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Fifty new species of vascular plants from Western Australia—celebrating fifty years of the Western Australian Botanic Garden at Kings Park

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Abstract

Barrett, R.L. Fifty new species of vascular plants from Western Australia—celebrating fifty years of the Western Australian Botanic Garden at Kings Park. *Nuytsia* 26: 3–20 (2015). This paper introduces a special issue of *Nuytsia* containing seven collaborative papers naming 50 new species of Western Australian vascular plants. It has been compiled to celebrate the 50th anniversary of the opening of the Western Australian Botanic Garden at Kings Park. Several species are named after former Kings Park staff to honour their contributions to botany in Western Australia, including one that occurs naturally in the Kings Park bushland and is named after one of the designers of the Botanic Garden. Field research by Kings Park staff across Western Australia, including the rediscovery of *Auranticarpa resinosa* (Domin) L.W.Cayzer, Crisp & I.Telford, missing for 180 years, is documented.

Introduction

The Western Australian Botanic Garden at Kings Park was officially opened in October 1965 (Figure 1) and celebrates its 50th anniversary in 2015 (Webb 2013). To commemorate the work of staff, students and volunteers in the discovery and promotion of the Western Australian flora, the Botanic Gardens and Parks Authority (BGPA), the management authority for Kings Park and Botanic Garden, commissioned a special project to name 50 new plant species discovered or studied by BGPA staff. Each of these species is formally named and described in a series of taxonomic papers. Forty-one of the species are only known from few locations and are conservation-listed in Western Australia.

The species named in this series of papers have been collected and recognised over a period of decades, based on hundreds of field trips made by staff and students based at Kings Park, often to remote parts of Western Australia. While a large proportion of the species named here were discovered in the remote Kimberley region, *Calectasia elegans* R.L.Barrett and *Lepidosperma oldhamii* R.L.Barrett both occur in the Perth area, the latter in Kings Park bushland (Barrett & Barrett 2015a). Many of the new species have been collected as part of collaborative studies with a wide range of individuals and

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organisations, and this work is summarised. Former Kings Park staff and one of the designers of the Botanic Garden are honoured with new species named after them: *Aphyllodium beardii* R.L.Barrett (for John Beard), *Calectasia demarzii* R.L.Barrett (for Herbert Demarz), *Hybanthus bennettiae* R.L.Barrett (for Eleanor Bennett), *Lepidosperma fairallianum* R.L.Barrett (for Arthur and Pauline Fairall), *L. hopperi* R.L.Barrett (for Stephen Hopper) and *L. oldhamii* R.L.Barrett (for John Oldham) (Barrett & Barrett 2015a).

Kings Park was first set aside as public land in the early 1830s and with its central and prominent location in the City of Perth, is a special place for local residents and visitors alike. While the City has changed considerably in the time since the Botanic Garden was established, its significance, for both the location and the work conducted by staff, has not. Since its inception, the main focus of the Botanic Garden has been the discovery, promotion and conservation of the Western Australian flora (Figures 2, 3), with many staff contributing to these efforts over the last 50 years. Staff, students and volunteers at Kings Park have made many internationally significant contributions to scientific research, along with many visiting researchers who have conducted studies within the Kings Park bushland. Maps of collections made by the most prolific collectors during their time at Kings Park are shown in Figures 4 and 5, based on data compiled from the database of Australia's Virtual Herbarium.

Figure 1. Director of Kings Park John Beard with Premier David Brand and Mrs Brand at the opening of the Western Australian Botanic Garden in 1965. Photograph from BGPA Archive.

Figure 2. Ernst Wittwer preparing the wildflower display in 1965 for the opening of the Western Australian Botanic Garden. Photograph from BGPA Archive.

Figure 3. Elaborate displays of wildflowers cultivated in the Kings Park Nursery have always featured prominently at the Kings Park Wildflower exhibitions and festivals, as seen here in 1971. Photograph from BGPA Archive.

