endemic to Western Australia where it extends from the Pilbara region south to Paynes Find and east to near Wiluna and Laverton. An outlier occurs in the Shark Bay district on Carbla Station (e.g. *G. Phillips for A.M. Ashby* AMA 4493). The species is not common in the Pilbara where it occurs in the vicinity of Paraburdoo with an outlier on Balfour Downs Station in the east of the region (i.e. *B.R. Maslin* 8873). It is recorded from the southern Pilbara, Gascoyne, Murchison, eastern Carnarvon and north eastern Yalgoo IBRA bioregions (Figure 37).

Habitat. *Acacia fuscaneura* often grows in brown or red-brown sand, sandy loam, clay-loam (commonly over hardpan or clay at shallow depth) or clay on stony plains or in skeletal soil on low rocky hills of mixed geology (e.g. quartz, greenstone, conglomerate, banded ironstone or laterite). It is commonly associated with water courses and sometimes grows near salt lakes, but is rarely found on unconsolidated deep sand. Grows in open to dense Mulga and/or mixed *Acacia* shrubland.

Flowering and fruiting period. Plants with an abundance of inflorescences at anthesis have been collected from about late March to early May and again in September; plants with sporadic inflorescences have been collected in April and July to October. Pods with mature seeds have been collected from early October to mid-November, however, not all plants collected during this period had pods. In September and October some plants had both pods and a few inflorescences at anthesis. Two unusual specimens are noted: *G. Phillips for A.M. Ashby* 4493 which was collected in either late November or mid-December is in full flower, and *M. de Graaf* K2 which was collected in late January had a few mature seeds.

Taxonomy. *Acacia fuscaneura* is a member of the Grey-green Alliance and judging from morphological criteria appears to be most closely related to *A. pteraneura*. The two species are sometimes sympatric and intergrades between them have been observed in a few populations (see under *Variation* below).

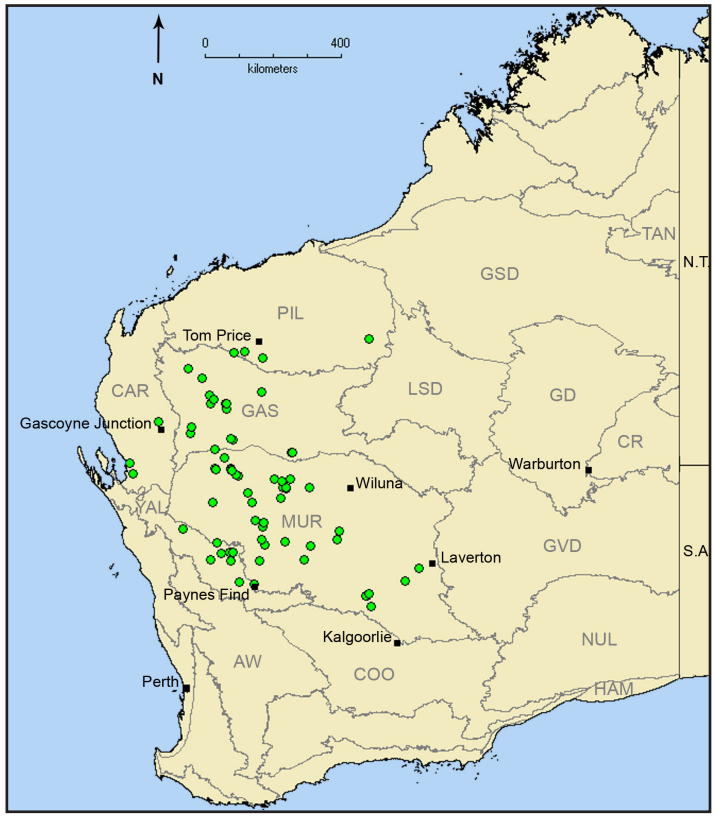


Figure 37. Distribution of *Acacia fuscaneura* (●) based on specimens examined at the Western Australian Herbarium (PERTH). Boundaries and name abbreviations for IBRA bioregions (Department of Environment, Water, Heritage and the Arts 2008) are shown in grey.

While it could be argued that *A. fuscaneura* and *A. pteraneura* should be treated as infraspecific taxa of the one species, such an action would result in a perplexingly variable species. We therefore consider it more appropriate, and not at variance with the rank ascribed elsewhere in this work, to treat them as distinct species, albeit narrowly circumscribed. *Acacia fuscaneura* is also closely related to the widespread *A. aneura* and it is sometimes difficult to distinguish the two. Differences between *A. fuscaneura* and its two close relatives are discussed under *Affinities* below.

Chloroplast DNA analyses (Miller *et al*., unpublished data) show *A. fuscaneura* and *A. macraneura* (Green Alliance) as unresolved on a clade which is sister to a clade containing *A. aptaneura* but well-separated from the clade containing *A. aneura* and *A. pteraneura*. Morphologically *A. fuscaneura* and *A. macraneura* are very dissimilar but in view of the genetic data their relationship warrants further investigation. As discussed below *A. fuscaneura* often has bevel-edged pods which Maslin *et al.* (2012) speculated may be indicative of hybridity between a rimmed and winged species. It is therefore possible that *A. fuscaneura* is of hybrid origin, perhaps involving *A. macraneura* (pods rimmed) and a winged species of the Grey-green Alliance. In addition to its pods *A. fuscaneura* is characterised by correlated morphological attributes, most notably its dark-coloured, non-resinous new shoots and rather large seeds, and is therefore considered worthy of recognition as a distinct species.

The specimens *A.W. Humphries* M31 and *M. Kerkhoff s.n.* that Pedley (2001) cited under *A. aneura* var. *fuliginea* are hybrids involving *A. craspedocarpa*, while the specimen *J.W. Green* 1625 that was also cited under var. *fuliginea* is a member of the Mulga group but we cannot name it with confidence.

Morphology. Juvenile plants of this species sometimes have some phyllodes arranged in clusters of two or three; these clusters are absent or very infrequent on adult plants. Plants possessing a conifer (all lateral branches horizontal) or pseudo-conifer (lower lateral branches horizontal) growth form sometimes occur in *A. fuscaneura*; these individual normally also have some clustered phyllodes.

The young new shoots of *A. fuscaneura* are characteristically dark-coloured (often blackish) due to a very dense layer of glandular hairlets that tend to persist (but are less dense) so that the expanding shoots have the appearance of being covered by a sooty substance. Because the young new shoots are not obviously resinous their lustre is dull and the glandular hairlets are easily scraped away (using a hard-pointed instrument such as a scalpel or forceps) to expose the underlying indumentum of white appressed hairs (or occasionally a layer of shiny resin). These new shoot characteristics can be useful in helping to distinguish *A. fuscaneura* from its two closest relatives, *A. aneura* and *A. pteraneura.* In these latter two species the youngest phyllodes on the new shoots are slightly to obviously shiny with their glandular hairlets embedded in a resin matrix which is not easily scraped away; also, in these two species the sooty nature of the expanding new shoots is normally not as well developed as it is in *A. fuscaneura*. Admittedly these are qualitative, subtle characters (and not present all year round) and it may take a little patience and experience to accurately assess them. Also, as discussed under *Affinities* below, there are some specimens that appear to be intermediate between *A. fuscaneura* and its relatives, and these specimens often also have new shoot characters that are intermediate between the new shoot types discussed above.

Variation. The pods of *A. fuscaneura* can be either bevel-edged or winged. Although a bevel-edge and a marginal wing look different, Rutishauser *et al*. (2010) interpret these marginal structures as homologous, with the bevel-edge being a highly reduced wing. In *A. fuscaneura* specimens with winged pods appear to be less common than those with bevel-edged pods. Individuals with winged pods have phyllodes about 1 mm wide, which is at the lower end of the width range for the species, and glands that are often further removed from the pulvinus (mostly to 5 mm, rarely to 8 mm) than on individuals with bevel-edged pods. When phyllodes are very narrow (*c.* 1 mm wide) care is needed not to confuse these winged-pod morphotypes of *A. fuscaneura* with *A. pteraneura* (see discussion under *Affinities* below).

The seeds of *A. fuscaneura* are normally 4–6 mm wide but on some specimens (especially in the Yalgoo – Mt Magnet area) they are sometimes slightly narrower (to 3 mm wide) and as such are the same width as the broadest seeds of *A. aneura* (the pods on these specimens are within the normal width range for *A. fuscaneura*).

Affinities. Notwithstanding the genetic data noted above *A. fuscaneura* appears to be most closely related to *A. aneura* and *A. pteraneura*, and more study is needed to better characterise and distinguish these species. Nevertheless, *A. pteraneura* is distinguished from both *A. fuscaneura* and *A. aneura* by its terete or sub-terete phyllodes (flat in the other two species). *Acacia pteraneura* is further distinguished from *A. fuscaneura* by its more resinous new shoots (see *Morphology* above), its gland often further removed from the pulvinus, its normally narrower seeds and by its pods, which are always winged (never bevel-edged) with normally wider wings, never tinged purple and are not or scarcely constricted between the seeds. These two species have been recorded as sympatric or parapatric in a number of

places (e.g. Warriedar, Milly Milly, Landor and Sherwood stations in the mid-west) but presumed intermediates between them seem to be uncommon.

Notwithstanding the above-mentioned differences between *A. fuscaneura* and *A. pteraneura* there are some specimens that cannot be satisfactorily accommodated in either species. These specimens have been labelled '*A. fuscaneura-pteraneura* group' at PERTH and are here considered to be intergrades between the two species. All presumed intergrade specimens have very narrow phyllodes (*c.* 1 mm wide) and possess unusual combinations of phyllode T.S., new shoot resinosity and pod characters. The most common of these suspect intermediates have both flat and terete phyllodes on the same plant (e.g. *B.R. Maslin* 9047 from 55 km NW of Meekatharra), thus combining the attributes of both species. Other unusual combinations of characters include terete phyllodes with bevel-edged pods (e.g. *B.R. Maslin* 8994 from 9 km N of Leonora), and flat phyllodes with resinous new shoots and with either winged pods (e.g. *B.R. Maslin & J.E. Reid* BRM 9964B from 15 km N of Paynes Find) or bevel-edged pods (e.g. *B.R. Maslin & J.E. Reid* BRM 9790A from 23.5 km W of Mt Magnet). Plants possessing these unusual combinations of characters have been recorded as growing with either *A. fuscaneura* or *A. pteraneura*, rarely with both species, or sometimes neither. Further detailed study (especially genetic) is needed to determine the taxonomic status of these presumed intergrades but it is suspected that some at least may represent hybrids between *A. fuscaneura* and *A. pteraneura.*

The most notable differences between *A. fuscaneura* and *A. aneura* are found in their pods and new shoots. In *A. aneura* the pods are more thinly textured (±chartaceous), glabrous to sparsely hairy, mostly straight-edged and often with resinous margins. There is also a slight colour difference with the pods of *A. aneura* paler-coloured and lacking the purplish tinge which commonly occurs in *A. fuscaneura*. The new shoots of *A. aneura* are more resinous than those of *A. fuscaneura*, as discussed under *Morphology* above. Other characters useful in recognising *A. aneura* include its normally smaller seeds, slightly longer bracteoles and sepals, and non-wavy phyllodes.

Although the dark-coloured new shoots of *A. fuscaneura* are often similar to those of *A. craspedocarpa* the two species do not appear to be particularly closely related. *Acacia craspedocarpa* is readily recognised by its smaller, differently shaped and reticulately-nerved phyllodes and pale-coloured, thick-textured pods that possess a prominent marginal wing.

Hybridity. From morphological criteria and field observations it appears that *A. fuscaneura* may sometimes hybridise with *A. pteraneura* (see discussion under *Affinities* above) and occasionally with *A. ramulosa*, e.g. on Milly Milly Station in the Murchison district (e.g. *B.R. Maslin et al.* BRM 9153; *A. ramulosa* var. *linophylla* – *B.R. Maslin et al.* BRM 9148 was sympatric with this putative hybrid, and *A. fuscaneura* grew nearby – see BRM 9145 below). Co-occurring with BRM 9153 was a seemingly rare putative hybrid involving *A. fuscaneura* and *A. incurvaneura* (see *B.R. Maslin et al.* BRM 9149); although neither putative parent was collected in this population both occurred nearby (*B.R. Maslin et al.* BRM 9145 – *A. fuscaneura*, and *B.R. Maslin et al.* BRM 9146 – *A. incurvaneura*).

Conservation status. Not considered rare or endangered.

Common name. Sooty Mulga.

Etymology. The species name is derived from the Latin *fuscus*- (brown, dark; with reference to the characteristically dark brown to black indumentum on the new shoots), with 'aneura' as the stem of the epithet.

Acacia incurvaneura Maslin & J.E.Reid, *sp. nov.*

Frutices multicaules, rotundati vel obconici 2.5–5 m alti, in statu maturitas *arbores* ad 6(–8) m altae, coronae ±densae, pallido-griseae ad griseo-virides vel caeruleo-griseae saepe nitore leviter argentei. *Ramuli* resino-costati, resino plerumque opaco et aliquantum crasso. *Surculi* novi plerumque resinosi. *Phyllodia* teretia vel plana et anguste linearia, plerumque 40–80 × 1–2.5 mm et leviter incurvata. *Legumina* oblonga ad fusiformia, plerumque 5–8 mm lata, ala marginali 0.5–1 mm lata.

Typus: Paynes Find–Sandstone Road, 34 km east of Great Northern Highway, Western Australia, 11 November 2008, *B.R. Maslin* 9915 (*holo*: PERTH 07955278; *iso*: K).

Acacia aneura var. *microcarpa* Pedley, *Fl. Australia* 11B: 489 (2001); *Racosperma aneurum* var. *microcarpum* (Pedley) Pedley, *Austrobaileya* 6: 450 (2003). *Type citation*: '16 miles [26 km] SW of Nannine, Eremean Province, W.A., 8 Sept. 1957, *N.H. Speck* 726; *holo*: PERTH; *iso*: AD, CANB.' *Type*: 16 miles [26 km] SW of Nannine, Eremean Province, Western Australia, 8 September 1957, *N.H. Speck* 726 (*holo*: PERTH 00490873, ex CANB; *iso*: AD, CANB *n.v.*).

Acacia aneura var. *microcarpa*, L.Pedley (ms) in B.R.Maslin (co-ordinator), *WATTLE Acacias of Australia* (2001), *nom. inval*.

Rounded or obconic, multi-stemmed *shrubs* 2.5–5 m tall and 3–6 m wide, maturing to single-or few stemmed *trees* to 6(–8) m tall, stems and major branches ±straight to somewhat crooked, the upper branches obliquely spreading to erect (the lowermost branches rarely wide-spreading); crowns dense to sub-dense, pale grey to grey-green or bluish grey (occasionally tinged brown) and often with a slight silvery sheen. *Bark* grey or sometimes brown, longitudinally fissured on main stems, smooth on upper branches. *Branchlet* ribs on upper branchlets covered with a ±thick overburden of opaque, yellowish resin (occasionally interspersed with small patches of reddish translucent resin), the resin often with a surface bloom and becoming segmented on mature branchlets where it commonly forms whitish beaded lines visible to the unaided eye, minutely and obscurely sericeous between ribs at extremities but glabrous with age. *New shoots* resinous, pale brown to dark brown or grey-brown and sometimes with a purple tinge when fresh; *youngest phyllodes* covered by a layer of opaque resin or sometimes a dense layer of red-brown, glandular hairlets that obscure (or almost obscure) the underlying indumentum and nerves, the hairlets often sparser as the shoot expands; *expanding phyllodes* striate with white appressed hairs between the resinous longitudinal nerves. *Phyllodes* (30–)40–80(–90) mm long, (0.8–)1–2.5(–3) mm wide, terete to flat, narrowly linear, shallowly or occasionally moderately incurved, sometimes interspersed with a few that are straight, shallowly sigmoid or wavy, ascending to erect, not rigid, commonly grey-green to greyish or sub-glaucous, sometimes glaucous or (especially when young) green, often with a slight sheen and/or lightly pruinose; parallel *longitudinal nerves* numerous, close together and indistinct, resinous; *margins* normally resinous but not especially prominent; *apices* normally uncinate to sub-uncinate or curved, sometimes straight and eccentrically mucronulate, innocuous. *Gland* situated on adaxial surface or edge of phyllode at distal end of pulvinus, obscure. *Inflorescences* simple; *peduncles* 3–6 mm long, with sparse, appressed, white hairs and often also red-brown, glandular hairlets when in flower, glabrous in fruit; *spikes* (10–)15–20 mm long when dry, light golden. *Bracteoles* spathulate to sub-peltate, *c.* 0.5 mm long, the claws oblong to narrowly oblong and glabrous, the laminae inflexed and slightly thickened, dissimilar to sepals. *Flowers* 5-merous; *sepals* free, *c.* ½ length of petals, oblong but the glabrous claws sometimes slightly expanded at their non-thickened, sparsely ciliolate apices; *petals* 1–1.3 mm long. *Pods* 10–40 mm long, (4–)5–8(–10) mm wide including the wing, oblong to narrowly oblong or fusiform, chartaceous, straight, flat, glabrous or (when young) microscopically appressed-hairy, dull mid-brown to dark

brown and often with a greyish tinge, often resinous or scurfy, ±longitudinally reticulate, obtuse or acute, stipitate; *marginal wings* 0.5–1 mm wide, often scarcely visible on outer surface of pod valve. *Seeds* oblique in the pods, 3.5–4 mm long, 2–2.5 mm wide, obloid to slightly ellipsoid, dark brown, flat, shiny; *aril* small and white. (Figures 38–40)

Characteristic features. Rounded or obconic, multi-stemmed *shrubs* 2.5–5 m tall and about the same across, maturing to single-or few stemmed *trees* to 6(–8) m tall; crowns dense to sub-dense and pale grey to grey-green or bluish grey often with a slight silvery sheen. *Branchlets* resin-ribbed, the resin normally opaque, rather thick and persistent on mature branchlets as whitish beaded lines. *New shoots* normally resinous, the opaque resin obscuring the underlying nerves on youngest phyllodes. *Phyllodes* terete to flat, narrowly linear, normally 40–80 × 1–2.5 mm, all or mostly shallowly incurved, commonly grey-green to greyish or sub-glaucous. *Pods* oblong to fusiform, mostly 5–8 mm wide, brown but often tinged greyish, ±longitudinally reticulate; *marginal wing* 0.5–1 mm wide.

Selected specimens seen. WESTERN AUSTRALIA: Great Victoria Desert, 220 km W of Western Australia border, 14 Aug. 1995, *H. Hewitson* 869 (PERTH ex AD); 40 km W of Windy Corner, Gibson Desert, 17 July 2001, *P.K. Latz* 17868 (PERTH ex NT); 41.8 km S of Mt Magnet towards Paynes Find, 29 July 1974, *B.R. Maslin* 3573 (PERTH); Great Victoria Desert, near SE end of Lake Rason, SE of Laverton, 13 Sep. 1984, *B.R. Maslin* 5728 (PERTH); Hamersley Range, *c.* 59 km W of Newman on road to Port Hedland, 12 July 2000, *B.R. Maslin* 8029 (BRI, CANB, PERTH); Milly Milly Station, 22 km NE of Erong Springs–Milly Milly Road on road to Yunda Outstation, 4 Oct. 2007, *B.R. Maslin, J. Miller & J.E. Reid* BRM 9146 (PERTH); 3.3 km S of Wiluna (at intersection of Goldfields Highway and Watton Street) on highway to Leinster, 20 Oct. 2007, *B.R. Maslin, J. Miller & J.E. Reid* BRM 9286 (PERTH); Weld Range, 66.5 km NW of Cue on Beringarra–Cue Road, 14 Oct. 2008, *B.R. Maslin & J.E. Reid* BRM 9646 (K, PERTH); 5.5 km N of Menzies on Goldfields Highway to Leonora, 20 Oct. 2008, *B.R. Maslin & J.E. Reid* BRM 9716 (AD, PERTH); 28 km S of Mt Magnet on Great Northern Highway to Wubin, 26 Oct. 2008, *B.R. Maslin & J.E. Reid* BRM 9785 (NSW, PERTH); S side of road, 31.7 km W of Newman turnoff on Great Northern Highway, 28 Oct. 2009, *J.E. Reid* JER 19 (PERTH). NORTHERN TERRITORY: 37 km SSW of Mt Olga on track to Foster Cliff, 7 Sep. 2009, *D.E. Albrecht & P.K. Latz* 13151 (PERTH ex NT: phyllodes at lower end of length range); 47 km E of Curtin Springs Roadhouse on road to Stuart Highway, 14 Oct. 2000, *B.R. Maslin* 8123 (CANB, PERTH ex NT: phyllodes at lower end of length range). SOUTH AUSTRALIA: Wirrealpa, Black Oak Range in the Northern Flinders Range, 18 Oct. 1946, *H.M. Cooper s.n.* (AD 966030527: possibly *A. incurvaneura* but the (immature) pods are atypically long).

Distribution. *Acacia incurvaneura* is widespread in Western Australia and ranges to north-west South Australia (Pedley 2001, as *A. aneura* var. *microcarpa*) and the south-west of the Northern Territory where it is seemingly uncommon. In Western Australia it extends eastwards from the longitude of Yalgoo (*c.* 117°E) and from Tom Price (latitude *c.* 23°S) south to the latitude of Kalgoorlie (*c.* 31°S). It is most common in the Murchison, southern Yalgoo, eastern Gascoyne and southern Pilbara IBRA bioregions but is seemingly less common in the eastern parts of the state (i.e. Gibson Desert, Great Victoria Desert, Central Ranges and southern boundary of the Great Sandy Desert bioregions). The paucity of collections in the eastern parts of the State probably reflects, at least in part, the relative dearth of collecting activity in these areas. In the Pilbara most populations of this species occur in the vicinity of West Angelas in the central part of the Hamersley Range, but it is also recorded from near Paraburdoo (Maslin *et al.* 2010). *Acacia incurvaneura* is often common in places and is often sympatric with *A. caesaneura* (Figure 41).

Habitat. *Acacia incurvaneura* has been recorded from a wide range of habitats. It commonly grows on plains or in gently undulating country in red-brown sandy loam, often over hardpan at a relatively

Figure 38. *Acacia incurvaneura*. A – stand showing mature tree with obconic habit (foreground centre) and adolescent shrub with rounded habit (foreground right); B – new shoot resinous and dark brown; C – branchlet showing phyllodes and inflorescence spikes; D – branchlet showing phyllodes; E – mature pods with obscure, narrow marginal wings. Photographs by B.R. Maslin.

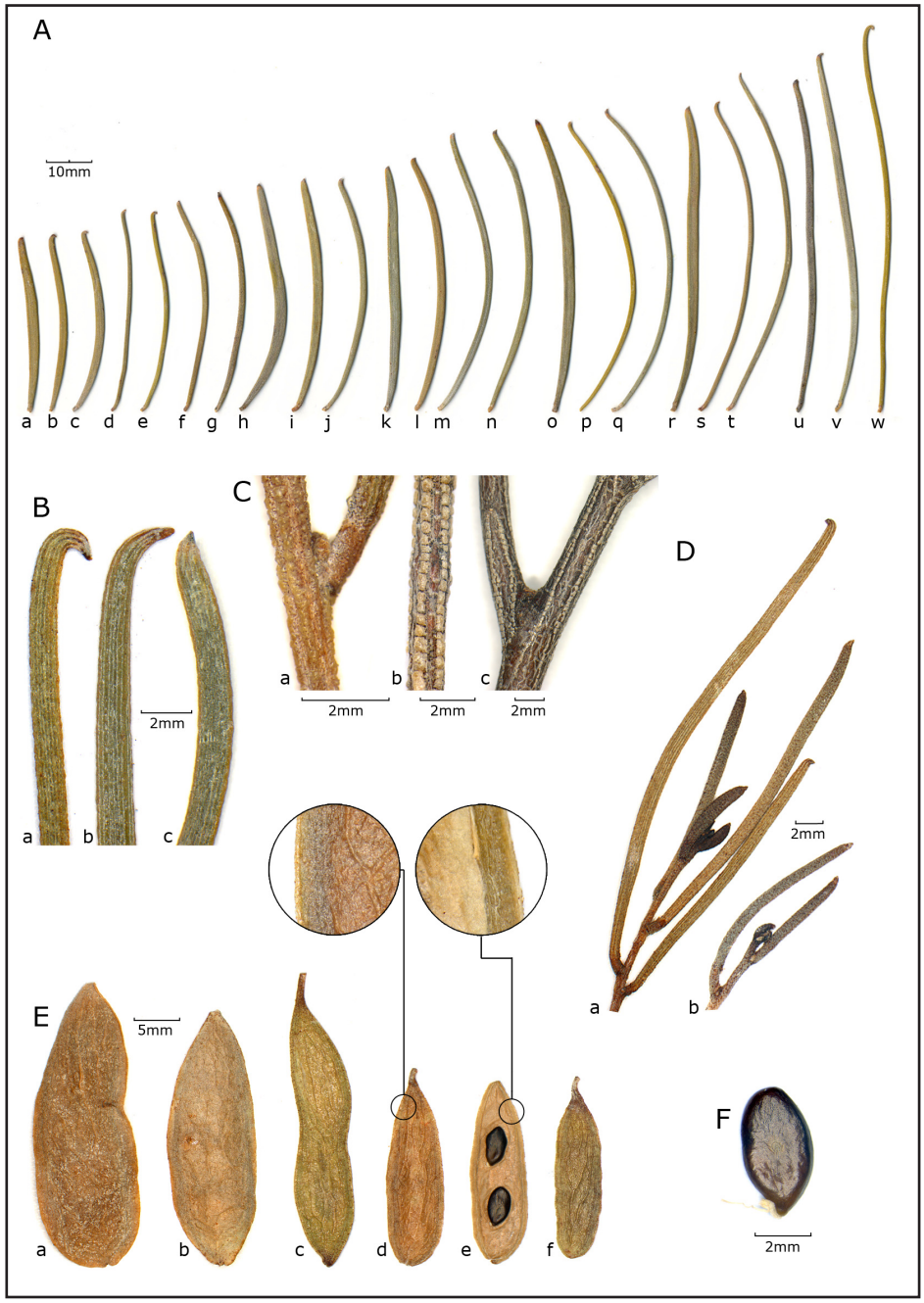


Figure 39. *Acacia incurvaneura*. A – phyllode variation from a range of specimens; B – phyllode apices, a) uncinate, b) curved, c) eccentrically mucronulate; C – branchlets with opaque resin ribs, a) penultimate branchlet with thick overburden of resin, b) penultimate branchlet with thick, transversely fractured, mealy resin, c) mature branchlet showing segmented resin forming beaded lines; D – new shoots resinous, first phyllodes with glandular hairlets in the opaque resin, expanding phyllodes striate; E – pods, a, b) pods slightly wider than normal, the marginal wings obscure, c, f) exteriors with marginal wing scarcely apparent, d) exterior with close-up showing obscure marginal wing, e) interior with seeds and close-up showing marginal wing more apparent; F – seed with small aril. Scale bars shown on figure; vouchers are listed in Appendix 1.

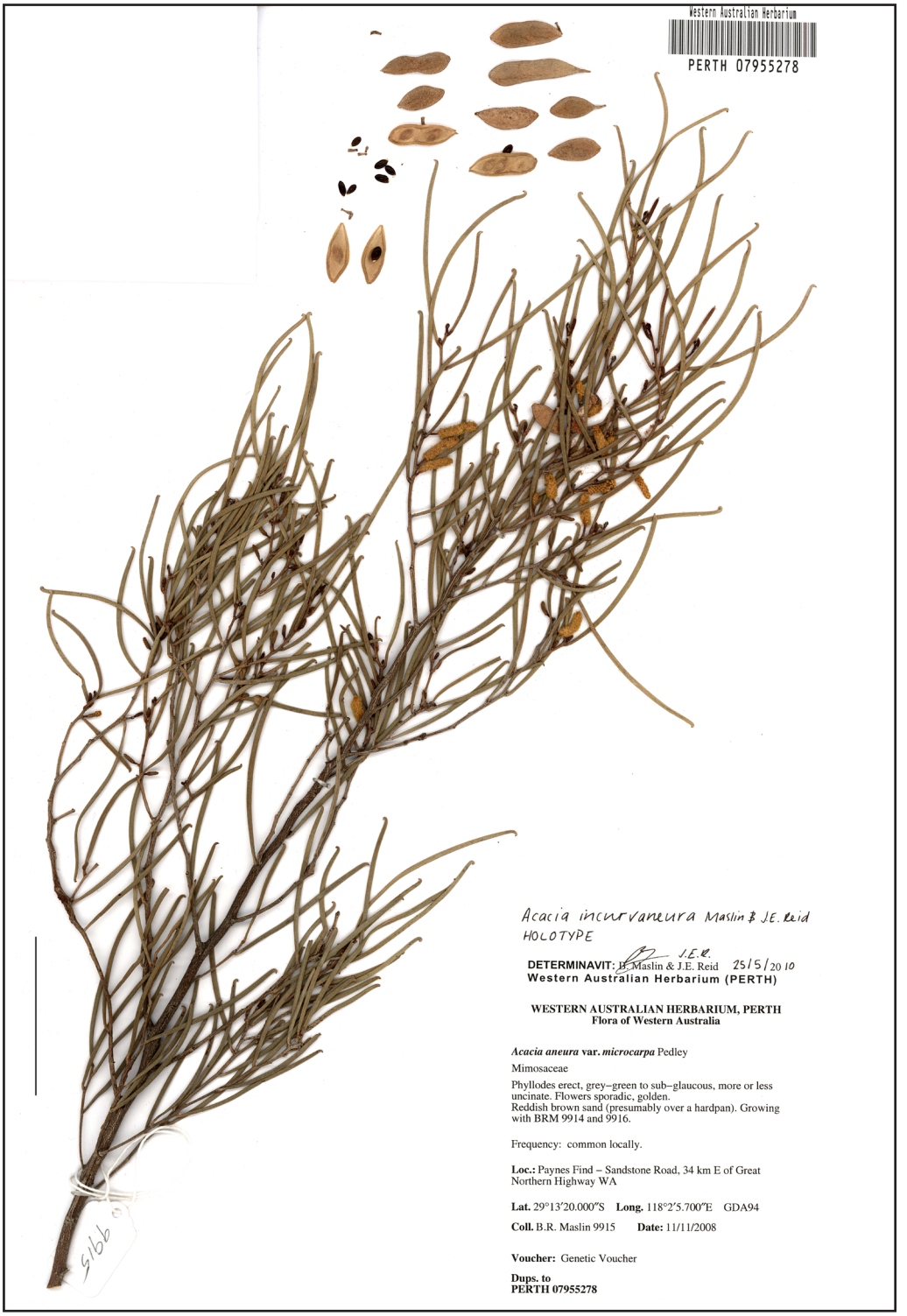


Figure 40. Holotype of *Acacia incurvaneura* (PERTH 07955278), scale = 5 cm.

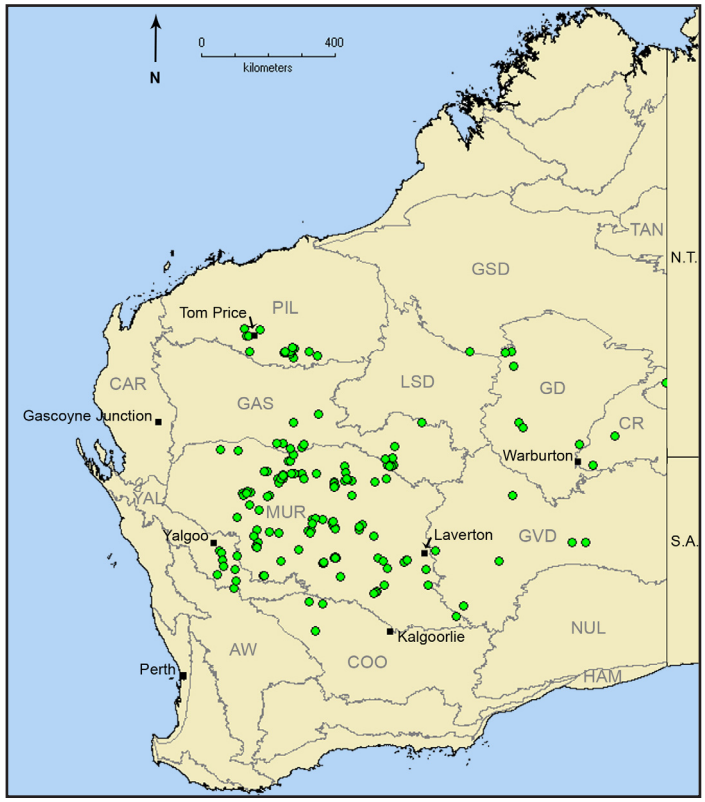


Figure 41. Distribution of *Acacia incurvaneura* (●) based on specimens examined at the Western Australian Herbarium (PERTH). Boundaries and name abbreviations for IBRA bioregions (Department of Environment, Water, Heritage and the Arts 2008) are shown in grey.

shallow depth. It has also been recorded from a variety of other soil types ranging in texture from sand to clay and sometimes with gravelly or stony rubble (often quartz or banded ironstone) on the surface. The species also often grows in skeletal soil on breakaways or low rocky hills of mixed geology (e.g. quartz, banded ironstone, weathered haematite, basalt, laterite) and on alluvial plains or along diffuse water courses. It is occasionally recorded from granite outcrops and at Queen Victoria Springs it is reported to grow in sand over sandstone. *Acacia incurvaneura* grows in mixed *Acacia* shrubland or woodland communities, often in association with other members of the Blue Alliance (especially *A. caesaneura*). The ground cover is often Spinifex (*Triodia* spp.) or sometimes Bunch Grass (*Aristida contorta*).

Flowering and fruiting period. Plants with inflorescences at anthesis have been collected in late March and April and again in mid-August. However, plants with sporadic inflorescences have also been collected in July and September to November, with some plants in October and November possessing both inflorescences at anthesis and mature pods. Pods with mature seeds have been collected from early October to mid-November, or occasionally late September. The quantity of pods produced is variable, even within the one population where some plants may have large pod crops while adjacent plants may have few or no pods at all. The phenology of this species is very similar to that of *A. caesaneura*.

Taxonomy. *Acacia incurvaneura* is a member of the Blue Alliance and is distinguished from the other members of this group by its very narrow, linear, mostly incurved phyllodes.

The specimens *A.S. George* 8191 and *K.F. Kenneally* 52A, which were cited by Pedley (2001) under *A. aneura* var. *microcarpa* are referable to *A. pteraneura*, the first being the narrow-pod variant of that species.

Variation. The phyllodes of *A. incurvaneura* vary from terete to flat and both types can co-occur in the one population (e.g. *B.R. Maslin et al.* BRM 9286 – flat and BRM 9287 – terete; *J.E. Reid* JER 19 – flat and 19A – terete).

Normally the phyllodes of *A. incurvaneura* are 50–80(–90) mm long but there are a few specimens scattered throughout the range of the species with shorter than normal phyllodes (30–50 mm long) which may be either terete or flat. These morphotypes have been recorded as co-occurring with normal (longer) phyllode morphotypes, for example, at Lorna Glen Conservation Park, about 150 km north-east of Wiluna, *B.R. Maslin et al.* BRM 9304 (long phyllodes) was sympatric with *B.R. Maslin et al.* BRM 9304B (short phyllodes). However, it is not known if short-phyllode morphotypes of *A. incurvaneura* always occur sympatrically with the normal morphotypes. They sometimes resemble the putative *A.* ? *incurvaneura* × *mulganeura* hybrid that is noted below.

Pods of *A. incurvaneura* are normally 5–7(–8) mm wide but a few specimens scattered throughout the geographic range have pods to 10 mm wide (e.g. *B.R. Maslin et al.* BRM 9269, *c*. 225 km N of Meekatharra; *B.R. Maslin et al.* BRM 9333, *c*. 61 km E of Leonora).

Affinities. *Acacia incurvaneura* appears to be related to both *A. caesaneura* and *A. mulganeura* with which it commonly sympatric and sometimes hybridises (see *Hybridity* below). Also, judging from new shoot characteristics it is not far from *A. minyura*. As already noted, *A. incurvaneura* is distinguished from these Blue Alliance relatives by its combination of resinous new shoots and narrow, linear, mostly incurved phyllodes.

Hybridity. It appears that *A. incurvaneura* hybridises (or intergrades) with both *A. mulganeura* and *A. caesaneura* with which it is sometimes sympatric (both putative parents are members of the Blue Alliance). The putative hybrids/intergrades form a complex array of morphotypes within populations (see Figure 5) and further detailed field, morphological and genetic studies are needed to resolve these patterns of variation. Nevertheless, much of the variation is encompassed by the following two entities.

Acacia ? *incurvaneura* × *mulganeura*. This entity has the general facies of a short, broad phyllode form of *A. incurvaneura* except that the phyllodes are narrowly elliptic (linear in *A. incurvaneura*) and the sepals are very short (like *A. mulganeura*). Its salient features are as follows: *Youngest phyllodes* on *new shoots* resinous. *Phyllodes* narrowly elliptic or rarely linear-elliptic, mostly 30–50 mm long and 3–4 mm wide with l: w = 10–22 (*A. incurvaneura* mostly 40–80 × 1–2.5 mm with l: w = 20–80, *A. mulganeura* mostly 20–50 × 5–10 mm with l: w = 3–7). *Sepals* less than half the length of the petals. *Pods* 5–10 mm wide. This entity is scattered throughout the Murchison and southern Yalgoo IBRA bioregions and extends to the Gibson Desert bioregion; in some, but not all, populations where it has been collected this entity co-occurred with both putative parents (e.g. N of Wiluna: *B.R. Maslin et al.* BRM 9294 – putative hybrid, *B.R. Maslin et al.* BRM 9292, 9293 – *A. incurvaneura*, *B.R. Maslin et al.* BRM 9295 – *A. mulganeura*).

Acacia ? *caesaneura* × *incurvaneura*. This entity basically has the phyllodes of *A. incurvaneura* and new shoots and branchlet resin of *A. caesaneura* (narrow-phyllode variant). However, judging from morphological criteria alone it is not certain that all specimens referred to this entity have been correctly assigned. Its salient features are as follows: Ribs at *branchlet* extremities overtopped by a poorly developed, thin or moderately thick layer of opaque, yellowish resin. *Youngest phyllodes* on *new shoots* not or scarcely resinous, finely striate with reddish longitudinal nerves or nerves completely obscured by a dense layer of reddish glandular hairlets or occasionally appressed white hairs. *Phyllodes* normally linear and 50–100 × 1–3 mm with l: w = 20–50, mostly straight to shallowly incurved but sometimes shallowly wavy; *marginal nerve* resinous but not prominent. *Pods* 7–13 mm wide including wings 1–2 mm wide. This entity is found mostly in the Murchison IBRA bioregion where it has a scattered distribution; in some, but not all, populations where it has been collected this entity co-occurred with both putative parents (e.g. between Sandstone and Mt Magnet: *B.R. Maslin & J.E. Reid* BRM 9654, 9655 – possible hybrid, *B.R. Maslin & J.E. Reid* BRM 9652, 9656 – *A. caesaneura* (narrow-phyllode variant), *B.R. Maslin & J.E. Reid* BRM 9659, 9660 – *A. incurvaneura*).

Acacia incurvaneura appears also to occasionally hybridise with members of the Grey-green Alliance, namely, *A. ayersiana*, *A. fuscaneura* and *A. pteraneura*, and rarely with *A. aptaneura* in the Green Alliance (see these species for discussion).

In addition to the above there are some specimens at PERTH that we suspect may be hybrids involving *A. incurvaneura*, but we cannot guess what the other parent might be. This material is labelled '*A. incurvaneura* (hybrid)'.

Conservation status. Not considered rare or endangered.

Common name. Narrow-leaf Mulga.

Etymology. Derived from the Latin *incurvus* (incurved, in allusion to the shallowly incurved phyllodes that are normal for this species), with 'aneura' as the stem of the epithet.

Acacia macraneura Maslin & J.E.Reid, *sp. nov.*

Frutices patentes plerumque 2–5 m alti, interdum *arbores* obconicae ad 4–6(–7) m altae. *Ramuli* ad extremitates obscure costati; costae plerumque tegmene tenui vel crasso resinae translucenti. *Surculi* novi resinosi. *Phyllodia* teretia vel interdum sub-teretia, 40–70(–90) mm longa, leviter ad valde incurvata vel sigmoidea ad sinuata, viridia ad caeruleo griseo-viridia. *Glans* 0–3 mm supra pulvinum; phyllodium ad glandem sursum curvatum vel convolutum. *Legumina* magna (plerumque 20–70 × 12–22 mm), glabra, resinosa; margines nervis crassis resinosis ornati. *Semina* magna (plerumque 7–9.5 × 5–7 mm).

Typus: 48 km south of Kumarina Roadhouse on Great Northern Highway to Meekatharra, Western Australia, 18 October 2007, *B.R. Maslin, J. Miller & J.E. Reid* BRM 9274 (*holo*: PERTH 07796323).

Acacia aneura var. *macrocarpa* Randell, *J. Adelaide Bot. Gard.* 14(2): 121 (1992); *Racosperma aneurum* var. *macrocarpum* (Randell) Pedley, *Austrobaileya* 6: 450 (2003). *Type citation*: 'upper Rudall R. area, W.A., *B.R. Maslin 2084*, 3.ix.1971 (PERTH – leafy specimens with attached pods).'

Type: Upper Rudall River area, Western Australia, 3 September 1971, *B.R. Maslin* 2084 (*holo*: PERTH 00615838; *iso*: BRI, CANB, K, MEL, NSW).

Spreading, sometimes sprawling, rounded or occasionally obconic, multi-stemmed *shrubs* commonly 2–5 m tall and about the same across, occasionally obconic *trees* to 4–6(–7) m tall, the stems and major branches often somewhat crooked but occasionally (especially on arborescent plants) straight. *Bark* grey, finely fissured at base of main stems otherwise smooth. *Branchlets* terete, minutely appressed-hairy (hairs very difficult to see without magnification) between the obscure ribs at extremities, the ribs yellow and often covered with a thin to moderately thick overburden of translucent resin. *New shoots* resinous but resin sometimes not obvious, light to dark brown at initiation when fresh but becoming yellowish (often tinged brown) or light green as the shoot expands, red-brown glandular hairlets normally scattered and not conspicuous. *Phyllodes* 40–70(–90) mm long, 0.8–1.1 mm wide, terete or sometimes sub-terete, rarely interspersed with a few flat ones, shallowly to strongly incurved (rarely recurved) or sigmoid to sinuous, sometimes interspersed with a few straight ones, resinous, often with a slight, sweet fragrance when crushed, green to grey-green with bluish tinge, obscurely appressed-hairy between the nerves, glabrous with age; parallel *longitudinal nerves* numerous, obscure and close together; *apices* acute, mucronulate, innocuous; *pulvinus* 1.5–3 mm long, ±smooth, light orange. *Gland* situated on adaxial surface of phyllode 0–3 mm above the pulvinus, the phyllodes normally slightly to rather prominently swollen, curved upwards and/or slightly or ±obviously kinked at the gland. *Inflorescences* simple; *peduncles* 5–15 mm long, glabrous or with sparse, appressed, white hairs commonly interspersed with some pale brown glandular hairlets, slightly resinous or scurfy; *spikes* 10–20 mm long when dry. *Bracteoles* sub-peltate to linear-spathulate, *c.* 0.5 mm long, the claws glabrous, the laminae widely ovate and slightly thickened. *Flowers* (few seen) 5-merous; *sepals* free or shortly united at base, half to two-thirds length of petals, the claws linear to narrowly oblong, expanded at apex into non-thickened, sparsely ciliolate laminae; *petals* 1.3–1.5 mm long. *Pods* (15–)20–70(–100) mm long, 12–22 mm wide, oblong to narrowly oblong, slightly to obviously rounded over the seeds and not or scarcely constricted between them (constrictions occasionally deep), thinly coriaceous, flat or undulate, normally yellow to light brown (rarely tinged orange), glabrous or rarely sparsely appressed-hairy, with a thin layer of transparent resin, slightly shiny at least when young, obscurely transversely reticulate, stipitate (stipe 3–5(–8) mm long); *margins* rimmed by a thick, resinous nerve often most pronounced when pods are young. *Seeds* transverse in the pods, 7–9.5 mm long, 5–7(–8) mm wide, obloid to ellipsoid or sometimes discoid, compressed, dark brown, slightly shiny; *funicle* linear, expanded into a small terminal aril. (Figures 42–44)

Characteristic features. Spreading *shrubs* commonly 2–5 m tall and about the same across, sometimes obconic *trees* to 4–6(–7) m tall. *Branchlets* obscurely ribbed at extremities, the ribs often with a thin or ±thick overburden of translucent resin. *New shoots* resinous, becoming yellowish (often tinged brown) or light green as the shoot expands. *Phyllodes* terete or sometimes sub-terete, 40–70(–90) mm long, shallowly to strongly incurved or sigmoid to sinuous, often with a slight, sweet fragrance when crushed, green to grey-green with bluish tinge. *Gland* 0–3 mm above the pulvinus, the phyllode curved upwards and/or ±kinked at the gland. *Pods* large (mostly 20–70 × 12–22 mm), normally yellow to light brown and glabrous, resinous; *margins* rimmed by a thick, resinous nerve. *Seeds* large (mostly 7–9.5 × 5–7 mm).

Selected specimens seen. WESTERN AUSTRALIA: upper Rudall River area, 9 Sep. 1971, *B.R. Maslin* 2216 (BRI, CANB, K, PERTH); 9 km due SE of Mt Magnet on Boogardie Station ('Mulletah' block), 2 June 1994, *B.R. Maslin* 7332 (BRI, PERTH); 109 km NW of Meekatharra on road to Gascoyne Junction, 10 Sep. 2006, *B.R. Maslin* 9059 (NSW, PERTH); 54 km N of Gascoyne Junction on road to Eudamullah Station, 6 Oct. 2007, *B.R. Maslin, J. Miller & J.E. Reid* BRM 9175 (AD, PERTH);

Figure 42. *Acacia macraneura*. A – plant showing typical spreading habit; B – new shoot resinous and light brown (very few glandular hairlets); C – plant showing less common arborescent habit; D – large pod with thickened marginal rim. Photographs by B.R. Maslin.

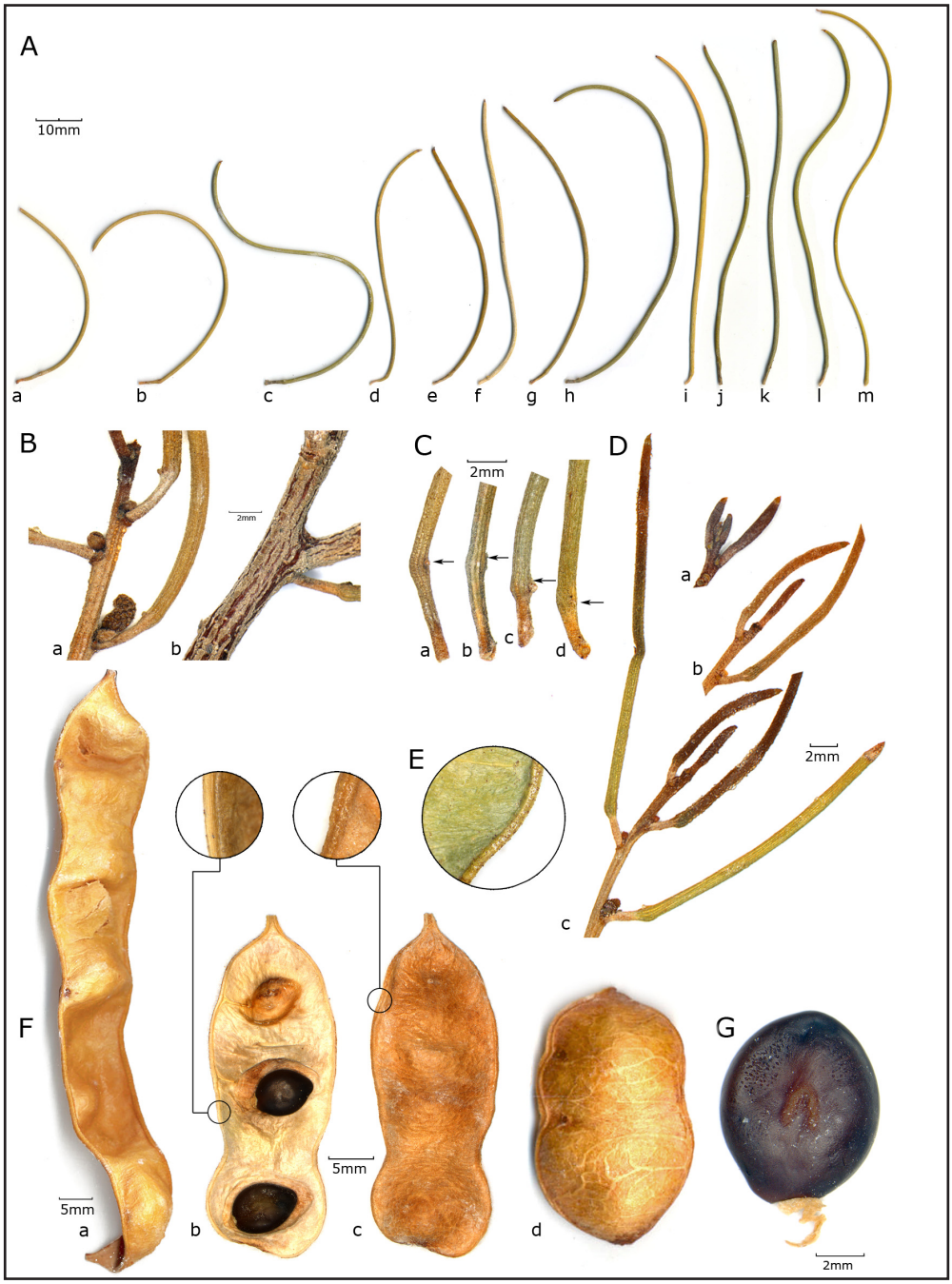


Figure 43. *Acacia macraneura*. A – phyllode variation from a range of specimens; B – branchlets, a) penultimate branchlet with minimal translucent resin on ribs (most obvious below insertion of phyllode), b) mature branchlet ribless; C – phyllode glands (arrowed), a) lamina swollen and kinked at gland, b) lamina swollen but scarcely kinked at gland, c) lamina swollen and not kinked at gland, d) lamina slightly swollen and not kinked at gland; D – new shoots, a, c) resinous, b) resin dissolved to show scattered glandular hairlets; E – close-up of immature pod showing thick, resinous marginal rim; F – pods (large), a) undulate, b) interior with seeds and close-up showing suture line, c) exterior with close-up showing thick, resinous marginal rim, d) exterior showing obscure reticulum; G – seed with small aril. Scale bars shown on figure; vouchers are listed in Appendix 1.