Kings Park and Botanic Garden history

Mt Eliza, around which Kings Park is centred, has a very significant place in local Nyoongar history, being known by a number of names, including *Karta Koomba* (the big hill), *Karra katta* (the hill of the spiders), *Yongariny* (place for catching kangaroo), *Geenunginy Bo* (the place for looking a long way) and *Karlkarniny* (place for sitting by the fire), each with its own cultural context (Collard & Harben 2010). Kings Park also has a relatively long European history, with the land around Mt Eliza being set aside for 'public purposes' by Lieutenant Governor James Stirling and Surveyor-General John Septimus Roe in the 1830s, then gazetted as a public reserve by Surveyor-General Malcolm Fraser in 1871, and expanded to near its current size by Surveyor-General John Forrest in 1890 (Erickson 2009).

One of the earliest botanical collections made in Western Australia was probably made near or in Kings Park by the expedition led by Willem de Vlamingh in 1697 (Hamilton & Bruce 1998). The unusual (to European eyes) vegetative morphology of the sterile specimen led to it being described as a fern, *Polypodium spinulosum* Burm.f., some 70 years later (Burman 1768). The specimen is actually a member of the Proteaceae family, *Synaphea spinulosa* (Burm.f.) Merr. Important early botanical collections in and around Kings Park itself were made by Charles Frazer (1827), James Mangles (1931), Baron Karl von Hügel (1833), J.A. Ludwig Preiss (1838–1842), Alexander Morrison (1897–1906), Jeremiah Sheath (Superintendent, 1904–1915) and Carl E.H. Ostenfeld (Ostenfeld 1916, 1918).

The Kings Park bushland, located at the edge of a major regional biodiversity hotspot (Hopper & Gioia 2004), has a large number of native plant species (351 recorded to date; Barrett & Pin Tay 2005; R.L. Barrett, unpubl. data). A number of species have been named from specimens collected in or near Kings Park, including the fungus *Amanita ochroterrea* Gentilli ex Bas. (Gentilli 1953; Davison 2011) and the plants *Acacia benthamii* Meisn., *Candollea parviflora* Steud. (=*Hibbertia racemosa* (Endl.) Gilg), *Casuarina preissiana* Miq. (=*Allocasuarina humilis* (Otto & F.Dietr.) L.A.S.Johnson), *Cryptandra tridentata* Steud. var. *tomentosa* Reissek (=*Stenanthemum notiale* Rye subsp. *chamelum* Rye), *Dodonaea hackettiana* W.Fitzg., *Drosera porrecta* Lehm., *Eurybia axillaris* DC. var. *exaltata* Steetz (=*Olearia axillaris* (DC.) Benth.), *Gnephosis angianthoides* (Steetz) Anderb., *Grevillea preissii* Meisn., *Helipterum roseum* var. *nigropapposum* Ostenf. (=*Rhodanthe chlorocephala* (Turcz.) Paul G.Wilson subsp. *rosea* (Hook.) Paul G.Wilson), *Machaerina preissii* (Nees) L.A.S.Johnson & Koyama, *Orthrosanthus laxus* (Endl.) Benth., *Patersonia turfosa* Endl. (=*P. occidentalis* R.Br.), *Pomaderris albicans* Steud. (=*Spyridium globulosum* (Labill.) Benth.), *Scaevola holosericea* de Vriese (=*S. anchusifolia* Benth.), *Simsia latifolia* R.Br. var. *gracilis* Ostenf. (=*Stirlingia latifolia* (R.Br.) Steud.), *Tetraria octandra* (Nees) Kük. (Bennett 1992, 1995; Barrett & Pin Tay 2005), *Calectasia narragara* R.L.Barrett & K.W.Dixon (Barrett & Dixon 2001), *Poranthera moorokatta* R.L.Barrett (Barrett 2012a) and *Lepidosperma oldhamii* R.L.Barrett (Barrett & Barrett 2015a). Several plant species are conservation-listed, being restricted to the Perth area, with their main populations occurring in Kings Park (*Acacia benthamii*, *Dodonaea hackettiana*, *Jacksonia sericea* Benth. and *Poranthera moorokatta*) (Barrett 2012a; Barrett & Pin Tay 2005). Development pressures on Kings Park were one of the reasons for the founding of the Western Australian Naturalists Club, to give a combined voice to concerns over threats to native vegetation (Main *et al.* 1957).