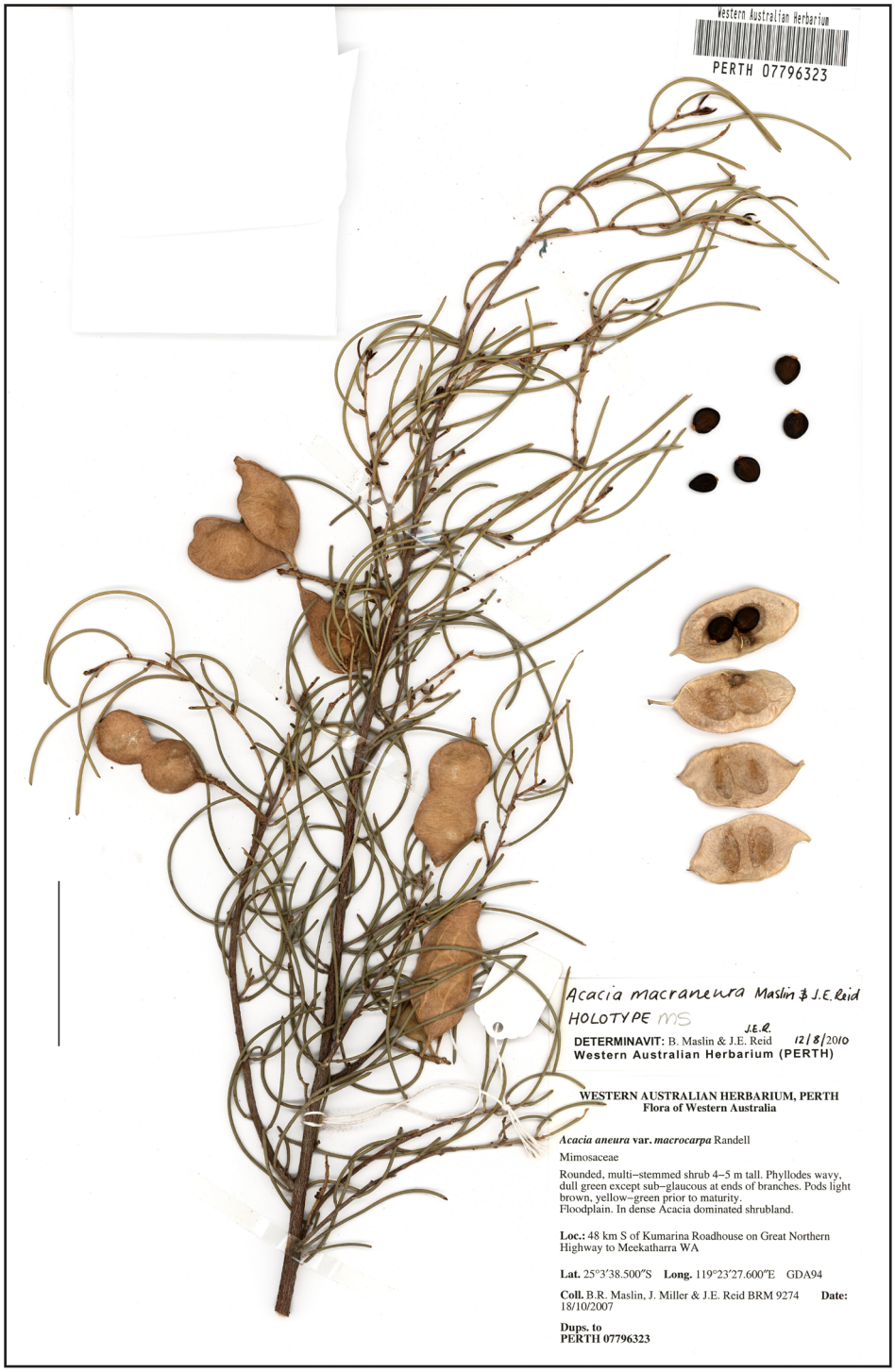


Figure 44. Holotype of *Acacia macraneura* (PERTH 07796323), scale = 5 cm.

72.5 km N of Dairy Creek Homestead on road to Cobra Station (E of Carnarvon), 9 Oct. 2008, *B.R. Maslin & J.E. Reid* BRM 9594 (NY, PERTH); E side of track, *c.* 19 km along main access track to Giles Point, *c.* 60 km due WNW of Newman, 29 Oct. 2009, *J.E. Reid* JER 29 (PERTH); 0.4 km S of Carrowina Creek [NE of Newman], 6 Sep. 1991, *P.G. Wilson & R. Rowe* PGW 956 (BRI, PERTH). SOUTH AUSTRALIA: Mt Agnes, Blyth Range, 25 Sept. 1955, *W.S. Reid s.n.* (AD 97609605).

Distribution. *Acacia macraneura* is mostly restricted to Western Australia; however, there are a few collections of this species from Mt Agnes in South Australia (near the Western Australia–South Australia border). In Western Australia *A. macraneura* has a scattered distribution from near Mt Magnet and Leonora (110 km W of Laverton) in the Murchison IBRA bioregion north through the Gascoyne bioregion to the southern Pilbara bioregion and the Rudall River in the northern Little Sandy Desert bioregion. The species is not common in the Pilbara where it is recorded from near West Angelas in the central Hamersley Range, near Newman, on Hillside Station (unvouchered record) and Balfour Station in the east of the region (Figure 45).

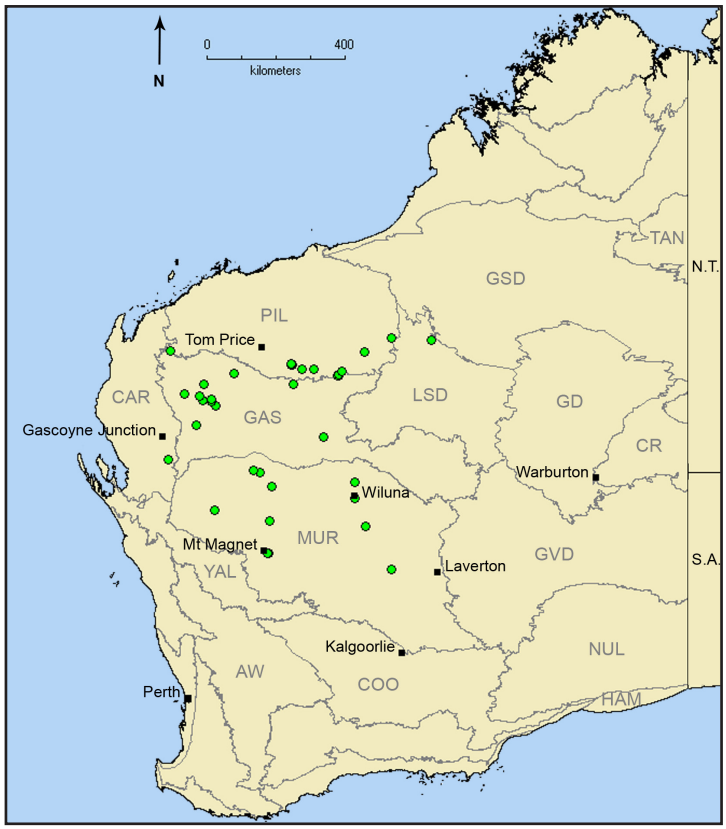


Figure 45. Distribution of *Acacia macraneura* (●) based on specimens examined at the Western Australian Herbarium (PERTH). Boundaries and name abbreviations for IBRA bioregions (Department of Environment, Water, Heritage and the Arts 2008) are shown in grey.

Habitat. This species is most commonly found in clay-loam soils and is often associated with calcrete. It occurs in low-lying areas of the landscape, often on floodplains or associated with shallow drainage systems. However, it also grows on stony gibber plains and (in the Rudall River area) on Spinifex-dominated sandplains. To the south of Wiluna *A. macraneura* occurs in hardpan and playa lake complexes adjacent to calcrete outcrops where it grows along paleochannels in areas subject to sheet flooding and some short-term waterlogging following heavy rains (G. Cockerton, pers. comm.). *Acacia macraneura* commonly grows in open mixed Mulga communities with ground cover comprising grasses (e.g. *Aristida contorta*, *Enneapogon polyphyllus*) or low shrubs such as *Ptilotus* spp. or *Eremophila* spp.

Flowering and fruiting period. Few plants with scattered inflorescences at anthesis have been collected in April and May and again in July and August. However, many sterile plants also occur during these periods. Pods with mature seeds have been collected from early September to late October but not all plants during this period produced fruit. One specimen (*B.R. Maslin* 7332) was unusual in having mature seed in early June.

Taxonomy. *Acacia macraneura* is a member of the Green Alliance and seems most closely related to the only other member of this alliance, *A. aptaneura* (see *Affinities* below). The two most important characters uniting these species are their rimmed (not winged) pods and their translucent branchlet resin. It could be argued that these two species could be treated as infraspecific taxa of a single variable species in much the same way as did Randell (1992) and Pedley (2001). However, such an action would further complicate the circumscription of an already variable *A. aptaneura*. We therefore consider it more appropriate, and not at variance with the ranks ascribed elsewhere in this work, to treat them as distinct species, albeit narrowly circumscribed.

Chloroplast DNA analyses (Miller *et al.*, unpublished data) show *A. macraneura* and *A. fuscaneura* (Grey-green Alliance) as unresolved on a clade which is sister to a clade containing *A. aptaneura*. Morphologically *A. fuscaneura* and *A. macraneura* are very dissimilar but in view of the genetic data their relationship bodes further investigation (see *A. fuscaneura* for further discussion).

Variation. Some specimens from the vicinity of Cobra Station (*c*. 200 km NE of Gascoyne Junction) have less obviously resinous new shoots than elsewhere.

Affinities. Notwithstanding the genetic data noted above *A. macraneura* appears to be most closely related to the more widespread and common *A. aptaneura* but is distinguished by its normally broader, more thickly textured and commonly paler-coloured pods containing larger seeds, and by its generally more shrubby grow form (which apparently never develops a pseudo-conifer habit). In the absence of pods or habit information it can be difficult distinguishing these species but in *A. macraneura* the phyllodes are always terete (flat to terete in *A. aptaneura*). Furthermore, the phyllodes of *A. macraneura* are often slightly thicker, shorter, more prominently curved or sinuous and more discernibly swollen or kinked at the gland than in *A. aptaneura*.

If hybridity can be regarded as an indication of relationship then *A. macraneura* possibly has some affinities with *A. craspedocarpa*, *A. paraneura* and *A. pteraneura* in the Grey-green Alliance (see below).

Hybridity. Under *A. aneura* var. *macrocarpa* both Randell (1992: 122) and Pedley (2001: 317) referred to an unusual specimen (*B.R. Maslin* 2183) from the Rudall River area in the Little Sandy Desert that

is characterised by long, strongly nerved pods. Randell suggested that this entity was derived from *A. paraneura* whereas Pedley suggested that it may be a hybrid involving *A. ramulosa*. While hybrid origin for *B.R. Maslin* 2183 seems likely its parentage is uncertain. Although *A. paraneura* grows in the Little Sandy Desert it seems less likely, judging from morphological criteria, that it would be involved in hybridity with *A. macraneura* than the far more southerly-distributed *A. ramulosa*. Apart from *A. macraneura* the other Mulga species recorded for the Rudall River area include *A. aptaneura* and some specimens of uncertain status, namely: *B.R. Maslin* 2176, 2191 and 2273a (possibly hybrids involving *A. aptaneura*), *B.R. Maslin* 2135 (*A.* ? *pteraneura*) and *B.R. Maslin* 2215 (possibly a hybrid involving *A.* ? *pteraneura*).

Notwithstanding the above it seems that *A. macraneura* and *A. paraneura* sometimes hybridise on the floodplain of the Fortescue River near Newman in the Pilbara region, e.g. *B.R. Maslin & J.E. Reid* BRM 10071 (both putative parents also occurred in the population where this putative hybrid occurred).

Seemingly rare putative hybrids between *A. macraneura* and *A. pteraneura* have been found in two populations located about 100 km north-west of Meekatharra. In one of these populations the putative hybrid (*B.R. Maslin* 9065) co-occurred with both putative parents. Similarly rare putative hybrids involving *A. craspedocarpa* and possibly *A. aptaneura* are noted under these species.

Conservation status. Not considered rare or endangered.

Common name. Big Pod Mulga.

Etymology. The species name is derived from the Greek *macro-* (large, with reference to the wide pods), with 'aneura' as the stem of the epithet.

Acacia minyura Randell, *J. Adelaide Bot. Gard.* 14(2): 126 (1992). *Type citation:* '24 km E Ayres (sic.) Rock, 30.ix.1979, *J.R. Maconochie 2539*.' *Type*: 24 km E of Ayers Rock, Northern Territory, 30 September 1979, *J.R. Maconochie* 2539 (*holo*: PERTH 00604496; *iso* (*n.v.*): B, BRI, CBG, DNA, G, HO, MO, NSW, PAUH).

Acacia aneura variant A, B.R. Maslin in J. Jessop *Flora of Central Australia* 138 (1981).

Rounded or obconic, multi-stemmed *shrubs* or sometimes small *trees* 1–4(–5) m tall, 1.5–6 m wide; crowns dense, compact and often grey or bluish grey. *Bark* dark grey, longitudinally fissured at base of main stems otherwise smooth. *Branchlet* ribs on upper branchlets covered with a thick overburden of normally opaque, dull yellowish or milky blue-grey, often segmented resin (occasionally resin is translucent and brown), the resin often persisting on mature branchlets where it forms white beaded lines visible to the unaided eye, minutely appressed-hairy between the ribs but indumentum often obscured by resin. *New shoots* very resinous, not viscid; *vegetative buds* and upper one-third of lamina on *youngest phyllodes* (except the mucro) enveloped by a conspicuous layer of resin which completely obscures the underlying indumentum and normally also the longitudinal nerves, the resin colour as on branchlets. *Phyllodes* 5–25(–30) mm long, (1.5–)2–4(–5) mm wide, flat, elliptic to oblong-elliptic or oblong-obovate, straight and dimidiate to shallowly recurved or sometimes shallowly sigmoid, grey to grey-green, sub-glaucous or glaucous and sometimes pruinose, the oldest phyllodes sometimes dull green; parallel *longitudinal nerves* numerous and of uniform prominence, often obscured by resin; *marginal nerve* normally resinous but often not well-developed; *apices* mucronate, the mucro central

or more commonly excentric, innocuous. *Gland* situated on adaxial margin of phyllode at distal end of pulvinus, very obscure. *Inflorescences* simple; *peduncles* 4–12 mm long, appressed-hairy (hairs often obscured by resin) when in flower, glabrous or sub-glabrous when in fruit; *spikes* 8–15(–20) mm long when dry, lemon yellow or golden. *Bracteoles* dissimilar to sepals, 1 mm long, the claws narrowly linear, the laminae clearly expanded, triangular-ovate, acute to short-acuminate and inflexed almost at right angles to the claws. *Flowers* 5-merous; *sepals* free, ±½ length of petals, membranous, linear to narrowly oblong, not or scarcely expanded at apices; *petals* 1.5 mm long. *Pods* short and broad, mostly 15–35 mm long and 8–15 mm wide including the wing, oblong, chartaceous, flat, light brown to mid-brown, ±glabrous, obscurely reticulate; *marginal wing* 1–2 mm wide. *Seeds* oblique to transverse in pods, 4.5–6 mm long, 2.5–3.5 mm wide, obloid to ellipsoid, compressed, mid-brown to dark brown, shiny; *aril* small and creamy white. (Figures 46–48)

Characteristic features. Rounded or obconic, multi-stemmed *shrubs* or sometimes small *trees* 1–4(–5) m tall and about the same across; crowns compact and often grey or bluish grey. *Branchlet* ribs with a thick, normally opaque (rarely translucent) overburden of resin that often persists to mature branchlets as beaded, white lines. *New shoots* enveloped by a conspicuous layer of resin when young, the resin opaque and whitish grey tinged bluish or translucent and brown. *Phyllodes* small (mostly 5–25 × 2–4 mm), flat, elliptic to oblong-elliptic or oblong-obovate, straight and dimidiate to shallowly recurved or shallowly sigmoid, mucronate, grey to grey-green, sub-glaucous or glaucous. *Pods* short and broad (mostly 15–35 × 8–15 mm); *marginal wing* 1–2 mm wide.

Selected specimens seen (typical variant unless otherwise indicated). WESTERN AUSTRALIA: Laverton district, 14 May 1965, per *R.J. Donovan s.n.* (PERTH 00615633, 00615641, 00615668, 00615676); 5 km E of number 5 bore on Lorna Glen Station, 150 km ENE of Wiluna, 10 Apr. 2002, *A. Chant* 256 (PERTH: translucent-resin variant); Towrana Station, 5 km NE of Promise Well, 25 Apr. 1982, *R.J. Cranfield* 2109 (PERTH); 33 miles [52.8 km] E of Neale Junction, Great Victoria Desert, 11 Oct. 1966, *A.S. George* 8440 (PERTH); N of Rawlinson Ranges, 31 Oct. 1983, *A. Kalotas* 1621 (DNA *n.v.*, PERTH); 91 km S of Wiluna on road to Leinster, 31 Mar. 1992, *B.R. Maslin* 7068 (AD, BRI, NSW, PERTH); Lorna Glen Conservation Park (*c.* 150 km ENE of Wiluna) on main access road 5 km W of old homestead, 22 Oct. 2007, *B.R. Maslin, J. Miller & J.E. Reid* BRM 9302 (PERTH); 14 km S of Karijini Drive turnoff on Great Northern Highway to Newman, 22 May 2009, *B.R. Maslin & J.E. Reid* BRM 10049 (CANB, K, PERTH: translucent-resin variant); 8.4 km NW of Sladen Waters Gap, Rawlinson Range, 31 Oct. 1983, *S.J. Midgley* SM 584 (PERTH: translucent-resin variant); 2 km S of Packsaddle Hill, 16 km ENE of Mt Meharry, 6.8 km SE of Packsaddle Camp, Hamersley Range, 14 May 1992, *S. van Leeuwen* 1175 (PERTH: translucent-resin variant). NORTHERN TERRITORY: western Tanami Desert, Coomarie Springs area, 28 Apr. 2004, *I.D. Cowie & B. Crase* 10188 (DNA *n.v.*, NT); Curtin Springs Station, 4 km S of Uluru-Stuart Highway road on road to Victory Downs, 12 Oct. 2000, *B.R. Maslin* 8106 (CANB, PERTH); 35 km E of Ayers Rock on Old East Road, 25 Oct. 1983, *S.J. Midgley* SM 525 (PERTH); 16.5 miles [26.5 km] N of Alice Springs, 10 Oct. 1972, *D.J. Nelson* 2228 (PERTH, dup of NT 37057); 34 km E of Ayers Rock, 17 Oct. 1979, *L. Ulyatt* 119 (BRI *n.v.*, NSW *n.v.*, PERTH ex NT: translucent-resin variant). SOUTH AUSTRALIA: Mt Harriet, 30 Sep. 1953, *Anon*. (Donation from the Pastoral Board) (AD). QUEENSLAND: None seen.

Distribution. *Acacia minyura* has a scattered and somewhat discontinuous distribution in Western Australia between about latitudes 23°S and 28° 30'S; it also occurs in the south of the Northern Territory, northern South Australia and with outliers in central-west Queensland (Pedley 2001). In Western Australia most records show the species to occur in three clusters which are located in the southern Pilbara, in areas to the east of Wiluna and in the far eastern parts of the state. These areas encompass the southern Pilbara, eastern Gascoyne and adjacent north-eastern Murchison, southern Gibson Desert

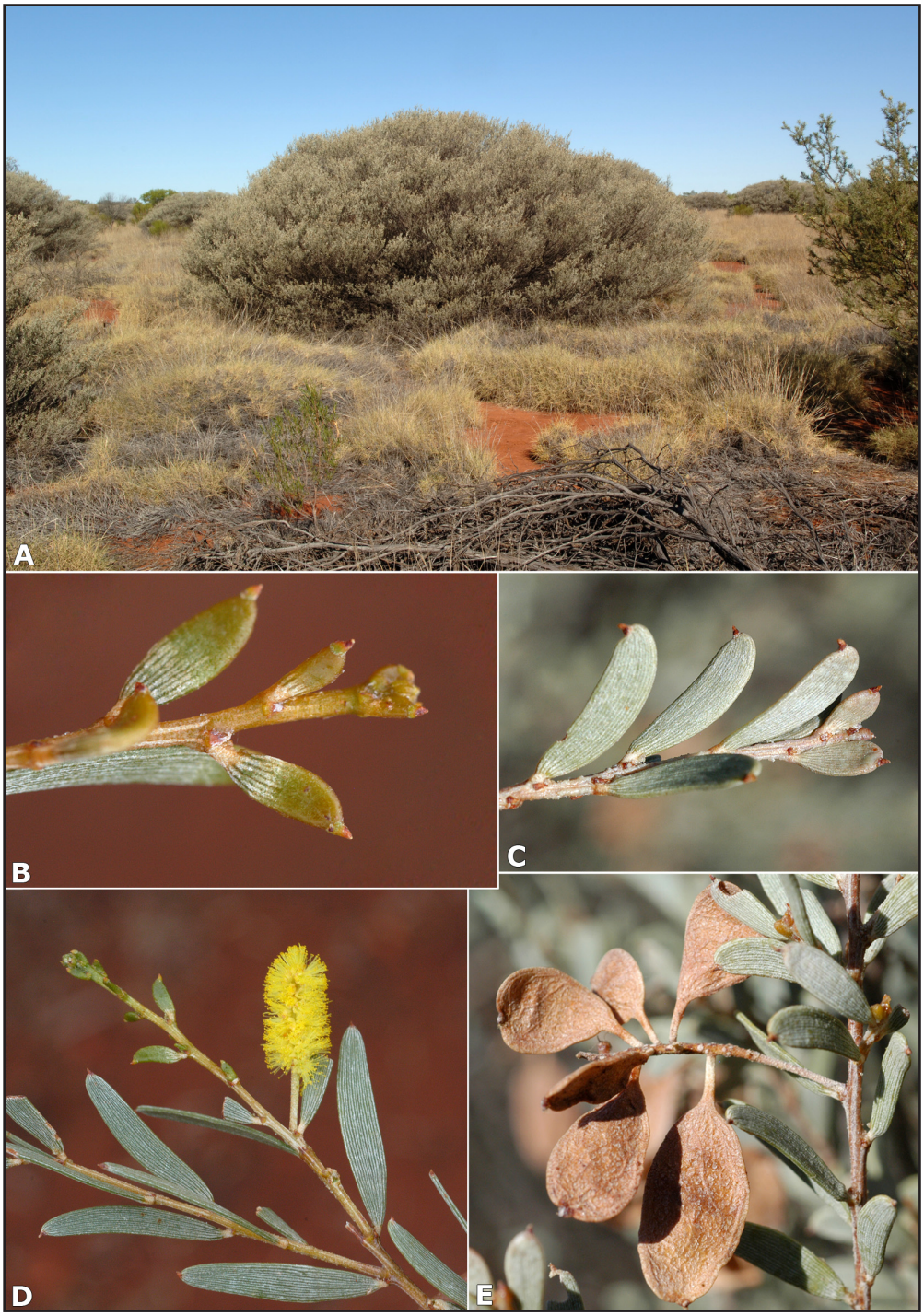


Figure 46. *Acacia minyura*. A – plant showing typical dense, rounded habit; B – new shoot with conspicuous translucent resin on upper part of phyllodes; C – upper branchlet with new shoot (opaque resin on upper part of phyllodes); D – branchlet with inflorescence spike; E – mature pods with somewhat obscure marginal wings. Photographs by B.R. Maslin.

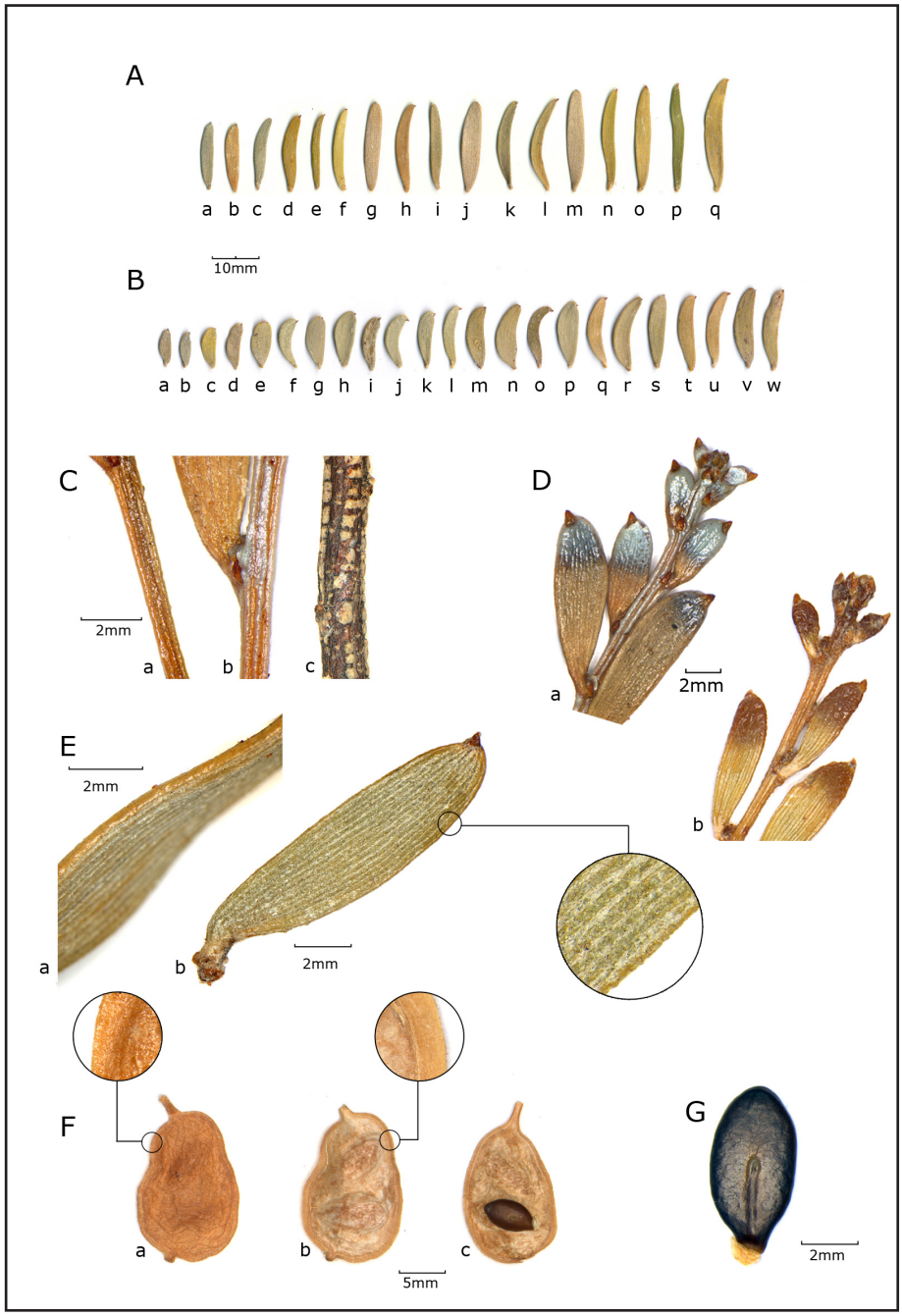


Figure 47. *Acacia minyura*. A – phyllode variation from a range of specimens (translucent resin variant); B – phyllode variation from a range of specimens (typical variant); C – branchlets, a, b) penultimate branchlet with thick overburden of opaque resin on ribs, c) mature branchlet with mealy, segmented opaque resin on ribs; D – new shoots very resinous, upper proportion of phyllodes with thick overburden of resin, a) resin opaque (typical variant), b) resin translucent (translucent resin variant); E – phyllode margins resinous, a) resin shiny (oblique view), b) resin dull and not well developed (plane view); F – pods, a) exterior with close-up showing marginal wing ±obscure, b) interior with close-up showing marginal wing more obvious, c) interior with seed; G – seed with small aril. Scale bars shown on figure; vouchers are listed in Appendix 1.