A general history of exploration activities by staff at Kings Park has been provided by Erickson (2009). Most of the voucher specimens for botanical collections made by staff at Kings Park are held at the Western Australian Herbarium (PERTH; Department of Parks and Wildlife). A working collection is held in the Kings Park Research Herbarium (KPBG), and not all specimens are duplicated at PERTH. Significant collections in KPBG's BG-Base database (10,347 plus many more collections yet to be incorporated) include L. Sweedman (4,475 collections), H. Demarz (802 collections), J. Beard (585

collections), G. Keighery (521 collections), F. Lullfitz (374 collections), A. Fairall (348 collections), E. Wittwer (320 collections) and J. Blockley (92 collections).

Fifty new species from Western Australia

In January 2014, a call by the BGPA for special projects to celebrate the 50th anniversary of the Western Australian Botanic Garden at Kings Park was made and a proposal to name 50 new species of Western Australian plants accepted. Many currently undescribed plant species have been discovered by Kings Park staff in the field, through studies in herbaria, or through phylogenetic studies. The 50 species named in this series of papers were selected to represent the diverse range of plant groups and geographic distribution that staff have worked with and in over the past 50 years. They are named in this special issue in collaboration with other authors from around Australia. An additional five new species described as part of this project are named in associated papers published elsewhere (Barrett 2015; Barrett & Barrett 2015b).

Thirty-eight of the new species were discovered during long-running surveys in the Kimberley region of Western Australia (Figure 4) and some specific background to discovery in the region is presented here. A former Director of Kings Park, John Beard, travelled widely in the Kimberley during his vegetation mapping project and made many valuable collections (Beard 1990). He was the first to formally recognise the presence of extensive vine thickets in the region, despite most scientists considering it too dry for such vegetation (Beard 1976; Beard & Clayton-Greene 1984; Beard *et al.*