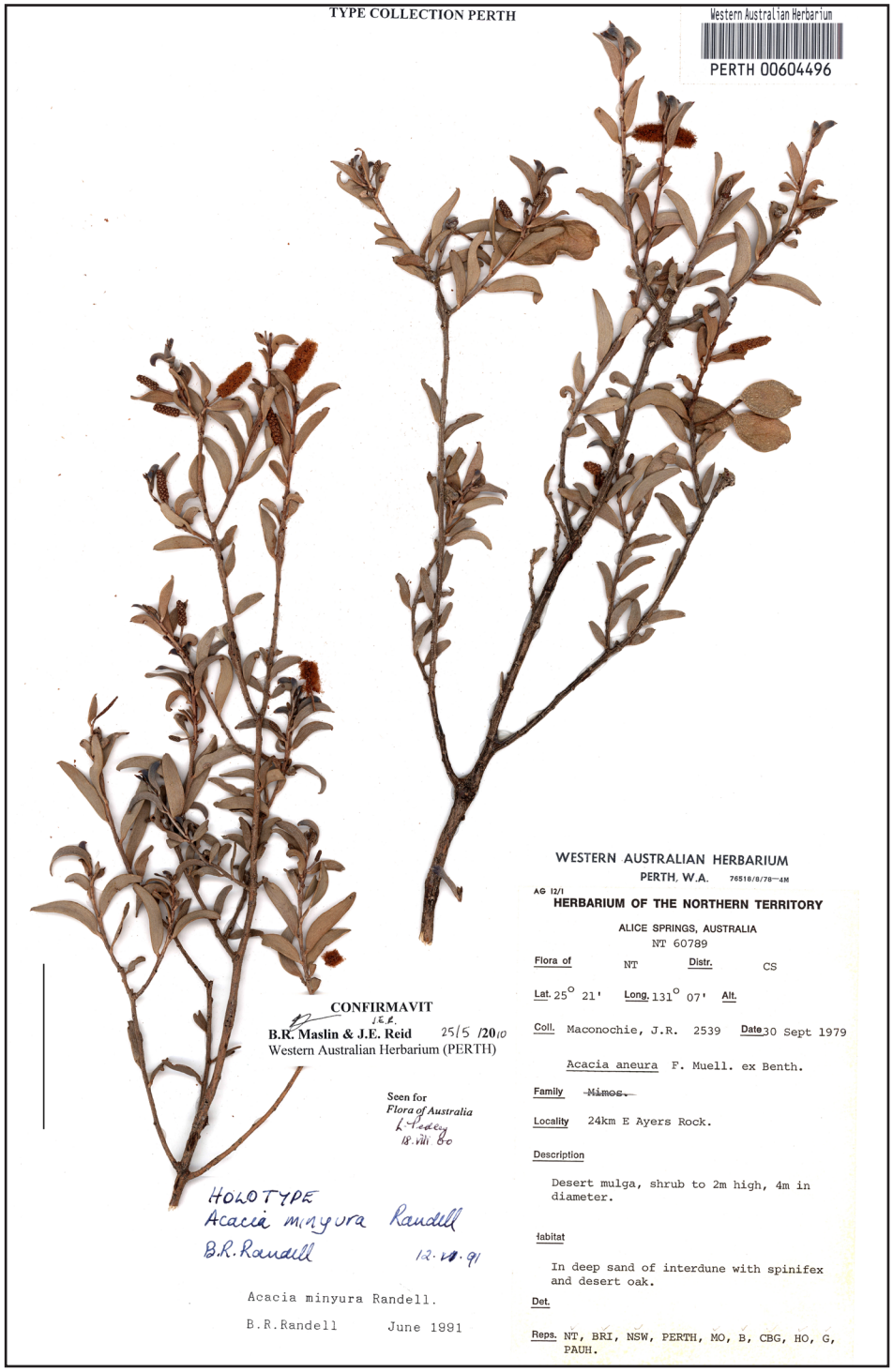


Figure 48. Holotype of *Acacia minyura* (PERTH 00604496), scale = 5 cm.

and adjacent Central Ranges and south-eastern Great Victoria Desert IBRA bioregions. Outliers occur on Towrana Station in the Carnarvon bioregion (*R.J. Cranfield* 2109) and in the Laverton district in the western part of the Great Victoria Desert bioregion (*R.J. Donovan s.n.*). In the Pilbara, *A. minyura* is restricted to a small area in the central Hamersley Range between West Angelas and Juna Downs Station (Maslin *et al.* 2010). Notes on the distributions of the typical and translucent-resin variants of the species are provided under *Variation* below (Figure 49).

Habitat. Often grows in red sand or sandy loam on plains in hummock grassland with *Triodia* spp. (Spinifex). Sometimes (especially in the Pilbara) it is found on stony or gravelly red-brown clay or sandy clay, on flats or low hills, often in mixed Mulga communities.

Flowering and fruiting period. All flowering specimens seen possessed relatively few spikes at anthesis and were collected between late March and June, and in August. Herbarium records show pods with mature seeds have been collected from mid-October to early November, but *A. minyura* is likely to have a broader fruiting period than this. It is not uncommon to find some sterile plants during both the flowering and fruiting periods.

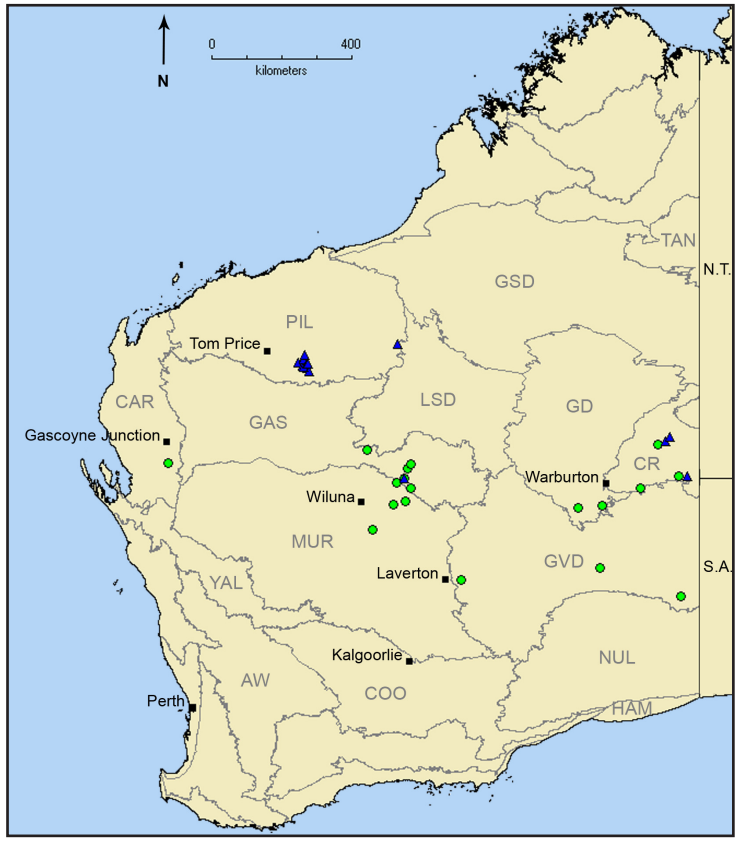


Figure 49. Distribution of *Acacia minyura* (●) and *A. minyura* (translucent resin variant) (▲) based on specimens examined at the Western Australian Herbarium (PERTH). Boundaries and name abbreviations for IBRA bioregions (Department of Environment, Water, Heritage and the Arts 2008) are shown in grey.

Taxonomy. *Acacia minyura* is a member of the Blue Alliance and is distinguished from other members of this group by its small phyllodes which possess a conspicuous overburden of resin when very young. This species has a distinctive field facies on account of its relatively low stature, multi-stemmed habit and dense, compact, greyish or bluish grey crowns (*A. mulganeura* and *A. craspedocarpa* are often somewhat similar in these regards). As discussed below *A. mulganeura* has in the past sometimes been included within the circumscription of *A. minyura*.

Based on information provided by P. Latz (pers. comm.) *A. minyura* was first recognised as distinct by Maslin (1981) who treated it as a variant of *A. aneura*; it was subsequently formally described as a species by Randell (1992). Randell broadly circumscribed *A. minyura* to include plants with exceptionally broad phyllodes which are here included within our circumscription of *A. mulganeura* (see this species for discussion).

Variation. Typical representatives of *A. minyura* are characterised by having a layer of thick, opaque, milky blue-grey resin that envelops the vegetative buds and apices of youngest phyllodes, and overtops the branchlet ribs (although its colour is often dull yellowish); the phyllodes are characteristically small (mostly 5–20 mm long and 2–4 mm wide with l: w = 2–6). There is, however, a variant of *A. minyura* easily recognised by the translucent, brown resin that envelops the vegetative buds and apices of youngest phyllodes; the resin overtopping branchlet ribs is normally opaque but is sometimes translucent or a mixture of the two types, and is sometimes not as thick as in typical *A. minyura.* The phyllodes of this translucent-resin variant tend to be slightly longer and more elongate than those of typical *A. minyura* (mostly 15–25(–30) mm long with l: w = 5–10). Although the new shoot resin colour enables specimens of *A. minyura* to be readily ascribed to one or other of the variants, there is overlap in their phyllode dimensions; a cpDNA analysis of Miller *et al*. (unpublished data) places the two variants together on the same clade. Judging from collections the translucent-resin variant is less common than the typical variant. In Western Australia most plants of the typical variant extend eastwards from the vicinity of Wiluna through the Rawlinson Range to the Northern Territory, South Australia and Queensland. The translucent-resin variant has been recorded from the Pilbara region (the only form of *A. minyura* recorded from that area), the Rawlinson Range and Lorna Glen Conservation Park east of Wiluna (judging from herbarium specimen records the two variants may co-occur at Lorna Glen). A few specimens from the Northern Territory seem referable to the translucent-resin variant but we have not thoroughly examined non-Western Australian material. Further detailed study is needed to assess the taxonomic status of the translucent-resin variant. A selection of specimens referable to both variants of *A. minyura* is included in the specimens cited above.

Additional to the above there are a few specimens (mostly from the vicinity of Lorna Glen Conservation Park) that have thick, opaque resin on their vegetative buds like typical *A. minyura* but with phyllodes similar to those of the translucent-resin variant except that they are more elongate than normal (l: w to 15) and sometimes linear. These specimens cannot be satisfactorily accommodated within the circumscription of *A. minyura* as defined here and their status needs to be reassessed (some of these specimens may be hybrids involving *A. minyura*). Representative specimens include: Earaheedy Station, *D.J. Edinger et al.* DJE 3132; 88 km east of Wiluna on Gunbarrel Highway, *B.R. Maslin* 9020, 9029.

Affinities. *Acacia minyura* appears to be most closely related to *A. mulganeura* (see this species for discussion). Judging from new shoot characteristics it is not far removed from *A. incurvaneura* which is most readily distinguished by its longer, linear, shallowly incurved phyllodes.

Hybridity. A few specimens with atypically elongate phyllodes that are noted under *Variation* above may represent hybrids involving *A. minyura* as one parent (the other parent is unknown).

Notes. Plants have the ability to resprout from the root stock after fire or mechanical damage.

Conservation status. Not considered rare or endangered.

Common names. Desert Mulga (Latz 1995); Shrubby Desert Mulga (Miller *et al.* 2002).

Aboriginal names (Language Group in parentheses). *Kitir-kitir* (Ngaatjatjarra), *fide* label information on *A. Kalotas* 1621 (PERTH); *Minyura* (Ngaanyatjarra), *fide* label information on *A. Kalotas* 1162 (PERTH); *Puyukara* or *Minyura* (Pitjantjatjara), *fide* Latz (1995).

Etymology. The botanical name is taken from one of the aboriginal names for the species (Randell 1992).

Acacia mulganeura Maslin & J.E.Reid, *sp. nov.*

Frutices rotundati multicaules plerumque 1.5–3 m alti, in statu maturitas *arbores* obconconici 4–5(–7) m alti; coronae plerumque compactae, canovirentes vel caeruleo-cinereae. *Costae ramulorum* tegmene crasso resinae opacae segmentatae lacto-griseae vel subflavae. *Surculi novi* resinosi. *Phyllodia* plerumque 20–50 × 5–10 mm, elliptica vel oblanceolata, plerumque obtusa, saepe leviter torta vel tenuiter undulata, nervo marginali resinoso. *Calyx* deminutissimus, ⅙–⅓ longitudinis corollae. *Bracteola* minuta (0.4–0.5 mm longa). *Legumina* plerumque 15–35 × 6–10 mm, oblonga vel fusiformia; ala marginalis 1–1.5 mm lata.

Typus: 5 km east-south-east of West Angela Hill, Hamersley Range, Fortescue Botanical District, Western Australia, 2 July 1979, *M.E. Trudgen* MET 17659 (*holo*: PERTH 07282796; *iso*: CANB, K).

Acacia sp. Mulga short phyllodes (B.R. Maslin et al. BRM 9276): *Australian Plant Census*, http://www.anbg.gov.au/chah/apc/index.html; Western Australian Herbarium, in *FloraBase*, http://florabase.dec.awa.gov.au [accessed June 2010].

Acacia sp. Hamersley Range hilltops (S. van Leeuwen 3552): *Australian Plant Census*, http://www.anbg.gov.au/chah/apc/index.html; Western Australian Herbarium, in *FloraBase*, http://florabase.dec.awa.gov.au [accessed June 2010].

Acacia aneura var. Bloods Range (D.J. Nelson 631): *Australian Plant Census*, http://www.anbg.gov.au/chah/apc/index.html.

Acacia minyura variant: *fide* L. Pedley, (*Fl. Australia* 11B: 325 (2001), as to *P.K. Latz* 6873 (New Crown Station, N.T.) and Winnecke (near Stuarts Ra.) – see discussion below.

Rounded, multi-stemmed *shrubs* commonly 1.5–3 m tall and about the same or wider across, maturing to obconic, single- or few-stemmed *trees* 4–5(–7) m tall, the stems straight to variously crooked, the major branches straight to sub-straight and spreading to erect; crowns dense to sub-dense, often

compact and greyish green to bluish grey. *Bark* grey to dark grey, finely longitudinally fissured on main stems, normally smooth on upper branches. *Branchlet* ribs on upper branchlets normally covered with a thick overburden of opaque, segmented, milky blue-grey or yellowish resin (occasionally co-occurring with small patches of semi-translucent, reddish resin), the resin often persisting but less pronounced on mature branchlets where it sometimes forms white beaded lines visible to the unaided eye, with minute red glandular hairlets often embedded in the resin. *New shoots* resinous, green when first initiated but becoming khaki, light to mid-brown or tinged purple when fresh, dark reddish brown or bluish grey when dry (colour determined by thickness and degree of opacity of the resin and the density of glandular hairlets that are embedded within the resin), sometimes mealy; *youngest phyllodes* covered by a resin layer which completely obscures (or sometimes almost obscures) the underlying indumentum and nerves; passing quickly to the *expanding phyllodes* which are striate by fine, resinous longitudinal nerves with white, appressed hairs between them; *marginal nerve* on young phyllodes discrete and resinous but sometimes not especially pronounced. *Phyllodes* variable in size and shape, (10–)20–50 mm long, 5–10(–13) mm wide, elliptic to narrowly elliptic or obovate to oblanceolate, mostly symmetrical with both margins shallowly convex, occasionally a few dimidiate, often slightly twisted or shallowly undulate, ascending to erect, grey, blue-grey, sub-glaucous or pale grey-green and sometimes with a silvery sheen, the oldest phyllodes dull green, occasionally lightly pruinose; parallel *longitudinal nerves* numerous, fine, close together and of uniform prominence; *margins* resinous and discrete by a ±thick overburden of yellow to light brown resin; *apices* obtuse or occasionally sub-acute, mucronulate, innocuous. *Gland* situated on adaxial margin of phyllode at distal end of pulvinus, obscure. *Inflorescences* simple or occasionally rudimentary racemes *c.* 2 mm long; *peduncles* 3–10 mm long, sparsely appressed white-hairy with some red-brown, microscopic glandular hairlets; *spikes* 10–20 mm long when dry, light golden. *Bracteoles* minute (0.4–0.5 mm long) and sub-sessile, equal in length to sepals but differing in having wider laminae, spathulate, the claws very short (0.2–0.3 mm long), the expanded laminae inflexed at right angles to the claws. *Flowers* 5-merous; *calyx* often extremely reduced, ⅙–⅓ length of corolla; *sepals* free or united at extreme base and readily lost upon dissection, the claws oblong to narrowly oblong and often slightly expanded at their apices; *petals* 1.2–1.3 mm long. *Pods* (10–)15–35 mm long, (5–)6–10(–11) mm wide including the wing, oblong or fusiform, firmly chartaceous to thinly coriaceous, flat, dark greyish brown, glabrous to sparsely appressed-hairy, sometimes slightly resinous, obscurely and openly longitudinally reticulate, obtuse or acute; *marginal wings* 1–1.5 mm wide. *Seeds* oblique or sometimes longitudinal in the pods, 4.5–5.5 mm long, 2.5–3.5 mm wide, ellipsoid, flat, dark brown, shiny; *aril* small and creamy white. (Figures 50–52)

Characteristic features. Rounded, multi-stemmed *shrubs* commonly 1.5–3 m tall and about the same or wider across, maturing to obconic, single- or few-stemmed *trees* 4–5(–7) m tall; crowns often compact and greyish green to bluish grey. *Branchlet* ribs with a thick overburden of opaque, segmented, milky blue-grey or yellowish resin often persisting as beaded white lines on mature branchlets. *New shoots* very resinous with dark-coloured glandular hairs embedded in resin. *Phyllodes* mostly 20–50 × 5–10 mm, symmetrically elliptic to oblanceolate, normally obtuse, often slightly twisted or shallowly undulate, *marginal nerve* resinous and yellow to light brown. *Calyx* very short, ⅙–⅓ length of corolla. *Bracteoles* minute (0.4–0.5 mm long). *Pods* mostly 15–35 × 6–10 mm, oblong or fusiform, dark greyish brown; *marginal wing* 1–1.5 mm wide.

Selected specimens seen. WESTERN AUSTRALIA: Carnarvon Range and vicinity, Nov. 1975, *A.A. Burbidge* 4 (PERTH: this specimen was cited by Pedley 2001 under *A. aneura* var. *argentea* which we regard as conspecific with *A. caesaneura*); Mt Fraser on Mt Padbury Station, 16 Aug. 1986, *R.J. Cranfield* 5714 (AD, PERTH); Mt Beadell, Gibson Desert, 12 June 1983, *S.D. Hopper* 2814 (PERTH); Booylgoo Range, survey site BOOY43, on Depot Springs Station *c.* 3.4 km E of Terracotta Bore and 2.8 km SSW of Mt Anderson (576 m), *c.* 65.0 km E of Sandstone, 13 Sep. 2006, *A. Markey & S.*

Figure 50. *Acacia mulganeura*. A – plant showing typical round, multi-stemmed habit; B – new shoot conspicuously resinous; C – mature pods oblong and with marginal wings; D – plant showing obconic, arborescent habit; E – branchlet with inflorescence spikes. Photographs by B.R. Maslin.

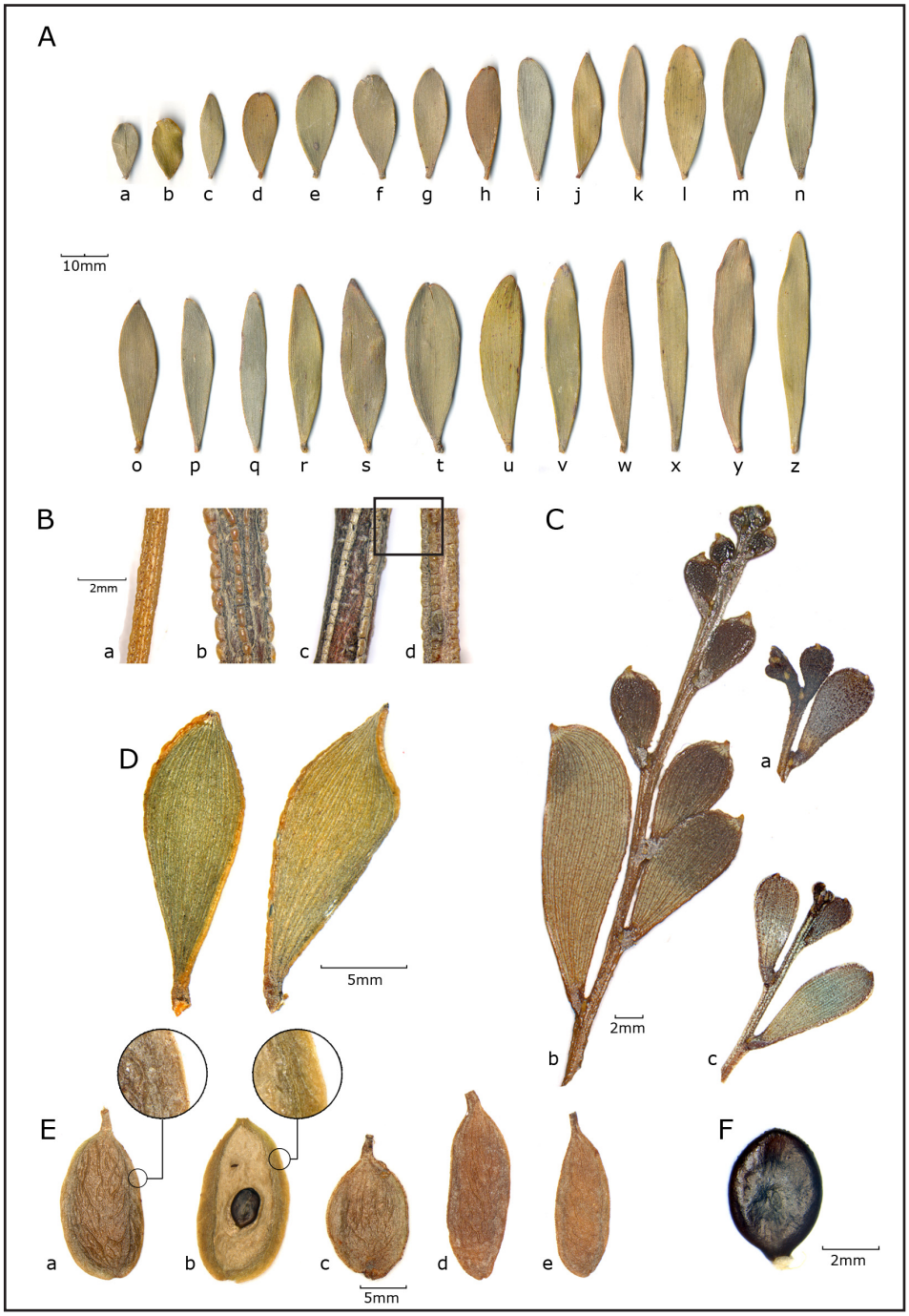


Figure 51. *Acacia mulganeura*. A – phyllode variation from a range of specimens; B – branchlets with opaque resin ribs, a, d) penultimate branchlets with thick overburden of resin, b, c) mature branchlets with ±mealy, segmented resin; C – new shoots resinous, first phyllodes covered by thick, opaque resin layer, expanding phyllodes striate; D – phyllodes often slightly twisted; E – pods oblong (a–c) or fusiform (d–e), a) exterior with close-up showing marginal wing, b) interior with seed and close-up showing marginal wing more obvious; F – seed with small aril. Scale bars shown on figure; vouchers are listed in Appendix 1.

Figure 52. Holotype of *Acacia mulganeura* (PERTH 07282796), scale = 5 cm.

Dillon 4553 (NSW, PERTH); 13.5 miles [21.6 km] S of Menzies towards Kalgoorlie, 11 Aug. 1971, *B.R. Maslin* 1941 (K, NT, PERTH: phyllodes at upper end of length range); 50 km W of Wiluna on road to Meekatharra, 1 Apr. 1992, *B.R. Maslin* 7077 (CANB, PERTH); Hamersley Range, *c.* 200 m below summit of Mt Robinson, 14 July 2000, *B.R. Maslin* 8067 (PERTH: phyllodes more elongate than normal); Paynes Find–Sandstone Road, 28 km E of Great Northern Highway, 11 Nov. 2008, *B.R. Maslin* 9912 (AD, BRI, MEL, PERTH: phyllodes at upper end of length range); 22 km S of Mt Magnet on Great Northern Highway to Wubin, 26 Oct. 2008, *B.R. Maslin & J.E. Reid* BRM 9789 (CANB, PERTH); 42.5 km W of Wiluna on Wongawol Road, 28 Apr. 2009, *B.R. Maslin & J.E. Reid* BRM 10014 (PERTH); *c.* 7 km due E of Giles Point (between Newman and Tom Price), 21 May 2009, *B.R. Maslin & J.E. Reid* BRM 10037 (K, PERTH); Spearhole Creek, 75 km W of Newman, 21 June 2007, *E. Thoma* ET 1292 (PERTH); Mt Windell, 18.9 km NNE of Mt Mossenson, 19.4 km S of Circular Pool in Dales Gorge, 31.7 km SW of Mt Lockyer, Hamersley Range, 1 Aug. 1998, *S. van Leeuwen* 3552 (PERTH). NORTHERN TERRITORY: N of Mt Hermannsburg, Krichauff Ranges, 28 Oct. 1981, *A.C. Kalotas* 957 (PERTH); Beddome Range, New Crown Station, 20 Apr. 1977, *P.K. Latz* 6873 (PERTH ex DNA); 0.5 km S Illara Waterhole, Tempe Downs, 27 Nov. 2001, *P.K. Latz* 18365 (NT). SOUTH AUSTRALIA: 4 km N of SW corner of Lake, Wilkinson Lakes, 14 July 1981, *F. Mollenman* 967 (AD).

Distribution. *Acacia mulganeura* is widely distributed in Western Australia, it also occurs in north-west South Australia and the southern part of the Northern Territory but we have not comprehensively assessed its geographic range in these two areas. In Western Australia the species extends from near Kalgoorlie and Paynes Find north to the southern Pilbara region, with a few scattered occurrences in the far east of the State. Most collections are from the Murchison and southern Pilbara IBRA bioregions but the species extends to the adjacent Gascoyne, northern Coolgardie, southern Yalgoo and south-west Great Victoria Desert bioregions; there are few records from the Little Sandy Desert and Gibson Desert IBRA bioregions. The paucity of collections in the eastern parts of the state probably reflects, at least in part, the relative dearth of collecting activity in these areas. *Acacia mulganeura* is not common in the Pilbara (it is scattered from the central Hamersley Range around West Angelas to east of Newman) where it is known only from the upper slopes and tops of rocky hills such as Mt Windell, Mt Robinson and Shovelanna Hill (Maslin *et al.* 2010) (Figure 53).

Habitat. Grows in red-brown loam, sandy loam, silty loam, clay-loam or sometimes clay often over hardpan, on flats, gently undulating country or in skeletal soil on rocky hills (often ironstone but granite, laterite and sandstone also noted on specimen labels). It is often found in mixed Mulga shrubland with a ground cover of Spinifex (*Triodia* spp.). Around Queen Victoria Springs it has been recorded as growing on sand plains and in low-profile dune country.

Flowering and fruiting period. Plants with inflorescences at anthesis have been collected in March, April, July, August, October and November but often only a few inflorescences are present during these months. Pods with mature seeds have been collected from early October to mid-November and sometimes flowers co-occur with pods during this period.

Taxonomy. *Acacia mulganeura* is a member of the Blue Alliance and is distinguished from other members of this group by a combination of its resinous new shoots and relatively short and broad, symmetric phyllodes; also, its very reduced calyx is unlike that found in any other species of this alliance.

Acacia mulganeura was included in Randell's (1992: 126) circumscription of *A. minyura*, and as a consequence described the phyllodes as reaching 10 mm wide. Although Randell did not cite any specimens of *A. mulganeura* under *A. minyura* there are collections of the species annotated by her

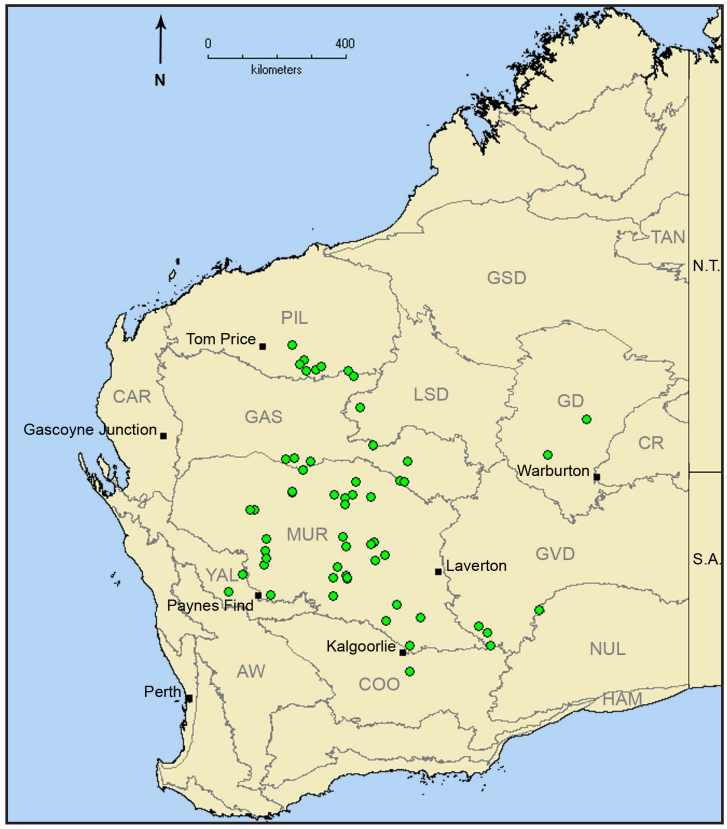


Figure 53. Distribution of *Acacia mulganeura* (●) based on specimens examined at the Western Australian Herbarium (PERTH). Boundaries and name abbreviations for IBRA bioregions (Department of Environment, Water, Heritage and the Arts 2008) are shown in grey.

in various Australian herbaria, e.g. *B.R. Maslin* 8067 and *A.C. Kalotas* 957 at PERTH. Also, under *A. craspedocarpa* Randell (1992: 127) referred a Winnecke specimen at MEL from 'near Stuarts Range' to *A. minyura*; this specimen had been provisionally referred to *A. craspedocarpa* by Mueller (1887). Pedley (2001: 325) referred the Winnecke collection to a 'well-marked variant' under his treatment of *A. minyura*, citing also a *P.K. Latz* 6873 collection from New Crown Station, Northern Territory. We have not seen the Winnecke specimen but if it is the same taxon as *P.K. Latz* 6873 (see specimen citations above), then it is *A. mulganeura*.

The specimen *A.A. Burbidge* 4 that Pedley (2001) cited under *A. aneura* var. *argentea* is *A. mulganeura.*

Variation. There is considerable variation in the shape and size of phyllodes within this species (see Figure 51). However, it is not known if this variation relates to age of the plants, other biological factors or geographic location, or a combination of these.

Variants. The following two variants are not included in the above circumscription of *A. mulganeura*; they may possibly represent hybrids or intergrades involving *A. caesaneura* and different morphotypes of *A. mulganeura* (Figure 54). Both variants differ from *A. mulganeura* in having less resinous new

shoots and from *A. caesaneura* in having shorter and/or more symmetric phyllodes (see Table 3 for salient features).

Acacia mulganeura (variant 1). The phyllodes of this variant are remarkably similar to those of *A. mulganeura* and care needs to be taken not to confuse the two entities. Sepal length, new shoot resinosity and the relative prominence of nerves on the youngest phyllodes of new shoots are the best characters for distinguishing these taxa (Table 3). This variant has a scattered distribution from about Paynes Find to Cue east to Laverton, but seems most common in the western part of this geographic range. It commonly co-occurs with *A. caesaneura* (narrow-phyllode variant) and sometimes with typical *A. caesaneura*, but is not known to be sympatric with *A. mulganeura* (but this species often occurs within the general vicinity of where variant 1 grows). If this variant 1 is indeed a hybrid or intergrade involving *A. mulganeura* then it is with the shorter-phyllode morphotypes of that species. Representative specimens include: 35 km S of Menzies on road to Kalgoorlie, 31 Mar. 1992, *B.R. Maslin* 7055 (PERTH); Weld Range, 70.5 km NW of Cue on Beringarra–Cue Road, 14 Oct. 2008, *B.R. Maslin & J.E. Reid* BRM 9637 (AD, BRI, PERTH); hilltop *c.* 1 km N of Fields Find Cemetery (on northern side of Paynes Find–Thundellara road), 20 Apr. 2009, *B.R. Maslin & J.E. Reid* BRM 9962 (CANB, K, MEL, PERTH). (Figures 54A, B)

Acacia mulganeura (variant 2). This is a poorly known and seemingly rare entity with a few collections from between Paynes Find and Laverton. It occasionally co-occurs with *A. caesaneura* (narrow-phyllode variant) but has not been found growing with only *A. mulganeura* or in populations where *A. mulganeura* and *A. caesaneura* are sympatric. If this entity is indeed a hybrid or intergrade involving *A. mulganeura* then it involves the longer-phyllode morphotypes of this species. Representative specimens include: 31 km E of Laverton on White Cliffs Road, 17 Oct. 2008, *B.R. Maslin & J.E. Reid* BRM 9673 (NSW, PERTH); 5.5 km N of Menzies on Goldfields Highway to Leonora, 20 Oct. 2008, *B.R. Maslin & J.E. Reid* BRM 9712 (CANB, K, MEL, PERTH); 22 km S of Mt Magnet on Great Northern Highway to Wubin, 26 Oct. 2008, *B.R. Maslin & J.E. Reid* BRM 9788 (AD, PERTH). (Figure 54C)

Affinities. *Acacia mulganeura* is closely related to *A. caesaneura* and *A. incurvaneura* (see these species for discussion, and under *Variants* above) and also to *A. minyura*. The phyllodes of *A. minyura* are normally 2–4 mm wide and as such are narrower than those of *A. mulganeura*. However, occasionally *A. minyura* phyllodes reach 5 mm in width and therefore coincide with the narrowest phyllodes of *A. mulganeura*. In these cases *A. minyura* can be recognised by its phyllodes which have a poorly developed marginal nerve, are asymmetric by a more or less straight lower margin and convex upper margin (most phyllodes symmetric with both margins convex in *A. mulganeura*) and have a slightly more pronounced apical mucro. Also, in *A. minyura* the sepals are half or slightly more than half the length of the petals whereas in *A. mulganeura* the sepals are clearly less than half the length of the petals.

Acacia mulganeura appears to have some affinities with *A. ayersiana* (Grey-green Alliance) on account of its very short sepals, winged pods and resinous-margined phyllodes. Indeed, as noted below under *Hybridity* there are putative hybrids between these two species in the Pilbara region. Specimens of *A. mulganeura* with the most elongate phyllodes resemble short-phyllode individuals of *A. ayersiana* (see that species for discussion).

Specimens of *A. mulganeura* with short phyllodes can resemble *A. craspedocarpa* (Grey-green Alliance); however, the latter is readily recognised by its reticulately nerved phyllodes (phyllode nerves parallel in *A. mulganeura*). These two species also have a very similar growth form, characterised by their dense, compact, often rounded crowns.

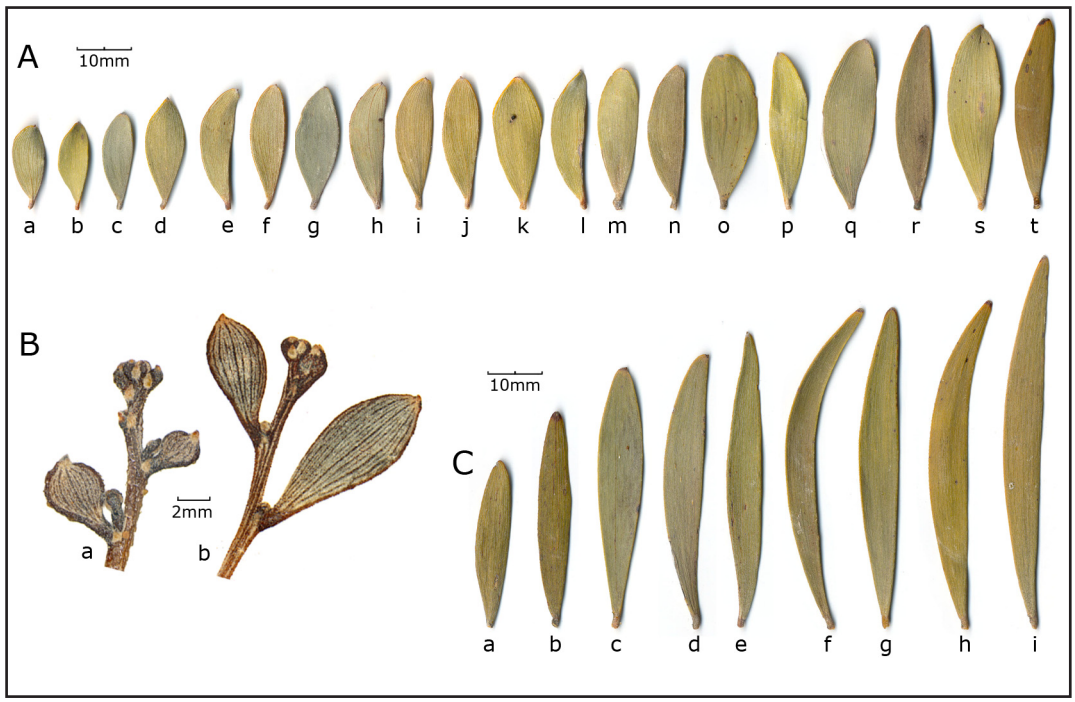


Figure 54. *Acacia mulganeura* variants. A – phyllode variation from a range of specimens (*A. mulganeura* variant 1); B – new shoots, a, b) not obviously resinous, youngest and expanding phyllodes striate with white appressed hairs between nerves and margins dark-coloured; C – phyllode variation from a range of specimens (*A. mulganeura* variant 2). Scale bars shown on figure; vouchers are listed in Appendix.

Table 3. Main distinguishing features between *Acacia caesaneura*, *A. mulganeura* and the two variants of *A. mulganeur*a.

Character	A. caesaneura	A. mulganeura (variant 1)	A. mulganeura (variant 2)	A. mulganeura
New shoots – youngest phyllodes	Not covered by resin; dense white hairs or reddish glandular hairlets obscuring underlying nerves, or striate by often resinous nerves and appressed-hairy in between.	As in *A. caesaneura*.	As in *A. caesaneura*.	Covered by resin that completely obscures the underlying indumentum and nerves.
Phyllodes	Straight and dimidiate or shallowly recurved, 30–70 × 2.5–10 mm with l: w = 4–20.	Similar to short phyllode individuals of *A. mulganeura*; phyllodes mostly 15–35 × 6–10 mm with l: w = 2–5.	Similar to long phyllode individuals of *A. mulganeura*; phyllodes mostly 40–70 × 5–7 mm with l: w = 6–11.	Straight and mostly symmetric, mostly 20–50 × 5–10 mm with l: w = 3–7.
Sepals	½ or slightly more than ½ length of petals.	As in *A. caesaneura*.	As in *A. mulganeura*	⅙–⅓ length of petals.
Bracteoles	0.8–1 mm long, distinctly stipitate.	As in *A. caesaneura*.	As in *A. mulganeura*	0.4–0.5 mm long, subsessile.
Pods	Oblong, mostly 10–15 mm wide.	Oblong, mostly 8–13 mm wide.	Oblong, 10–14 mm wide.	Oblong or fusiform, mostly 7–9 mm wide.

Hybridity. *Acacia mulganeura* seemingly hybridises with *A. incurvaneura* in some places where the two species co-occur (see under *A. incurvaneura* for discussion).

Judging from phyllode shape and nervature a few sterile specimens collected from near West Angelas in the Pilbara region may represent hybrids between *A. ayersiana* and *A. mulganeura* (e.g. *B.R. Maslin* 8087 and *A.S. Weston* 15995, both at PERTH). However, field and genetic studies are required to determine the status of these individuals. Neither putative parent was recorded as co-occurring with either of the above putative hybrids. While it is likely that *A. ayersiana* and *A. mulganeura* are sometimes sympatric we have not yet sampled any such population.

Notes. Plants appear to be killed by fire.

Conservation status. Not considered rare or endangered.

Common name. Milky Mulga; Hilltop Mulga (Maslin *et al.* 2010).

Etymology. The species name is derived from the Latin *mulgere* (to milk, in allusion to the opaque, milky-coloured resin on the branchlet ribs) with 'aneura' as the stem of the epithet.

Acacia paraneura Randell, *J. Adelaide Bot. Gard.* 14(2): 116 (1992). *Type citation:* '18 km from Wongawol homestead (which is *c.* 223 km. E Wiluna) towards Carnegie on the Gunbarrel hwy, *B.R. Maslin 5627*, 6.ix.1984 (PERTH); iso.: (BRI!, CBG, MEL!).' *Type*: 18 km from Wongawol H.S. (which is 223 km E from Wiluna) towards Carnegie on the 'Gunbarrel Highway', Western Australia, 6 September 1984, *B.R. Maslin* 5627 (*holo*: PERTH 00597406; *iso*: BRI, CBG, MEL).

Graceful, single- or several-stemmed *trees* 4–10 m tall, the stems straight to slightly crooked and to about 20 cm dbh; crowns open, often wispy and greyish or light grey-green, the ultimate branchlets commonly pendulous or sub-pendulous. *Bark* grey, longitudinally fissured on main stems, smooth on upper branches. *Branchlets* white appressed-hairy between ribs at extremities but ageing glabrous and normally ribless, the ribs red-brown or sometimes yellowish with or without a veneer of shiny, translucent resin. *New shoots* resinous; *youngest phyllodes* sometimes indistinctly to obviously striate or more commonly the nerves obscured by a dense covering of red-brown to black (when dry) glandular hairlets within a resin matrix; *expanding phyllodes* striate with appressed silvery hairs between the ±resinous nerves, with scattered glandular hairlets. *Phyllodes* long, slender and commonly pendulous, usually (60–)80–200(–230) mm long, 0.8–1.2 mm wide, terete to sub-terete or rarely flat, straight or more commonly variously curved, sigmoid or sinuous, not rigid, dull green to light grey-green, appressed silvery-hairy between nerves but becoming glabrous with age; parallel *longitudinal nerves* numerous and fine; *apices* innocuous. *Gland* situated on adaxial surface of phyllode (2–)4–25(–35) mm above pulvinus, the phyllode often slightly but noticeably bent and/or slightly swollen at the gland. *Inflorescences* simple or rudimentary racemes to 3 mm long; *peduncles* (4–)5–12(–15) mm long, with a mixture of simple, appressed, white hairs and red, glandular hairlets, often glabrous when in fruit; *spikes* 10–30 mm long when dry, light golden. *Bracteoles* normally sub-peltate, 0.5–0.7 mm long, the laminae slightly thickened and larger than sepal apices. *Flowers* 5-merous; *sepals* free or almost so, linear-spathulate, slightly more than ½ length petals, the laminae small; *petals* 1.5–1.7 mm long. *Pods* (15–)20–50(–90) mm long, (6–)8–12(–16) mm wide, oblong to narrowly oblong, obovate or rarely elliptic, narrowed at base, not constricted between the seeds, thinly coriaceous to ±crustaceous, flat, sparsely to moderately and minutely appressed-hairy, sometimes glabrous, brown to reddish

brown or (especially when immature) greyish brown, sometimes slightly resinous, ±obscurely openly reticulate with nerves normally longitudinally trending, stipitate; *marginal wings* (0.5–)1–2(–2.5) mm wide, rarely undulate. *Seeds* oblique to transverse in the pods, 4–7 mm long, 2.5–4 mm wide, obloid-ellipsoid to ovoid, compressed, light to dark brown, shiny; *funicle* folded below a relatively small, creamy white *aril*. (Figures 55–57)

Characteristic features. Graceful *trees* 4–10 m tall with open and often wispy crowns, the ultimate branchlets commonly pendulous or sub-pendulous. *Branchlets* white appressed-hairy between normally red-brown ribs at extremities, the ribs not resinous or with a veneer of shiny, translucent resin. *New shoots* resinous. *Phyllodes* normally terete, long and slender (mostly 80–200 × *c.* 1 mm), often pendulous, commonly variously curved, sigmoid or sinuous, dull green to light grey-green. *Gland* mostly 4–25 mm above pulvinus, the phyllode often slightly but noticeably bent and/or slightly swollen at the gland. *Pods* mostly 20–50 × 8–12 mm, brown to reddish or greyish brown, ±obscurely openly reticulately nerved; *marginal wing* mostly 1–2 mm wide.

Selected specimens seen. WESTERN AUSTRALIA: Gary Highway between Gunbarrel Highway and Windy Corner, 24 July 1967, *J.S. Beard* 4862 (PERTH); Gibson Desert, 53 km SSE of E end of Clutterbuck Hills, 14 June 1983, *S.D. Hopper* 2904 (PERTH); *c.* 2 km NE of Pass of the Abercerrages, 2 Nov. 1983, *A.C. Kalotas* 1632 (CANB, DNA *n.v.*, PERTH); Ashburton Botanical District-eastern extremity, 60 km from Wongawol Homestead (*c.* 223 km E of Wiluna) on the Gunbarrel Hwy to Carnegie Hsd, 6 Sep. 1984, *B.R. Maslin* 5630 (BRI, CANB, PERTH); *c.* 59 km E of Sandstone on road to Leinster, 5 Sep. 2006, *B.R. Maslin* 8975 (PERTH); *c.* 90 km due NE of Newman on Ethel Creek Jigalong Road at Balfour Downs Station turnoff, 16 Oct. 2007, *B.R. Maslin, J. Miller & J.E. Reid* BRM 9247 (PERTH); *c.* 90 km due NE of Newman on Ethel Creek Jigalong Road at Balfour Downs Station turnoff, 16 Oct. 2007, *B.R. Maslin, J. Miller & J.E. Reid* BRM 9249 (PERTH); *c.* 62 km due N of Laverton, on road to Bandya Station, 54 km N of Grand Central Road, 16 Oct. 2008, *B.R. Maslin & J.E. Reid* BRM 9661 (PERTH); Lake Cohen, 80 km N [of] Gunbarrel Highway, 10 Nov. 1983, *S.J. Midgley* SM 658 (PERTH); 0.5 km along Newman Airport road from Newman Airport, W side of road, 26 Oct. 2009, *J.E. Reid* JER 5 (PERTH); W of Carnegie Station, 30 Aug. 1998, *J.G. & M.H. Simmons* 3735 (PERTH); 23.6 km SW of Billinooka homestead, 6 Sep. 1991, *P.G. Wilson & R. Rowe* PGW 986 (BRI *n.v.*, K *n.v.*, PERTH). NORTHERN TERRITORY: *c.* 33 km NNW of Yuendumu on Tanami–Alice Springs road, Central Australia N district, 15 Sep. 1982, *R.B. Hadlow & A.B. Court* RBH 197 (DNA *n.v.*, PERTH ex CANB); Central Mount Stuart, 1 July 1974, *T.S. Henshall* 473 (NSW *n.v.*, PERTH ex NT); *c.* 75 km due SSE of Alice Springs, 1.7 km S of Deep Well North, 17 Oct. 2000, *B.R. Maslin* 8154 (CANB, PERTH); 2.4 km S of Floodout Bore turnoff (off Rabbit Flat–Yuenduma Road), 9 Oct. 1984, *L. Thomson* LXT 106 (PERTH). SOUTH AUSTRALIA: Lindsay Creek area (Lindsay Creek crosses Ilbunga, which is *c.* 130 km NNW of Oodnadatta), May 1973, *B. Major* 80 (PERTH ex AD). QUEENSLAND: none seen.

Distribution. *Acacia paraneura* has a scattered and somewhat discontinuous distribution from about 119°E in Western Australia east to the Northern Territory border; it also occurs in the southern part of Northern Territory and northern South Australia with outliers in central Queensland (Pedley 2001: the distribution point for *A. paraneura* in far-western New South Wales in Pedley's Figure 418 is an error). In Western Australia most collections of the species are from the southern Pilbara, eastern Gascoyne, Gibson Desert and Central Ranges IBRA bioregions, with scattered outliers in the Murchison bioregion to the south (these include both the narrow-pod variant which is discussed under *Variation* below, and the typical variant). There are very few records of the species from the Little Sandy Desert, southern Great Sandy Desert and Great Victoria Desert bioregions. In the Pilbara *A. paraneura* extends from near Tom Price (where it is uncommon; unvouchered record) through the Hamersley Range to the vicinity of Ethel Creek Station (where it is common) (Maslin *et al*. 2010) (Figure 58).

Figure 55. *Acacia paraneura*. A, D – mature plants showing typical weeping habit; B – branch showing pendulous to sub-pendulous phyllodes; C – branch showing predominately non-pendulous phyllodes; E, F – mature pods with marginal wings. Photographs by B.R. Maslin.

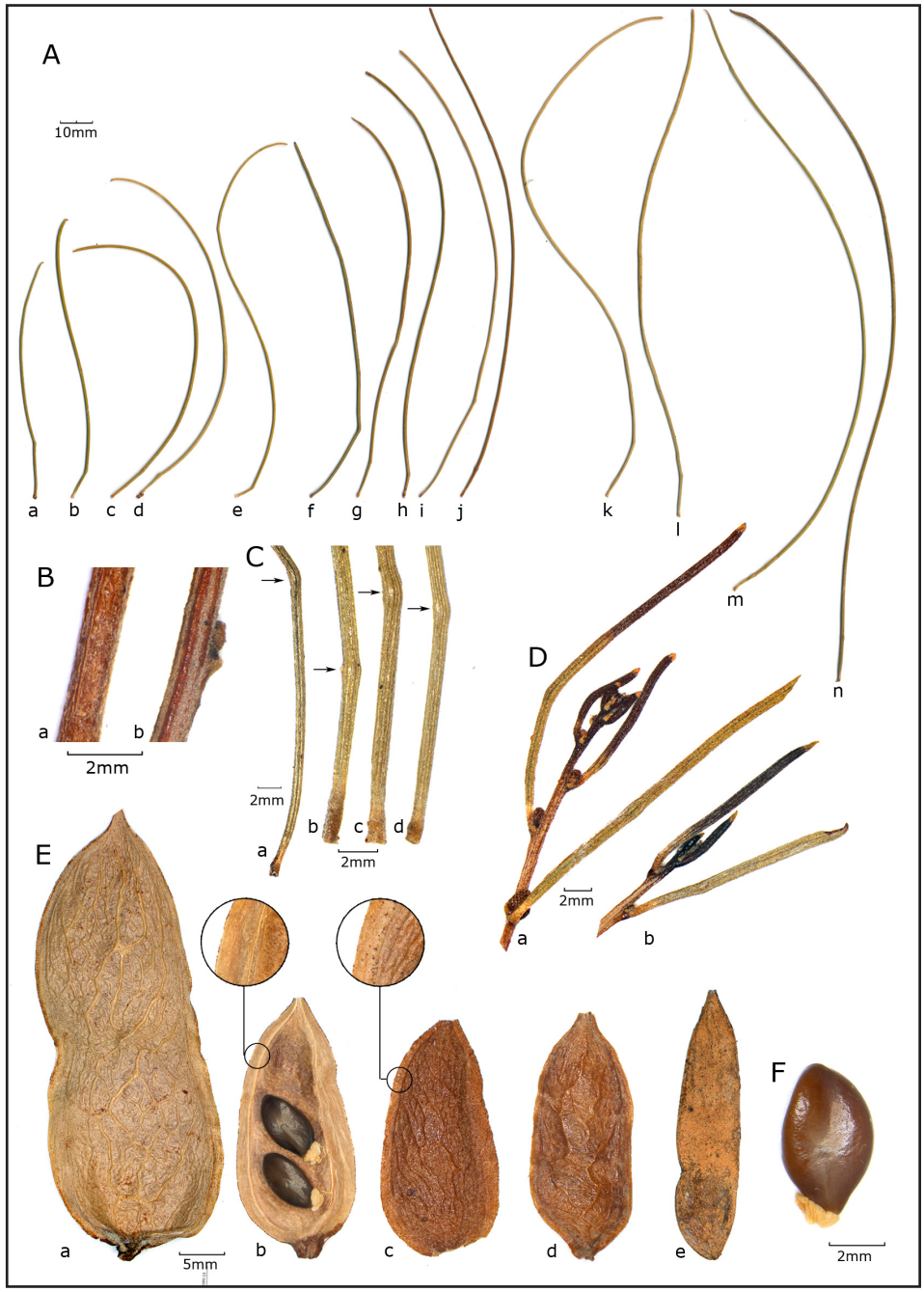


Figure 56. *Acacia paraneura*. A – phyllode variation from a range of specimens; B – branchlets, a) penultimate branchlet ribless, b) penultimate branchlet with minimal translucent resin on ribs; C – phyllode glands (arrowed), a, c) swollen, kinked and displaced from pulvinus, b, d) swollen, slightly kinked and displaced from pulvinus; D – new shoots, a, b) dark-coloured and resinous, vegetative buds and first phyllodes covered with dense layer of glandular hairlets, expanding phyllodes becoming striate; E – pods, a) exterior from holotype specimen, b) interior with seeds showing marginal wing, c) exterior showing marginal wing, d) exterior, e) exterior, pod and pod wing narrower than normal; F – seed with small aril. Scale bars shown on figure; vouchers are listed in Appendix 1.

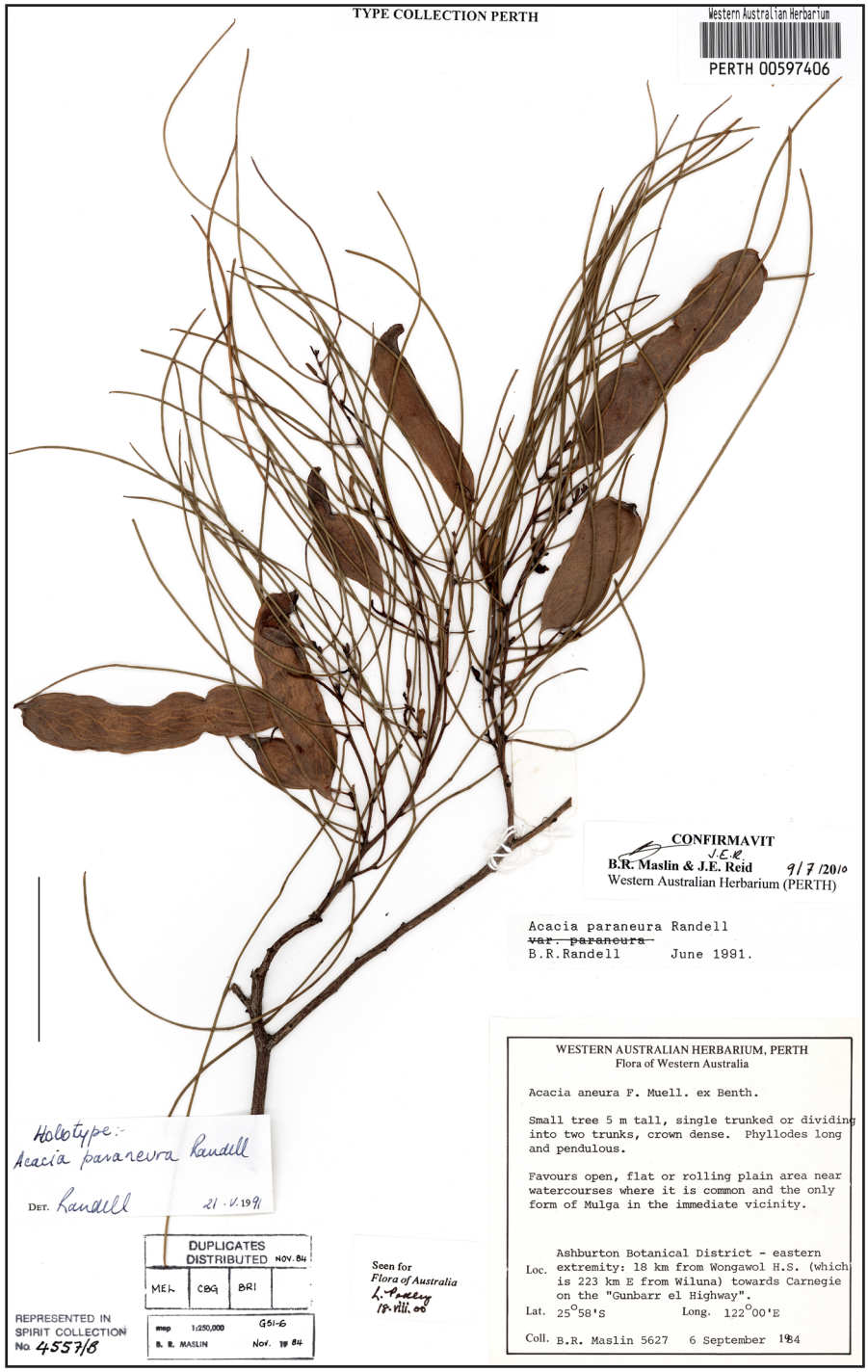


Figure 57. Holotype of *Acacia paraneura* (PERTH 00597406), scale = 5 cm.

Habitat. Grows in a variety of soils ranging from red or red-brown sand through loam to clay, commonly stony or gravelly on the surface and often over hardpan. It often occurs on plains and flats (commonly in water-gaining sites) or in gently undulating country, but is sometimes found on rocky ridges or in sand dune country. *Acacia paraneura* typically grows in Mulga shrubland or woodland communities over low shrubs (e.g. Chenopod or *Eremophila* spp.) and/or Spinifex (*Triodia* spp.).

Flowering and fruiting period. Plants with an abundance of inflorescences at anthesis have been collected in January and in all months from May to October; sometimes immature pods co-occur with the flowers. Pods with mature seeds have been collected from mid-September to mid-November, but plants are often sterile during this period.

Taxonomy. *Acacia paraneura* is a member of the Grey-green Alliance and is most closely related to *A. pteraneura* (see *Affinities* below for discussion). While it could be argued that these species might be treated as infraspecific taxa of a single variable species, such an action would result in a perplexingly variable species. We therefore consider it more appropriate, and not at variance with the ranks ascribed elsewhere in this work, to treat them as distinct species, albeit narrowly circumscribed.

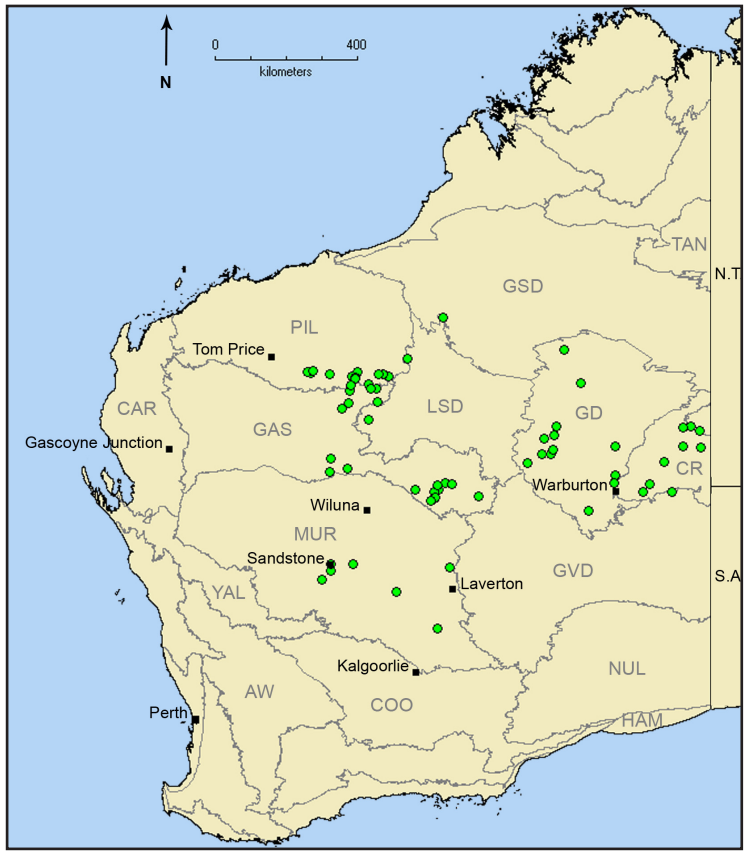


Figure 58. Distribution of *A. paraneura* (●) based on specimens examined at the Western Australian Herbarium (PERTH). Boundaries and name abbreviations for IBRA bioregions (Department of Environment, Water, Heritage and the Arts 2008) are shown in grey.

Pedley (2001: 314) regarded the specimen *B.R. Maslin* 2273a which Randell (1992) cited in the protologue of *A. aneura* var. *conifera* as *A. paraneura*; however, having inspected this specimen we are unsure of its identity (it may be a hybrid involving *A. aptaneura* and *A. pteraneura*).

Variation. *Acacia paraneura* has a distinctive facies in the field, especially when the branchlets and phyllodes are pendulous or sub-pendulous, a character that is otherwise unknown in the Mulga group. The weeping habit, however, is not constant for the species and both weeping and non-weeping morphotypes occur. Weeping morphotypes seem more common than non-weeping ones, and the two are sometimes found growing together. In the field non-weeping individuals of *A. paraneura* can normally be distinguished from co-occurring other Mulga species by their more open and rather wispy crowns. Randell (1992: 117) considered that these non-weeping individuals might represent intergrades between *A. paraneura* (which Randell described as having a weeping habit) and *A. aneura*, however, there is no evidence to suggest that this is the case.

The position of the phyllode gland in *A. paraneura* is very variable, but it is always removed from the pulvinus (the gland position is normally marked by a kink and/or swelling of the phyllode lamina). Large variations occur even on a single plant.

Typically some or all of the phyllodes of *A. paraneura* exceed 100 mm in length, but there are some exceptions. In the Pilbara region near Newman there are a few specimens with atypically short phyllodes (*c.* 40–60 mm long; e.g. *B.R. Maslin et al.* BRM 9249) and although these are sometimes found on juvenile plants there is no direct correlation between plant age and phyllode length. Similarly, in the Little Sandy and Gibson Deserts and the Central Ranges near Giles there are a few specimens with phyllodes mostly 60–95 mm long (e.g. *A. Kalotas* 1596, from SW of Lake Hopkins).

As noted under *Distribution* above there are a few specimens from the vicinity of Sandstone (SW of the main occurrence of the species) with slightly narrower than normal pods (6–8 mm wide) with narrow wings (0.5–1 mm wide), e.g. *B.R. Maslin* 8975. Although these specimens are provisionally referred to *A. paraneura* their taxonomic status requires further investigation.

Specimens with the longest pods (to about 70–90 mm) occur on Wongawol Station, about 200 km east-north-east of Wiluna; the type of *A. paraneura* has these atypically long pods.

Affinities. As already noted *A. paraneura* is most closely related to *A. pteraneura*. *Acacia paraneura* has a wider distribution than *A. pteraneura* and unlike that species is uncommon in the western and south-western Mulga zone of Western Australia (compare Figures 58 and 62). In the field the two species normally display different habit characteristics with *A. pteraneura* a smaller plant with stems more crooked, its lower branches often horizontally spreading so that adolescent plants commonly assume a pseudo-conifer growth form (this growth form seems not to occur in *A. paraneura*), the crown a darker green colour, often denser and never with the pendulous or sub-pendulous branchlets and phyllodes that often occur in *A. paraneura*. These differences easily enabled the species to be distinguished at 62 km north of Laverton where they are parapatric (*A. paraneura – B.R. Maslin & J.E. Reid* BRM 9661; *A. pteraneura – B.R. Maslin & J.E. Reid* BRM 9662). Despite their habit and geographic differences *A. paraneura* and *A. pteraneura* can sometimes be difficult to separate on herbarium specimens; normally the best distinguishing character is their phyllode length which usually exceeds 100 mm in *A. paraneura* (but see note under *Variation* above) but rarely reaches 100 mm in *A. pteraneura*.

Acacia paraneura and *A. aptaneura* are sometimes sympatric and in the absence of pods or habit information it can occasionally be difficult to separate them when using herbarium material. In these cases one way to recognise *A. aptaneura* is by its gland which is located close to the pulvinus (less than 4 mm) and its phyllodes which are normally straighter and not as discernibly kinked at the gland as in *A. paraneura*.

Hybridity. Judging from morphological features and field observations it appears that *A. paraneura* occasionally hybridises with *A. aptaneura*. For example, in the Pilbara region about 80 km due east-north-east of Newman, *B.R. Maslin et al.* BRM 9251 (*A. aptaneura*) and *B.R. Maslin et al.* BRM 9253 (*A. paraneura*) co-occurred with *B.R. Maslin et al.* BRM 9252 (a possible hybrid between the two species).

See note under *A. macraneura* regarding putative hybridity with *A. paraneura*.

Notes. This species has significant horticultural potential on account of its attractive growth form. However, while it is likely to be reasonably long-lived, *A. paraneura* is also likely to have a relatively slow growth rate. Furthermore, plants of this species are often inhabited by gall-producing thrips and this could also constrain its use as a horticultural plant if left untreated. Indigenous people of the Pilbara used the dense wood from *A. paraneura* to make weapons and hunting tools, the seeds and immature pods were eaten and the roots were used as fire sticks.

Conservation status. Not considered rare or endangered.

Common name. Weeping Mulga (Randell 1992: 117; Maslin *et al.* 2010).

Aboriginal name (Language Group in parentheses). *Warlun* (Kurrama).

Etymology. The botanical name is derived from the Greek *para* (near) and *aneura* (without nerves) reflecting its affinities to *A. aneura*.

Acacia pteraneura Maslin & J.E.Reid, *sp. nov.*

Frutices multi-caules vel in statu maturitas *arbores* ad 6(–8) m altae, interdum forma coniferarum vel (in statu juvenili) pseudo-coniferarum; caules et ramuli major sub-recti vel distorti. *Cortex* cinereus vel nigellus. *Costi ramulorum* plerumque rubro-brunnei, non resinosi vel strato ±tenue resinae ornati. *Surculi novi* resinosi. *Phyllodia* teretia vel sub-teretia, 40–80(–100) mm longa, plerumque diverse curvata ad sinuosa vel sigmoidea, plerumque viridia vel cinereo-viridia. *Glans* plerumque 2–10 mm supra pulvinum posita, phyllodium ad glandem plerumque tumidum et crispatum. *Legumina* plerumque 15–40 × 8–15 mm, alis marginalibus plerumque 1–3, plerumque leviter undulatis. *Semina* 4–6 × 2–3.5 mm.

Typus: 109 km north-west of Meekatharra on road to Gascoyne Junction, Western Australian, 10 September 2006, *B.R. Maslin* 9058 (*holo*: PERTH 07487517; *iso*: K).

Acacia aneura var. *conifera* Randell, *J. Adelaide Bot. Gard.* 14(2): 122 (1992); *Racosperma aneurum* var. *coniferum* (Randell) Pedley, *Austrobaileya* 6: 450 (2003). *Type citation*: '*c.* 25 km NNW Yuendumu, N.T., *P.K. Latz 8804*, 25.viii.1981 (PERTH).' *Type*: *c.* 25 km NNW of Yuendumu, Northern Territory, 25 August 1981, *P.K. Latz* 8804 (*holo*: PERTH 00728861; *iso*: CBG, NT).

Acacia sp. Mulga broad wings (B.R. Maslin 9058): *Australian Plant Census*, http://www.anbg.gov.au/chah/apc/index.html; Western Australian Herbarium, in *FloraBase*, http://florabase.dec.awa.gov.au [accessed June 2010].

Acacia sp. Mulga narrow wings (B.R. Maslin et al. BRM 9149): *Australian Plant Census*, http://www.anbg.gov.au/chah/apc/index.html; Western Australian Herbarium, in *FloraBase*, http://florabase.dec.awa.gov.au [accessed June 2010].

Rounded or obconic, multi-stemmed *shrubs* to 3 m tall and 4 m wide, maturing to single-or few-stemmed, mostly obconic *trees* to 6(–8) m tall, sometimes with a pseudo-conifer (adolescent plants) or rarely a conifer growth form, stems to *c.* 20 cm dbh, the stems and major branches sub-straight to crooked, the upper branches obliquely ascending to erect (except some or all horizontal on pseudo-conifer and conifer plants); crowns normally sub-dense and green but sometimes dense or grey-green. *Bark* grey to blackish, longitudinally fissured on main stems, smooth on branches. *Branchlets* often dark grey, white appressed-hairy between ribs at extremities but becoming glabrous and ribless with age, the ribs resinous or not resinous and commonly red-brown, the resin translucent and forming a thin veneer to moderately thick overburden (resin best developed on juvenile plants and immediately below insertion of phyllodes on some mature plants). *New shoots* resinous; *youngest phyllodes* sometimes indistinctly or obviously striate but more commonly the nerves obscured by a dense covering of dark brown, red-brown or black (when dry) glandular hairlets within a ±shiny resin matrix, the glandular hairlets becoming scattered as the shoot elongates but normally persistent on the expanding phyllodes, young branchlets and the uppermost mature phyllodes. *Phyllodes* 40–80(–100) mm long, often shorter (to *c.* 20 mm) on juvenile plants, 0.8–1.2(–1.5) mm wide, terete to sub-terete or rarely interspersed with a few compressed or flat, mostly variously curved to sinuous or sigmoid and ascending to erect, not rigid, often slightly resinous, single or sometimes grouped in often nodose clusters of 2–5, green to greyish green or occasionally sub-glaucous, with appressed, silvery hairs between nerves (most obvious on young phyllodes); parallel *longitudinal nerves* numerous and fine; *apices* acute, innocuous, straight to uncinate. *Gland* situated on adaxial surface of phyllode usually 2–10(–15) mm above the pulvinus, the phyllode often swollen and/or kinked at the gland. *Inflorescences* simple; *peduncles* 7–15 mm long, with sparse to moderately dense, appressed white hairs normally interspersed with red-brown glandular hairlets; *spikes* (few seen) 10–30 mm long, golden. *Bracteoles* (few seen) sub-peltate, 0.4–0.7 mm long, the claws short and glabrous, the laminae widely ovate, slightly thickened, dark brown and inflexed, morphologically dissimilar to sepals. *Flowers* (few seen) 5-merous; *sepals* free or almost so, ⅓–½ length of petals, the claws linear to narrowly oblong and expanded at their non-thickened, sparsely ciliolate apices; *petals* 1.5 mm long. *Pods* (10–)15–40 mm long, usually 8–15 mm wide including the wing, mostly oblong to narrowly oblong, sometimes elliptic or obovate, not or scarcely constricted between the seeds, thinly coriaceous, flat, brown to greyish brown or reddish brown, glabrous to moderately minutely appressed white-hairy, often with very scattered red-brown glandular hairlets, sometimes slightly resinous, openly reticulate with nerves obscure to somewhat evident and generally longitudinally trending, gradually or ±abruptly narrowed to a basal stipe 2–5 mm long; *marginal wing* 1–3(–3.5) mm wide, commonly shallowly undulate. *Seeds* oblique or sometimes longitudinal in the pods, 4–6 mm long, 2–3.5 mm wide, ellipsoid to obloid, compressed, mid-brown to dark brown, shiny; *funicle* expanded into a small, white or pale yellow *aril*. (Figures 59–61)

Characteristic features. Multi-stemmed *shrubs* maturing to single-or few-stemmed *trees* to 6(–8) m tall, sometimes with a pseudo-conifer (adolescent plants) or rarely conifer growth form, stems and major branches sub-straight to crooked; crowns normally ±dense and green. *Bark* grey to blackish. *Branchlet* ribs commonly red-brown, not resinous or with a normally ±thin layer of translucent resin. *New shoots* resinous, the *youngest phyllodes* normally with a dense covering of dark brown, red-

brown or black glandular hairlets which become scattered as the shoot expands. *Phyllodes* terete to sub-terete, 40–80(–100) mm long, mostly variously curved to sinuous or sigmoid, normally green to greyish green. *Gland* mostly 2–10 mm above the pulvinus, the phyllode often swollen and/or kinked at the gland. *Pods* mostly 15–40 × 8–15 mm, not or scarcely constricted between the seeds, openly reticulately nerved; *marginal wings* normally 1–3 mm wide and often shallowly undulate. *Seeds* 4–6 × 2–3.5 mm.

Selected specimens seen. WESTERN AUSTRALIA: Great Victoria Desert margin, 8 Apr. 1984, *B. Downing* 872 (CANB *n.v.*, MEL *n.v.*, PERTH); 9 km W of Laverton on Leonora–Windarra Road, *c.* 110 km NW of Leonora, 9 Oct. 1983, *S.J. Forbes s.n.* (PERTH 00600598; coniferous growth form; specimen cited by Randell (1992) under *A. aneura* var. *conifera*); 9 km S of Teutonic Bore Mine on Leonora–Agnew Road, *c.* 9 km N of Sullivan's Creek, 10 Oct. 1983, *S.J. Forbes* 1546 (MEL *n.v.*, PERTH: pods narrower than normal; this specimen was cited by Pedley 2001 under *A. aneura* var. *microcarpa* which we regard as conspecific with *A. incurvaneura*); 4 miles E of Notabilis Hill, Gunbarrel Highway, Gibson Desert, 25 July 1963, *A.S. George* 5376 (PERTH: coniferous growth form; this specimen was cited by Randell (1992) under *A. aneura* var. *conifera*); 23 miles [37 km] N of Warburton Mission, 1 Oct. 1966, *A.S. George* 8191 (PERTH: pods narrower than normal; this specimen was cited by Pedley 2001 under *A. aneura* var. *microcarpa*); Cue [8 km from Lakeside Homestead on the track to Cue], 3 Oct. 1965, *K.F. Kenneally* 52A (PERTH: this specimen was cited by Pedley 2001 under *A. aneura* var. *microcarpa*); 11 km W of Wiluna on road to Meekatharra, 1 Apr. 1992, *B.R. Maslin* 7074 (PERTH: this specimen was cited by Pedley 2001 under *A. aneura* var. *tenuis* which we regard as conspecific with *A. aptaneura*); 29.5 km N of Meekatharra on Great Northern Highway to Newman, 11 July 2000, *B.R. Maslin* 8007 (CANB, PERTH: coniferous growth form); 92 km NW of Meekatharra on road to Gascoyne Junction, 10 Sep. 2006, *B.R. Maslin* 9067 (PERTH); 11.5 km N of Meekatharra on Great Northern Highway to Newman, 11 Sep. 2006, *B.R. Maslin* 9085 (PERTH); 66 km W of Sandstone on road to Mt Magnet, 12 Nov. 2008, *B.R. Maslin* 9928 (NT, PERTH); *c.* 45 km due NW of Paynes Find on W side of Mongers Lake, 5.5 km S of Paynes Find–Yalgoo Road on minor road to Warriedar Homestead, 13 Nov. 2008, *B.R. Maslin* 9941 (PERTH); Woolgarong Station 106.5 km N of Mullewa on Carnarvon–Mullewa Road, 3 Oct. 2007, *B.R. Maslin, J. Miller & J.E. Reid* BRM 9134 (BRI, PERTH); Milly Milly Station near intersection of Erong Springs Road, 9.5 km W of Milly Milly Homestead, 0.3 km N of Byro-Milly Milly Road, 5 Oct. 2007, *B.R. Maslin, J. Miller & J.E. Reid* BRM 9158 (AD, BRI, PERTH); Dairy Creek Station, *c.* 1 km NW of Congo Creek crossing on Dairy Creek–Gascoyne Junction Road, 6 Oct. 2007, *B.R. Maslin, J. Miller & J.E. Reid* BRM 9171A (AD, PERTH); 14 km from Laverton on the road to Leonora, 27 Oct. 2007, *B.R. Maslin, J. Miller & J.E. Reid* BRM 9339A (PERTH: coniferous growth form); Weld Range, 70.5 km NW of Cue on Beringarra–Cue Road, 14 Oct. 2008, *B.R. Maslin & J.E. Reid* BRM 9642 (PERTH: coniferous growth form). NORTHERN TERRITORY: 49 km by road W from Finke, 12 Aug. 1993, *S.G. Pearson* SGP 260 (AD). SOUTH AUSTRALIA: 9.4 km SE from Maryinna Hill (5.2 km direct ESE of Oompeinna Hill), 16 Mar. 1995, *P.J. Lang & H.P. Vonow* BS23-24603 (AD).

Distribution. In Western Australia *A. pteraneura* extends from the latitude of Gascoyne Junction (*c.* 115°E) eastwards to the Northern Territory and South Australian borders, with most collections from between about 23°S and 29°S. Although we have not comprehensively examined collections from outside of Western Australia *A. pteraneura* does occur in the Northern Territory and in South Australia. In Western Australia *A. pteraneura* is particularly common in the Murchison IBRA bioregion but it also occurs in the Gascoyne, southern Pilbara, eastern Yalgoo, eastern Carnarvon, Little Sandy Desert (rare), Gibson Desert, Central Ranges and Great Victoria Desert bioregions, with outliers in the northern Nullarbor Bioregion (e.g. *B. Downing* 872). The typical variant of the species predominates in the western part of the geographic range and although the narrow-pod variant (discussed below under

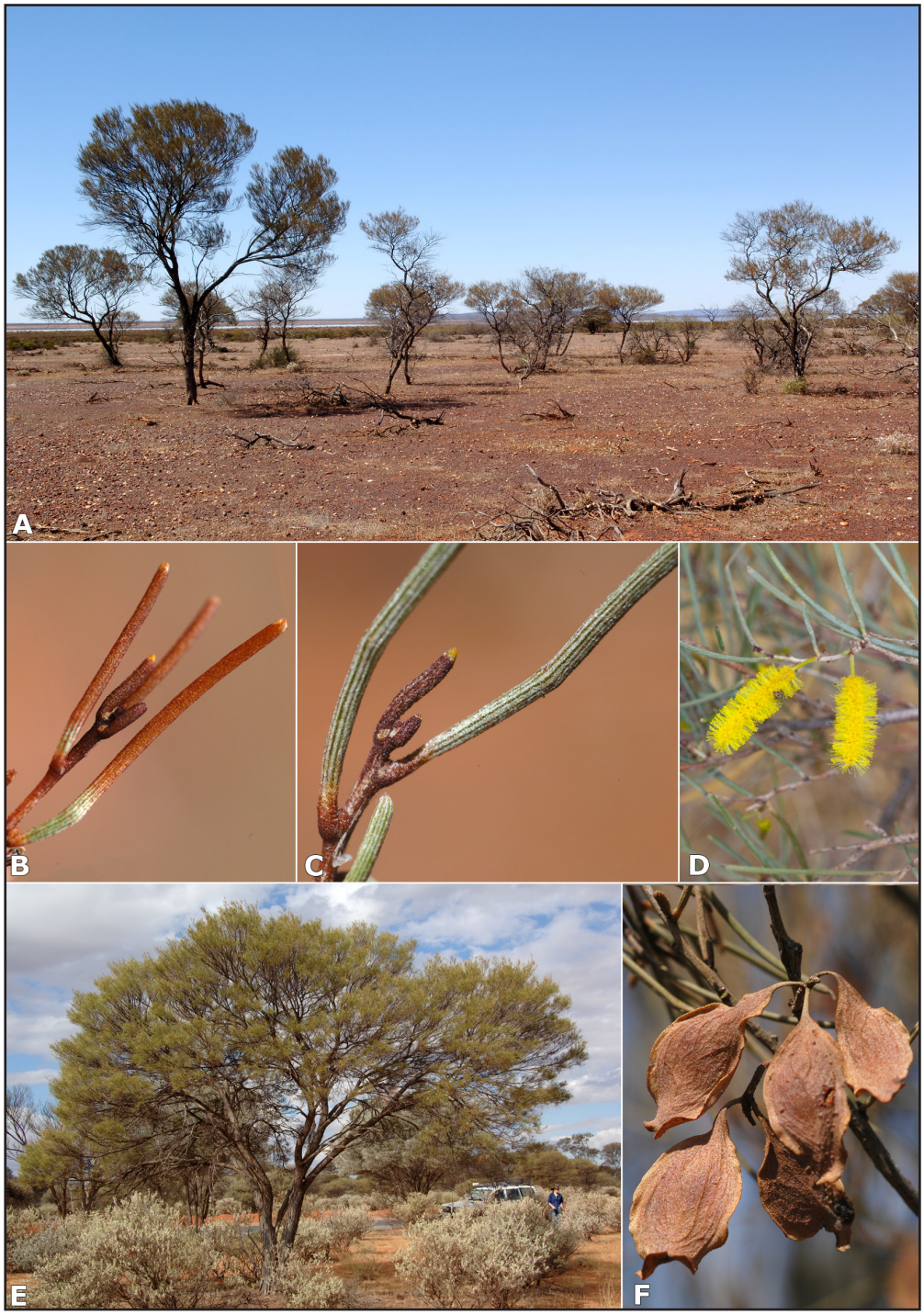


Figure 59. *Acacia pteraneura*. A, E – plants showing typical ±obconic habit; B – new shoot resinous, red-brown and with conspicuous glandular hairlets; C – new shoot resinous and dark brown, and phyllodes often kinked at gland which is commonly displaced from pulvinus; D – inflorescence spikes; F – mature pods with broad marginal wings. Photographs by B.R. Maslin.

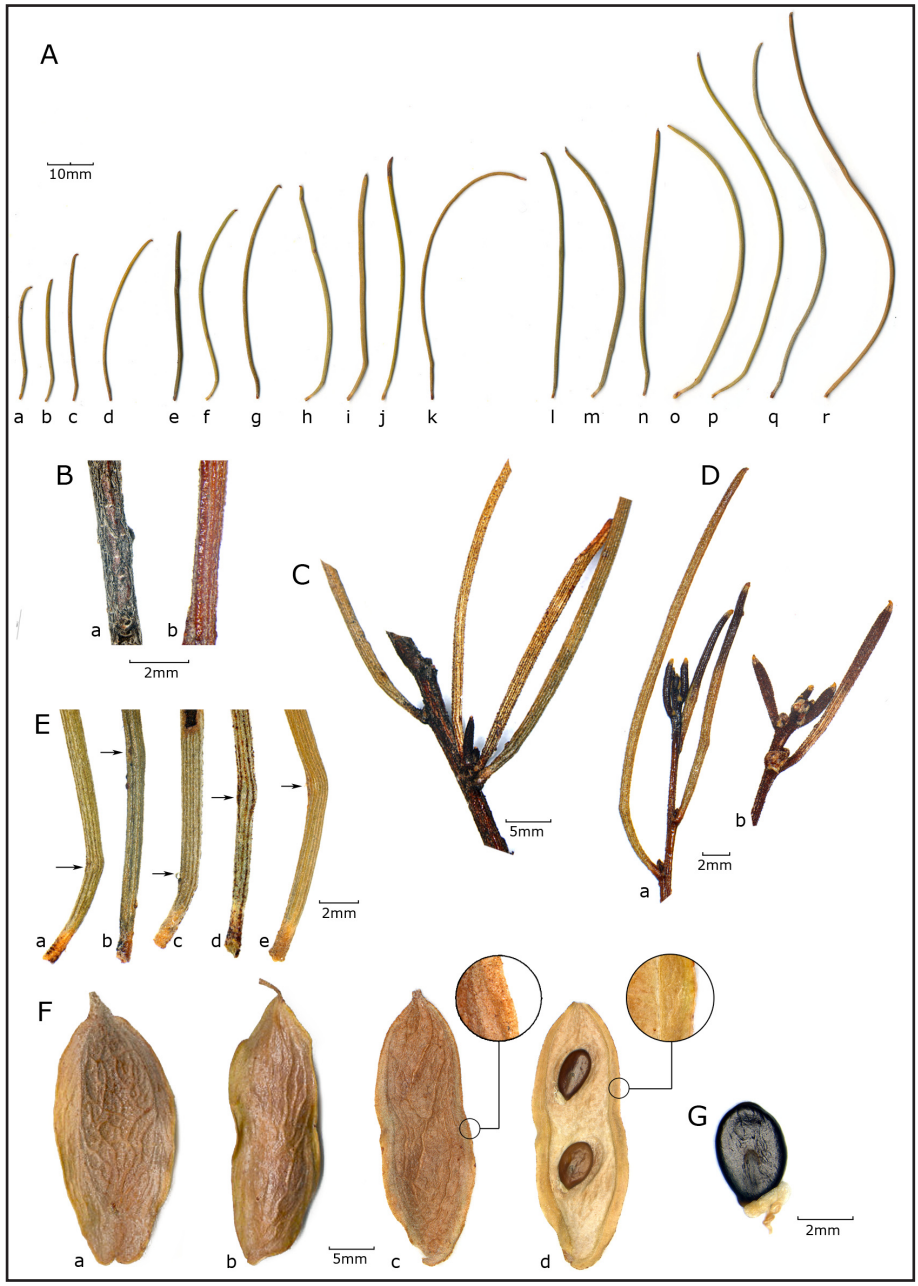


Figure 60. *Acacia pteraneura*. A – phyllode variation from a range of specimens; B – branchlets, a) mature branchlet ribless, b) penultimate branchlet, red-brown, with translucent resin on ribs; C – clustered phyllode development; D – new shoots, a) dark-coloured and resinous, vegetative buds and first phyllodes covered with dense layer of glandular hairlets, expanding phyllodes becoming striate, b) dark-coloured and scarcely resinous, vegetative buds and first phyllodes covered with dense layer of glandular hairlets, expanding phyllodes becoming striate; E – phyllode glands (arrowed), a) swollen, kinked and displaced from pulvinus, b) slightly swollen, not kinked and displaced from pulvinus, c) not swollen, slightly kinked and slightly displaced from pulvinus, d) swollen, not kinked and displaced from pulvinus, e) swollen, kinked and displaced from pulvinus; F – pods, a, b) exteriors, c) exterior showing marginal wing, d) interior with seeds showing marginal wing; G – seed with small aril. Scale bars shown on figure; vouchers are listed in Appendix 1.

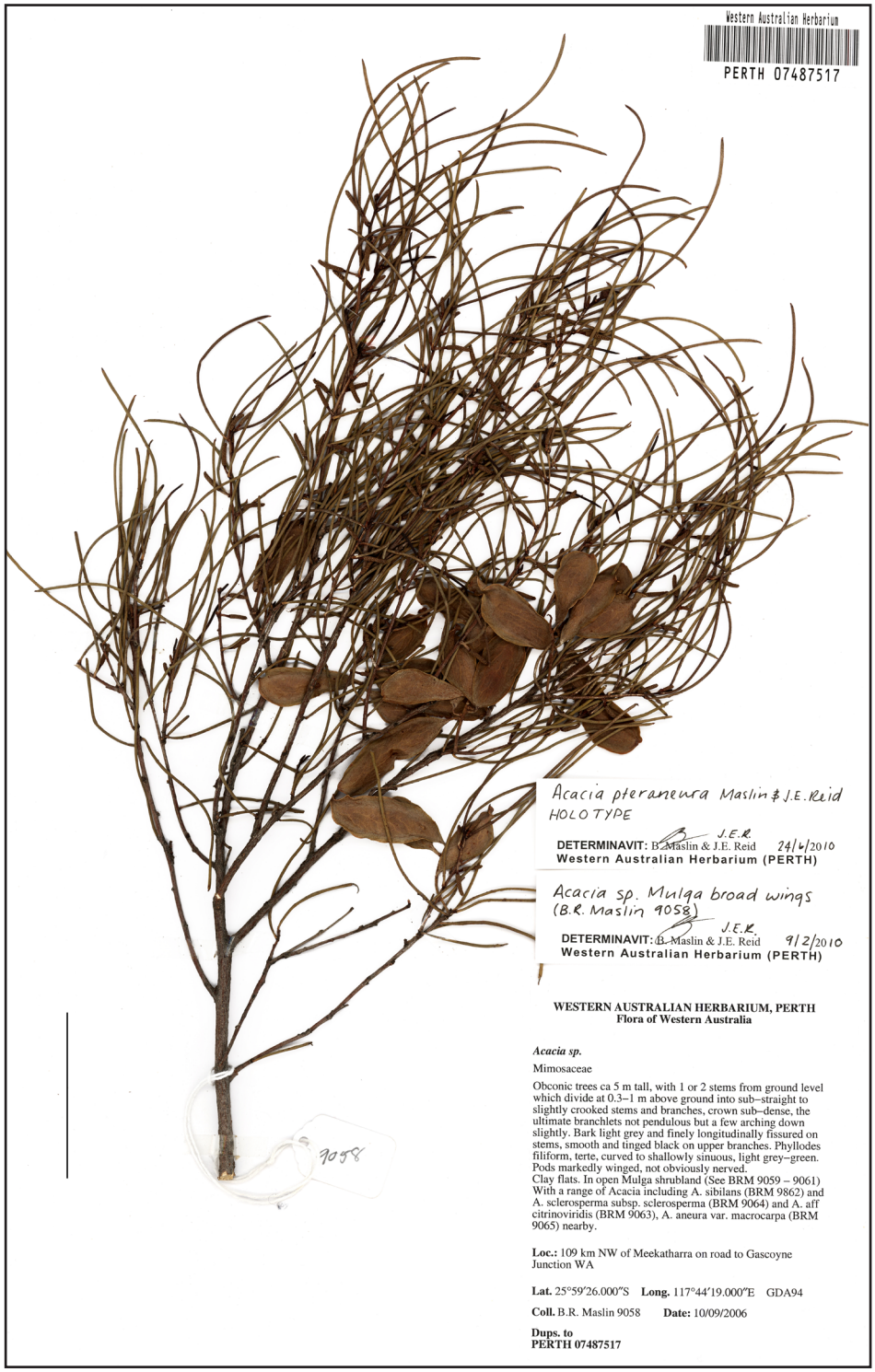


Figure 61. Holotype of *Acacia pteraneura* (PERTH 07487517), scale = 5 cm.

Variation) is also scattered here it extends well to the east (to the Northern Territory–South Australian border). A few specimens from the Pilbara region are provisionally referred to *A. pteraneura* but pods are needed to confirm the identity of most (but see note under *Variation* below) (Figure 62).

Habitat. *Acacia pteraneura* grows in a variety of habitats. It is commonly found in red-brown sand, sandy loam, clay or sandy clay loam often over hardpan and often with a stony surface (especially quartz or banded ironstone rubble). It is often found on stony plains but extends to low rocky hills (e.g. banded ironstone, quartz) or sometimes lateritic breakaways where it occurs in skeletal soils. It sometimes grows in association with granite or in water-gaining sites such as diffuse drainage channels or alluvial flats. It is normally found in open mixed Mulga shrubland or low woodland communities, either scattered or relatively common in places.

Flowering and fruiting period. Plants with an abundance of inflorescences at anthesis have been collected in April and May and again from July to September. Plants with sporadic flowers also occur during these months and in March and October. In the July–October period the flowers sometimes co-occur with immature pods. Pods with mature seeds have been collected from early October to late November, or occasionally mid-September. This species appears to be more fecund than most other

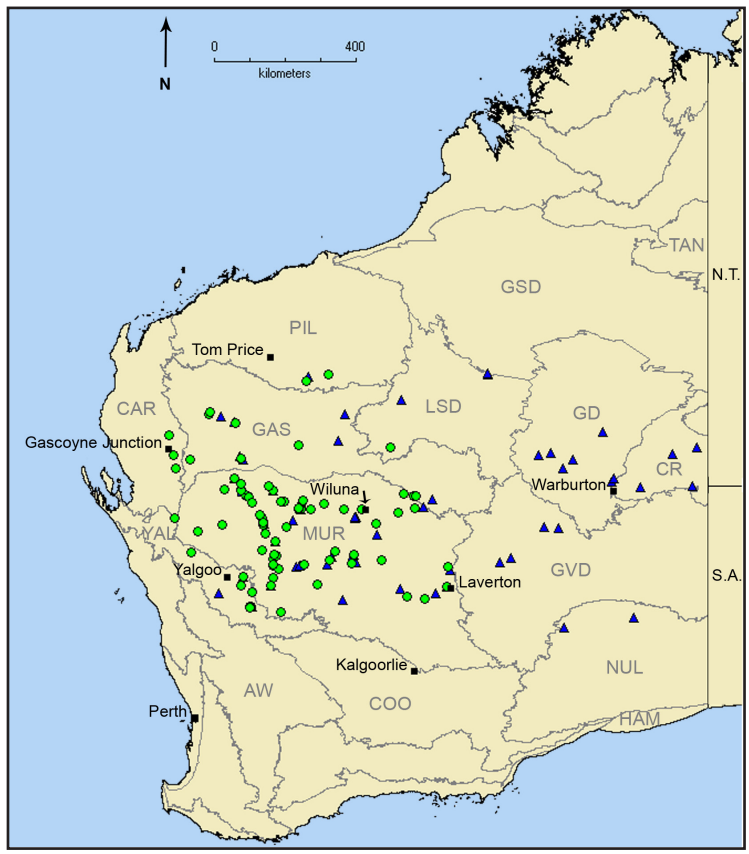


Figure 62. Distribution of *Acacia pteraneura* (●) and *A. pteraneura* (narrow pod variant) (▲) based on specimens examined at the Western Australian Herbarium (PERTH). Boundaries and name abbreviations for IBRA bioregions (Department of Environment, Water, Heritage and the Arts 2008) are shown in grey.

Western Australian Mulga species and the pods can be produced on plants when fairly young (e.g. when plants are about 2 m tall).

Taxonomy. *Acacia pteraneura* is a member of the Grey-green Alliance and is most closely related to *A. paraneura* and *A. fuscaneura* (see these species for discussion), but also has affinities with *A. aneura*. As defined here *A. pteraneura* is a broadly circumscribed species and is a common Mulga in Western Australia, but was not recognised as a distinct entity by either Randell (1992) or Pedley (2001). However, some PERTH specimens had been determined by Pedley as *A. aneura* var. *crebra*, a name that was never formally published. While it could be argued that *A. pteraneura* and *A. paraneura* might be treated as infraspecific taxa of a single variable species, such an action would result in perplexingly variable species. We therefore consider it more appropriate, and not at variance with the ranks ascribed elsewhere in this work, to treat them as distinct species, albeit narrowly circumscribed.

As will be seen from the specimen listing above, Pedley (2001) cited some specimens of *A. pteraneura* under *A. aneura* var. *microcarpa* (which we regard as conspecific with *A. incurvaneura*) and *A. aneura* var. *tenuis* (which we regard as conspecific with *A. aptaneura*), and Randell (1992) cited some specimens of *A. pteraneura* under *A. aneura* var. *conifera*.

Morphology. Juvenile plants of this species sometimes have some phyllodes arranged in nodose clusters of two to five; these clusters are absent or very infrequent on mature adult plants. Plants possessing a conifer (all lateral branches horizontal) (Figure 2B, D) or pseudo-conifer (lower lateral branches horizontal) (Figure 3A, D) growth form sometimes occur in *A. pteraneura*; these individuals normally also have some clustered phyllodes. Plants with narrow pods provisionally referred to *A. pteraneura* can also possess conifer and pseudo-conifer growth forms.

Variation. There is considerable variation in phyllode, pod and gland characters within *A. pteraneura* but there appear to be no sharp morphological discontinuities or strict character correlations that enable discrete taxa to be defined. It is clear that more work, especially genetic and field studies, is needed to elucidate the variation. Of particular interest is the heterogeneous narrow-pod variant discussed below.

Plants regarded as typical *A. pteraneura* have pods that are normally 8–15 mm wide with wings 1–3 mm wide, and green phyllodes with the gland normally located 2–10 mm above the pulvinus. There are, however, some specimens with generally narrower pods (5–8 mm wide, with wings *c.* 1 mm wide) and with the gland (0–)1–4 mm above the pulvinus. These plants were formerly known under the phrase name *Acacia* sp. Mulga narrow wings (B.R. Maslin et al. BRM 9149) at PERTH. Judging from morphological criteria there seemingly are discordant elements within this narrow-pod variant with some specimens possibly representing hybrids between *A. incurvaneura* and *A. pteraneura* (including the specimen *B.R. Maslin et al.* BRM 9149 noted above). These putative hybrids have grey, grey-green or sub-glaucous mature phyllodes (green when young). The other element shows affinities to *A. aneura* and appears to be the only form of *A. pteraneura* that occurs in the eastern part of the species range (such as the Gibson Desert and ranges east of Warburton, e.g. *A.S. George* 8191 which Pedley 2001 cited under *A. aneura* var. *microcarpa*); however, many specimens from this area are without pods so their identity cannot be confirmed. Fruiting specimens from one Pilbara population about 60 km east-south-east of Newman may also represent this same variant (e.g. *B.R. Maslin et al.* BRM 9244).

Affinities. As already noted *A. pteraneura* is closely related to both *A. fuscaneura* and *A. paraneura* (see these two species for discussion of differences). It is also close to *A. aneura* which is most reliably

distinguished by its flat phyllodes.

Acacia pteraneura can resemble terete-phyllode forms of *A. aptaneura* with which it is sometimes sympatric. The most reliable character for distinguishing these species is their pods which are clearly winged in *A. pteraneura* and rimmed in *A. aptaneura*; there are also some differences in pod colour, indumentum and nervation. However, care is needed with non-fruiting specimens not to confuse the two species. Normally *A. pteraneura* can be recognised by its glands which are often (but not always) further removed from the pulvinus and its phyllodes which are often more obviously swollen and/or kinked at the gland than in *A. aptaneura*. Also, the phyllodes of *A. pteraneura* are often more strongly curved or sinuous to sigmoid than those of *A. aptaneura* and its new shoots are often darker coloured with more obvious and longer-persistent reddish glandular hairlets. Furthermore, when ribs are present on the young branchlets they are more pronounced and darker coloured (red-brown to light brown) in *A. pteraneura* than in *A. aptaneura* (where they are yellow or yellowish). Regrettably, these differences disappear as the branchlets mature. In the field it is often seen that the stems and main branches of *A. pteraneura* are normally more crooked than those of *A. aptaneura*.

Hybridity. As noted under *Variation* above *A. pteraneura* possibly hybridises with *A. incurvaneura* (Blue Alliance). These putative hybrids have been recorded as growing with one or other or both or neither of the putative parents, e.g. *B.R. Maslin* 9083 (with both putative parents), *B.R. Maslin et al.* BRM 9272 (with *A. incurvaneura*), *B.R. Maslin* 9070 (with *A. pteraneura*), and *B.R. Maslin & J.E. Reid* BRM 9618 and *B.R. Maslin* 8940 (with neither parent, the former forming a monotypic stand, the latter occurring in a mixed Mulga community).

Acacia pteraneura also possibly occasionally hybridises with *A. aptaneura* (Green Alliance), e.g. *B.R. Maslin & J.E. Reid* BRM 9613 at Mt Augustus (neither putative parent was recorded from this population but occurred nearby, namely, *B.R. Maslin & J.E. Reid* BRM 9612 – *A. pteraneura* and *B.R. Maslin & J.E. Reid* BRM 9617 – *A. aptaneura*). *Acacia pteraneura* also putatively hybridises with *A. fuscaneura* and *A. macraneura* (see these species for discussion).

Conservation status. Not considered rare or endangered.

Common name. Broad-wing Mulga.

Etymology. The species name is derived from the Greek *pteron*- (a wing, with reference to the very broad wing on the pods of this species), with 'aneura' as the stem of the epithet.

Acknowledgements

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Appendix

Voucher specimens for figures in text. All vouchers are housed at the Western Australian Herbarium (PERTH), unless specified.

Figure 5. A – a) *B.R. Maslin & J.E. Reid* BRM 9660, b) *B.R. Maslin & J.E. Reid* BRM 9659, c) *B.R. Maslin & J.E. Reid* BRM 9658, d) *B.R. Maslin, J. Miller, L. Sweedman & B. Cole* BRM 7900B, e) *B.R. Maslin & J.E. Reid* BRM 9655, f) *B.R. Maslin & J.E. Reid* BRM 9654, g) *B.R. Maslin & J.E. Reid* BRM 9656, h) *B.R. Maslin & J.E. Reid* BRM 9652, i) *B.R. Maslin & J.E. Reid* BRM 9651.

Figure 6. A – a) *B.R. Maslin* 8946, b) *B.R. Maslin* 8949, c) *B.R. Maslin* 8943, d) *B.R. Maslin* 8940, e) *B.R. Maslin* 8941, f) *B.R. Maslin* 8942, g) *B.R. Maslin* 8951, h) *B.R. Maslin* 8948, i) *B.R. Maslin* 8944, j) *B.R. Maslin* 8945, k) *B.R. Maslin* 8947.

Figure 9. A – a) *S. van Leeuwen* 693, b) *M.E. Trudgen* MET 17624, c) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9253, d) *B.R. Maslin & J.E. Reid* BRM 9719, e) *B.R. Maslin* 8959A, f) *B.R. Maslin* 9924, g) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9240; B – *M.E. Trudgen* 17651; C – a) *B.R. Maslin & J.E. Reid* BRM 9668, b, c) *M.E. Trudgen* MET 16050, d) *B.R. Maslin* 9019, e) *B.R. Maslin & J.E. Reid* BRM 9758, f) *B.R. Maslin & J.E. Reid* BRM 9699, g) *D. Edinger* 4386; D – a) *P.K. Latz* 8006, b) *M.E. Trudgen* MET 15946, c) *R. Fairman* 251D; E – a) *S. van Leeuwen for B.R. Maslin* BRM 8085, b) *B.R. Maslin* 8048A, c) *M.E. Trudgen & G. Marney* MT 2575, d) *N. Burrows* JK 11, e) *B.R. Maslin & J.E. Reid* BRM 9593; F – a) *N.E. Casson & E.M. Mattiske* MCPL 1062, b) *K.J. Gibbons* 143 (PERTH 07859880), c) *B.R. Maslin* 8990, d) *B.R. Maslin & J.E. Reid* BRM 9781, e) *B.R. Maslin & J.E. Reid* BRM 9745, f) *B.R. Maslin* 8959A, g) *B.R. Maslin* 5029, h) *S.D. Hopper* 4991; G – *B.R. Maslin* 8977.

Figure 10. A – a) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9175, b) *M.E. Trudgen* MET 17638 (pod at upper end of width range); B – *B.R. Maslin, J. Miller & J.E. Reid* BRM 9160 (gland further removed from pulvinus base than normal); C – a) *B.R. Maslin* 9932, b, c) *B.R. Maslin & J.E. Reid* BRM 9746; d, e) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9147, f) *B.R. Maslin & J.E. Reid* BRM 9786; D – a, b) *B.R. Maslin & J.E. Reid* BRM 9584, c) *S. van Leeuwen* 1291, d) *B.R. Maslin* 7514, e) *B.R. Maslin* 7516, f) *B.R. Maslin* 5076, g) *B.R. Maslin* 7099, h) *B.R. Maslin* 9086, i, j) *B.R. Maslin* 8128, k) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9174.

Figure 12. *Acacia aneura*. A – a) *M. McDonald* 1796/1, b) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9352A (pods both bevel-edged and winged), c) *B.R. Maslin & J.E. Reid* BRM 9700A (pods both bevel-edged and winged), d) *M.E. Trudgen* 17651, e) *P.K. Latz* 20893, f) *S. Adriano s.n.* (PERTH 06910939), g) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9221, h) *B.R. Maslin & J.E. Reid* BRM 9634, i) *B.R. Maslin & J.E. Reid* BRM 9718, j) *B. Crespi* BC 99–36, k) *M.E. Trudgen* 19126, l) *B.R. Maslin & J.E. Reid* BRM 9700A (pods both bevel-edged and winged), m) *K.J. Gibbons* 143 (PERTH 07859880), n) *M. McDonald* MM 1804 (sheet 2/2, PERTH 04326083), o) *M.E. Trudgen* MET 19121, p) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9352 (pods both bevel-edged and winged), q) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9214 (pods both bevel-edged and winged), r) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9176, s) *D.J. Edinger* 5113, t) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9230; B – a) *B.R. Maslin & J.E. Reid* BRM 10009, b) *B.R. Maslin & J.E. Reid* BRM 9719 (juvenile plant); C – a) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9352 (pods both bevel-edged and winged), b) *J. Bull* R 108-01; D – a) *G.J. Morse* 6, b) *B.R. Maslin* 4620, c) *M.E. Trudgen* 17651; E – *E. Thoma* 1214 (pods both bevel-edged and winged); F – a) *Desert Dreaming Expedition* 175, b) *M.E. Trudgen* MET 19124, c) *E. Thoma* 1214 (pods both bevel-edged and winged), d) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9352 (pods both bevel-edged and winged); G – *M.E. Trudgen* MET 19122.

Figure 16. *Acacia aptaneura*. A – a, c) *B.R. Maslin & J.E. Reid* BRM 10034-3, b, f) *B.R. Maslin & J.E. Reid* BRM 10034-4, d, g) *B.R. Maslin & J.E. Reid* BRM 10034, e, h) *B.R. Maslin & J.E. Reid* BRM 10034-2, i, j) *B.R. Maslin & J.E. Reid* BRM 10034-1; B – a, b) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9223 (juvenile plant, short phyllodes), c) *B.R. Maslin* 8039 (adolescent plant, short phyllodes), d) *B.R. Maslin* 8736, e) *B.R. Maslin* 7996, f) *B.R. Maslin* 8976, g) *B.R. Maslin* 8060, h) *B.R. Maslin* 2221 (phyllode more incurved than normal), i) *B.R. Maslin* 8024A, j) *B.R. Maslin* 8976, k) *B.R. Maslin* 8061, l) *B.R. Maslin* 8772, m) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9266, n) *B.R. Maslin* 8989, o) *B.R. Maslin* 8033 (phyllode atypically wavy), p) *M.E. Trudgen* MET 17596, q) *B.R. Maslin* 8084C (phyllode slightly longer than normal); C – a) *R. Fairman* 285, b) *B.R. Maslin* 8053; D – a) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9342, b) *B.R. Maslin* 8053, c) *B.R. Maslin* 8071; E – a) *M.E. Trudgen* MET 16050, b) *D.J. Edinger, B. & B. Backhouse & G. Marsh* DJE 2339, c) *R. Meissner & Y. Caruso* 656; F – a) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9350, b, c) *B.R. Maslin* 9442; G – *M.E. Trudgen* MET 15946; H – a) *M.E. Trudgen* MET 17638 (pod at upper end of width range), b) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9350, c) *B.R. Maslin & J.E. Reid* BRM 9626 (bevel-edge pod variant), d) *B. Copley* 3840 (AD voucher: AD97240121); I – *L.S.J. Sweedman* 7027.

Figure 20. *Acacia ayersiana*. A – a) *S.D. Hopper* 2819, b) *S.D. Hopper* 2880, c) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9288, d) *D. Edinger* 4386, e) *B.R. Maslin* 8044E, f) *M.E. Trudgen* MET 15829, g) *B.R. Maslin* 5641, h) *B.R. Maslin, J. Miller, L. Sweedman & B. Cole* BRM 7906A, i) *M.E. Trudgen* MET 17625, j) *S.D. Hopper* 2880, k) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9232, l) *N.E. Casson & E.M. Mattiske* MCPL 1062, m) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9219, n) *P.K. Latz* 20892; B – a) *M.E. Trudgen* MET 17624, b) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9147; C – a) *M.E. Trudgen & G. Marney* MT 2575, b) *D. Edinger* 4386, c) *M.E. Trudgen* MET 17624; D – a) *S. van Leeuwen* 693, b) *D. Edinger* 4386, c) *B.R. Maslin* 8088, d) *M.E. Trudgen* MET 17624; E – *M.E. Trudgen & G. Marney* MT 2575; F – a–c) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9147; G – *B.R. Maslin, J. Miller & J.E. Reid* BRM 9147.

Figure 21. *Acacia ayersiana* (narrow-phyllode variant). A – a) *P.K. Latz* 8006, b) *B.R. Maslin* 9027, c, e) *B.R. Maslin* 9014, d) *B.R. Maslin* 8844, f) *A. Strid* 20259, g) *S.D. Hopper* 2906A, h) *B.R. Maslin & J. Miller* BRM 9218, i) *B.R. Maslin* 9023, j) *A.S. Weston* ASW 20214, k) *M.E. Trudgen* MET 17655, l) C.P. Campbell 2585, m) *M.E. Trudgen* MET 16101, n) *M.E. Trudgen* MET 17654, o) *B.R. Maslin & J. Miller* BRM 9208, p) *A. Chant* LG 257; B – *P.K. Latz* 17910; C – a) *B.R. Maslin* 9023, b) *B.R. Maslin* 9014.

Figure 25. *Acacia caesaneura*. A – a) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9368, b, c) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9360, d) *B.R. Maslin, J. Miller, L. Sweedman & B. Cole* BRM 7906C, e) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9332, f) *B.R. Maslin & J.E. Reid* BRM 9683, g) *B.R. Maslin* 8959A, h) *D.J. Edinger* 4723, i) *B.R. Maslin & J.E. Reid* BRM 9713, j) *B.R. Maslin & J. Miller* BRM 7924I, k) *B.R. Maslin & J.E. Reid* BRM 9713, l) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9313, m) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9367, n) *A. Markey & S. Dillon* 4542, o). *R.J. Chinnock* 973, p) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9382, q) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9362, r) *B.R. Maslin & J.E. Reid* BRM 9657, s) *B.R. Maslin, J. Miller, L. Sweedman & B. Cole* BRM 7913; B – a) *B.R. Maslin* 8960, b) *B.R. Maslin* 8959A, c) *R. Fairman* 274; C – a) *B.R. Maslin* 8960, b) *R. Fairman* 327; D – a) *B.R. Maslin* 8960, b, c) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9367; E – a, b) *B.R. Maslin* 9934, c, d) *B.R. Maslin* 9932; F – *B.R. Maslin* 9932.

Figure 26. *Acacia caesaneura* (narrow-phyllode variant). A – a, c) *B.R. Maslin* 9965, b) *B.R. Maslin* 7062, d) *B.R. Maslin* 8962, e) *B.R. Maslin & J.E. Reid* BRM 9720, f) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9391, g) *B.R. Maslin & J.E. Reid* BRM 9649, h) *B.R. Maslin & J.E. Reid* BRM 10022A,

i) *B.R. Maslin & J.E. Reid* BRM 9656, j) *B.R. Maslin & J.E. Reid* BRM 9696, k) *B.R. Maslin* 9900, l) *B.R. Maslin & J.E. Reid* BRM 9652, m) *B.R. Maslin & J.E. Reid* BRM 9650, n) *B.R. Maslin & J.E. Reid* BRM 9639, o) *B.R. Maslin & J.E. Reid* BRM 9745, p) *B.R. Maslin & J.E. Reid* BRM 9783, q) *L. Sweedman* S 4049, r) *R. Fairman* 300, s) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9363, t) *B.R. Maslin & J.E. Reid* BRM 9652, u, v) *B.R. Maslin & J.E. Reid* BRM 9356; B – a) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9391, b) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9384; C – *B.R. Maslin* 9914, D – a) *B.R. Maslin* 9024, b) *B.R. Maslin* 7062.

Figure 30. *Acacia craspedocarpa*. A – a) *E. de C. Clarke* 111, b) *B.R. Maslin* 7060, c) *P.G. Wilson* 8556, d) *A. Markey & S. Dillon* 4564, e) *B.R. Maslin* 8946, f) *B.R. Maslin* 4559, g) *B.R. Maslin & J.E. Reid* BRM 9786, h) *B.R. Maslin & J.E. Reid* BRM 9731, i) *B.R. Maslin* 7093, j) *D.J. Edinger & G. Marsh* DJE 4988, k) *B.R. Maslin* 5392, l) *I. Kealley* IK 003, m) *B.R. Maslin* 3578, n) *J.S. Beard* 6597, o) *B.R. Maslin* 5029, p) *A. Markey & S. Dillon* 4565, q) *C.A. Gardner* 7951, r) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9141, s) *B.R. Maslin, J. Miller, L. Sweedman & B. Cole* BRM 7892B, t) *A.S. George* 3741, u) *B. Severne* 77, v) *B. Rockel s.n.* (PERTH 00605018), w) *R. Cumming* 1134, x) *J. Brand* 1, y) *A. Stewart* 227, z) *A.Z. Parker* 127, (w–z) phyllodes at upper end of l: w; B – a) *B.R. Maslin, J. Miller, L. Sweedman & B. Cole* BRM 7903G, b) *B.R. Maslin & J.E. Reid* BRM 9786; C – *B.R. Maslin* 7104; D – *B.R. Maslin* 7093; E – a, b) *A. Markey & S. Dillon* 4564, c) *B.R. Maslin & J.E. Reid* BRM 9786; F – *B.R. Maslin & J.E. Reid* BRM 9786.

Figure 33. *Acacia craspedocarpa* (hybrid). A – a) *B.R. Maslin & J. Miller* BRM 7924E, b) *B.R. Maslin, J. Miller, L. Sweedman & B. Cole* BRM 7909, c) *B.R. Maslin & J.E. Reid* BRM 9984, d) *J. Coxon* S 2, e) *B.R. Maslin* BRM 8930, f) *R. Fairman* 302, g) *B.R. Maslin* 4556, h) *B.R. Maslin* 8951, i) *M. Hudson & K. Stratford* 3032, j) *B.R. Maslin* 4571, k) *B.R. Maslin & J.E. Reid* BRM 9761, l) *B.R. Maslin* 7099, m) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9140, n) *R. Fairman* 292, o) *S. Patrick* 2923, p) *B. Severne* 4706, q) *R. Fairman* 286, r) *B.R. Maslin & J.E. Reid* BRM 9981, s) *B.R. Maslin & J.E. Reid* BRM 9771, t) *B.R. Maslin* 8978, u) *R. Fairman* 304, v) *R. Fairman* 251C, w) *B.R. Maslin, J. Miller, L. Sweedman & B. Cole* BRM 7892E, x) *G.F. Melville* 191; B – a) *B.R. Maslin & J.E. Reid* BRM 9761, b) *S. Patrick* 2923, c) *R. Fairman* 348.

Figure 35. *Acacia fuscaneura*. A – a) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9335, b) *R.J. Cranfield* 5522, c) *B.R. Maslin & J.E. Reid* BRM 9593, d, e) *R.J. Cranfield* 5522, f) *R.J. Cranfield* 5344, g) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9154, h) *B.R. Maslin & J.E. Reid* BRM 9758, i) *B.R. Maslin & J.E. Reid* BRM 9623A, j) *B.R. Maslin* 9943, k) *B.R. Maslin & J.E. Reid* BRM 9757, l) *B.R. Maslin & J.E. Reid* BRM 9623A, m) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9160 (gland further removed from pulvinus base than normal), n) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9145, o) *B. Severne* 205 (gland further removed from pulvinus base than normal), p) *B. Severne* 202; B – *B.R. Maslin & J.E. Reid* BRM 9623A; C – a) *B.R. Maslin & J.E. Reid* BRM 9593, b) *B.R. Maslin & J.E. Reid* BRM 9623A; D – a) *B.R. Maslin* 9095, b) *B.R. Maslin & J.E. Reid* BRM 9758, c) *R.J. Cranfield* 5383; E – *B.R. Maslin, J. Miller & J.E. Reid* BRM 9160 (gland further removed from pulvinus base than normal); F – a) *B.R. Maslin & J.E. Reid* BRM 9757, b) *B.R. Maslin & J.E. Reid* BRM 9791A.

Figure 39. *Acacia incurvaneura*. A – a) *B.R. Maslin* 8914, b) *B.R. Maslin* 8995, c) *B.R. Maslin & J.E. Reid* BRM 9749, d) *R. Meissner & B. Bayliss* 754, e) *R. Meissner & B. Bayliss* 750, f) *B.R. Maslin* 7999, g) *B.R. Maslin* 9008, h) *A. Markey & S. Dillon* 3920, i) *B.R. Maslin* 9913, j) *B.R. Maslin & J.E. Reid* BRM 9781, k) *A. Markey & S. Dillon* 3920, l) *B.R. Maslin* 9004, m) *B.R. Maslin & J.E. Reid* BRM 9794, n) *B.R. Maslin & J.E. Reid* BRM 9785, o) *B.R. Maslin* 8963, p) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9280, q) *R. Meissner & B. Bayliss* 754, r) *B.R. Maslin* 9913, s) *R. Meissner & B. Bayliss* 1092, t) *R. Meissner & B. Bayliss* 751, u) *A. Markey & S. Dillon* 4567, v) *R. Meissner & B.*

Bayliss 1269, w) *R. Meissner & B. Bayliss* 749; B – a) *B.R. Maslin* 9924, b) *R. Fairman* 297, c) *M. McDonald* 1805 (PERTH 04356926); C – a) *B.R. Maslin* 9924, b) *B.R. Maslin & J.E. Reid* BRM 9665, c) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9269; D – a) *B.R. Maslin* 8034, b) *B.R. Maslin* 8052; E – a, b) *B.R. Maslin & J.E. Reid* BRM 9697, c) *B.R. Maslin* 9074, d–f) *B.R. Maslin & J.E. Reid* BRM 9746; F – *B.R. Maslin & J.E. Reid* BRM 9785.

Figure 43. *Acacia macraneura*. A – a, b) *S. van Leeuwen for B.R. Maslin* BRM 8085, c) *B.R. Maslin* 8990, d) *B.R. Maslin & J.E. Reid* BRM 9604, e, g) *B.R. Maslin* 8082E, f) *B.R. Maslin* 7332, h) *B.R. Maslin* 8990, i) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9188, j–l) *B.R. Maslin* 8990, m) *J.E. Reid* JER 9; B – a) *B.R. Maslin & J. Miller* BRM 7923, b) *B.R. Maslin & J.E. Reid* BRM 10015; C – a) *S. van Leeuwen for B.R. Maslin* BRM 8085, b) *B.R. Maslin* 8082E, c) *B.R. Maslin* 9012, d) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9188; D – a) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9179, b, c) *J.E. Reid* JER 9; E – *B.R. Maslin* 8879; F – a) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9178, b, c) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9175, d) *J.E. Reid* JER 29 (lateral displacement of pod marginal nerve unusual); G – *B.R. Maslin* 9012.

Figure 47. *Acacia minyura*. A – a, c) *B.R. Maslin* 8043D, b) *J.G. & M.H. Simmons* 2439, d) *S.J. Midgley* SM 584, e) *B.R. Maslin* 8860 (phyllode atypically narrow), f) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9226, g) *S.D. Hopper* 4991, h) *J.G. & M.H. Simmons* 2439, i) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9225, j) *S.D. Hopper* 4991, k) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9226, l) *B.R. Maslin* 8043D, m) *S.D. Hopper* 4991, n) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9225, o, q) *A. Kalotas* 1621, p) *E. Thoma* ET 1436; B – a, b) *K.F. Kenneally & D.J. Edinger* K 12651 E 3848, c, e) *H.P. Vonow, V.T. Clarke & W.A. Thompson* HPV 3300, d) *R.J. Cranfield* 2109, f) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9331, g, h) *B. & B. Backhouse, D.J. Edinger, G. Marsh, B. & R. Johnson* BEMJ 24, i) *S.D. Hopper* 2827, j–l) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9331, m) *B.R. Maslin* 9019, n) *B.R. Maslin* 7068, o) *R.J. Cranfield* 2109, p) *B. & B. Backhouse, D.J. Edinger, G. Marsh, B. & R. Johnson* BEMJ 24, q) *S.D. Hopper* 2827, r) *B.R. Maslin* 7068, s) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9302, t) *B.R. Maslin* 9019, u) *S.D. Hopper* 2827, v, w) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9302; C – a) *R.J. Cranfield* 2109, b) *B.R. Maslin* 9019, c) *R.J. Donovan s.n.* (PERTH 00615668); D – a) *B.R. Maslin* 9019, b) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9225; E – a) *S.D. Hopper* 2827, b) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9302; F – a–c) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9331; G – *B.R. Maslin, J. Miller, L. Sweedman & B. Cole* BRM 7906.

Figure 51. *Acacia mulganeura*. A – a) *R. Meissner & B. Bayliss* 745, b) *E. Thoma* ET 1292, c) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9295, d) *R.J. Cranfield* 5714, e) *B.R. Maslin & J.E. Reid* BRM 10008, f) *D.J. Edinger, B. & B. Backhouse & G. Marsh* DJE 3029, g) *S. van Leeuwen* 3833, h) *N.H. Speck* 1479, i) *B.R. Maslin & J.E. Reid* BRM 10037, j) *R. Meissner & B. Bayliss* 1095, k) *S. van Leeuwen* 4897, l) *B.R. Maslin* 9005, m) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9300A, n) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9240, o) *A. Chant* LG 43, p) *M.E. Trudgen* MET 17659, q) *A. Markey & S. Dillon* 4341, r) *B.R. Maslin* 9912, s) *A. Markey & S. Dillon* 4340, t) *D.J. Edinger* 1762, u) *B.R. Maslin* 8067, v) *R. Meissner & B. Bayliss* 1424, w) *B.R. Maslin* 1941, x) *A. Markey & S. Dillon* 2962, y) *D.E. Albrecht* 10087, z) *A. Markey & S. Dillon* 2961; B – a) *R. Meissner & B. Bayliss* 773, b) *B.R. Maslin* 7058, c) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9240, d) *L. Anderson* PLU 11; C – a) *B.R. Maslin* 9086, b) *B.R. Maslin & J.E. Reid* BRM 10037, c) *R. Meissner & B. Bayliss* 1284; D – *B.R. Maslin & J.E. Reid* BRM 9782; E – a–c) *B.R. Maslin & J.E. Reid* BRM 9789, d, e) *B.R. Maslin & J.E. Reid* BRM 10037; F – *B.R. Maslin & J.E. Reid* BRM 9789.

Figure 54. *Acacia mulganeura* variants. A – a, b) *B.R. Maslin & J.E. Reid* BRM 9962, c) *B.R. Maslin* 9897, d) *B.R. Maslin & J.E. Reid* BRM 9637, e, f) *B.R. Maslin s.n.* (PERTH 07838328), g) *F. Itzstein-*

Davey 40, h) *B.R. Maslin* 9918, i) *B.R. Maslin & J.E. Reid* BRM 9962, j) *B.R. Maslin s.n.* (PERTH 07838328), k) *B.R. Maslin & J.E. Reid* BRM 9637, l) *B.R. Maslin & J.E. Reid* BRM 9962, m, o) *B.R. Maslin & J.E. Reid* BRM 9773, n) *B.R. Maslin* 6615, p) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9386, q, s) *B.R. Maslin & J.E. Reid* BRM 9674, r, t) *B.R. Maslin* 7054; B – a) *B.R. Maslin & J.E. Reid* BRM 9962, b) *B.R. Maslin & J. Miller* 7890; C – a, b) *B.R. Maslin* 8435, c, d) *B.R. Maslin & J.E. Reid* BRM 9673, e) *B.R. Maslin* 8435, f, g) *B.R. Maslin & J.E. Reid* BRM 9690A, h, i) *B.R. Maslin & J.E. Reid* BRM 9690.

Figure 56. *Acacia paraneura*. A – a) *A.C. Kalotas* 1632, b) *B.R. Maslin* 8848, c) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9246, d) *S.J. Midgley* SM 617, e) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9249, f) *D.J. Edinger & G. Marsh* DJE 2847, g) *J.W. Green* 5369, h) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9249, i) *A.R. Fairall* 1934, j) *B.R. Maslin* 5277, k) *M. Gillett* 40, l) *N. Burrows* JK 11, m) *J.E. Reid* JER 5, n) *B.R. Maslin, J. Miller, L. Sweedman & B. Cole* BRM 7920; B – a) *J.E. Reid* JER 5, b) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9253; C – a) *D.J. Edinger & G. Marsh* DJE 2847, b) *M.E. Trudgen* MET 17658, c) *N. Burrows* JK 11, d) *J.W. Green* 5369; D – a) *B.R. Maslin* 8848, b) *M.E. Trudgen* MET 17658; E – a) *B.R. Maslin* 5627, b, c) *B.R. Maslin, J. Miller, L. Sweedman & B. Cole* BRM 7915, d) *S.J. Midgley* SM 659, e) *B.R. Maslin & J.E. Reid* BRM 9727; F – *S.J. Midgley* SM 618.

Figure 60. *Acacia pteraneura*. A – a, b) *B.R. Maslin & J.E. Reid* BRM 9662, c, d) *B.R. Maslin* 8966, e) *B. Crespi* P 18, f) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9341, g) *B.R. Maslin & J.E. Reid* BRM 9784A, h) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9158, i) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9171A, j) *B.R. Maslin* 9115, k) *B.R. Maslin* 8970, l) *R. Fairman* 341, m) *B.R. Maslin & J. Miller* BRM 7924A, n) *G. Byrne* 155, o) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9158, p) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9143, q) *B.R. Maslin* 9928, r) *B.R. Maslin* 7086; B – a) *B.R. Maslin & J.E. Reid* BRM 9643, b) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9343; C – *B.R. Maslin* 8966; D – a) *B.R. Maslin & J.E. Reid* BRM 9784A, b) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9139; E – a) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9158, b) *B. Crespi* P 18, c) *B.R. Maslin & J. Miller* BRM 7924A, d) *B.R. Maslin* 9941, e) *B.R. Maslin, J. Miller & J.E. Reid* BRM 9171A; F – a) *B.R. Maslin* 9928, b) *B.R. Maslin* 9060, c, d) *B.R. Maslin & J.E. Reid* BRM 9776; G – *B.R. Maslin & J.E. Reid* BRM 9612.