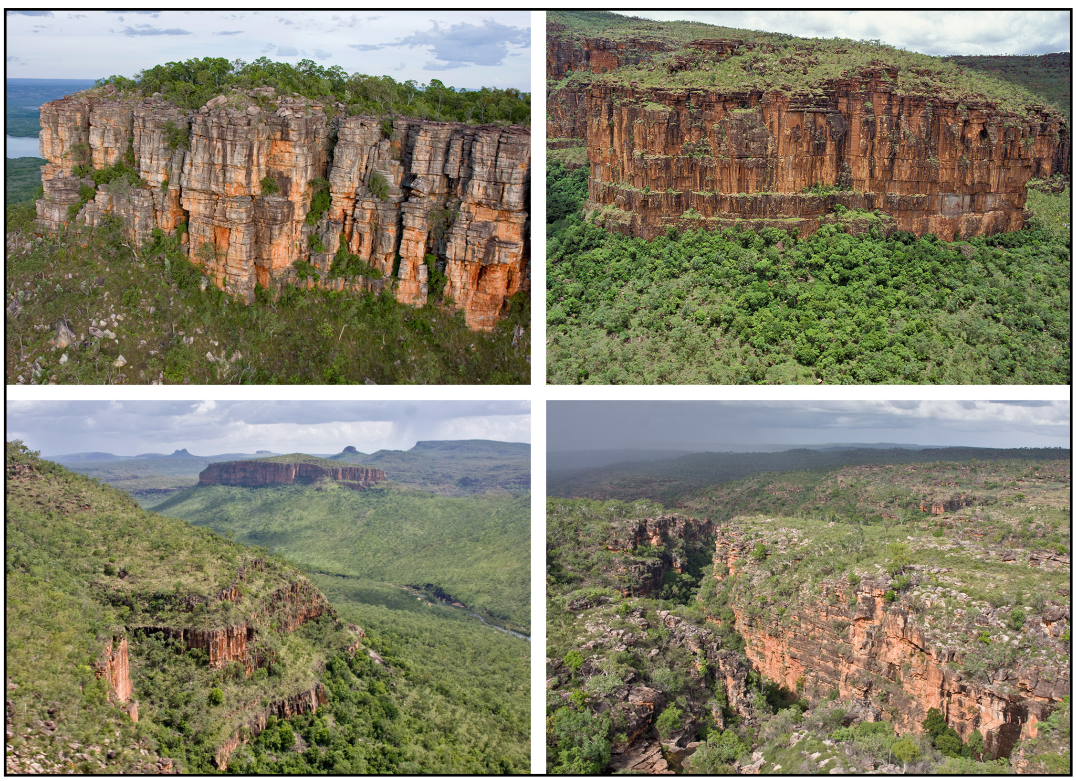

Figure 4. Rugged, highly dissected sandstone plateaux in the Prince Regent River area. These isolated areas have been found to be habitat for numerous locally endemic plant species. Photographs by R.L. Barrett.

1984). The discovery of this vegetation by Beard, as well as collections of orchids and interesting geophytes by Joe Smith (a grader driver with AMAX Exploration on the Mitchell Plateau), spurred further interest in the region (Dixon *et al.* 1989). Kingsley Dixon, a former Science Director at Kings Park, subsequently made his first trip to the Mitchell Plateau in 1980 to study geophytes (Pate & Dixon 1982; Brown *et al.* 2008). He made several trips to the region, and in the early 1990s was joined by botanical artist Pat Dundas who was working with Andrew Brown, Dixon and Stephen Hopper on a book on the orchids of Western Australia (Brown *et al.* 2008).

Kevin Kenneally, a Senior Research Scientist with the then Western Australian Department of Conservation and Land Management, had worked on the flora of the Kimberley region since the mid-1970s. He collaborated with Beard on studies of vine thickets in the Kimberley while conducting flora surveys (Beard *et al.* 1984; Beard & Kenneally 1987; Kenneally 1989). I first met Kenneally at a Gould League camp in Perth while I was in primary school and living on Beverley Springs Station (now known as Charnley River Station and Artesian Range Sanctuary) in the north-west Kimberley. I began collecting specimens and bringing them to Kenneally and became a volunteer at the Western Australian Herbarium in 1991 while studying at boarding school in Perth. Kenneally also introduced me to carnivorous plant and triggerplant enthusiast Allen Lowrie in 1992 and a long-term collaborative study of these groups in the Kimberley began (Barrett 1994; Barrett & Lowrie 2013; Lowrie 2014; Barrett *et al.* 2015). I was soon joined by my elder brother Matt in collecting plants and bringing the collections to the Western Australian Herbarium.

Our association with the Herbarium has been pivotal to our research on the flora of Western Australia and the Kimberley in particular. Building on the first *Flora of the Kimberley region* (Wheeler 1992), a new set of identification keys to the Kimberley flora has been prepared, now covering around 3,500 plant taxa. This has only been possible through extensive collaborations with staff at the Herbarium, and taxonomists around Australia, to build our knowledge of the entire flora. The processing and incorporation of over 12,000 voucher specimens that underpins this work has been a major undertaking for Herbarium staff and volunteers. Incorporation of these specimens has been critical for the addition of new phrase names to the Western Australian plant census, and for the review of conservation status for a large number of Kimberley plant taxa. Collaborative work with the Herbarium has been very rewarding for all concerned, as evidenced by the number of new species that have been added to the plant census, and new species described based on our collections.

Some of our earliest collections were of species that were soon to be described as new, including *Stylidium costulatum* Lowrie & Kenneally, *S. adenophorum* Lowrie & Kenneally, *S. barrettorum* Lowrie & Kenneally, *S. fimbriatum* Lowrie & Kenneally and *S. diceratum* Lowrie & Kenneally (Kenneally & Lowrie 1994; Lowrie & Kenneally 1996, 1997, 1998) and *Byblis rorida* Lowrie & Conran (Lowrie & Conran 1998). The first species we described, in collaboration with Alistair Hay from the Royal Botanic Gardens, Sydney, was *Typhonium peltandroides* A.Hay, M.D.Barrett & R.L.Barrett (Hay *et al.* 1999). This species was found in a single gorge in the centre of Beverley Springs (Charnley River) Station; only recently has a second population been discovered, in Prince Regent National Park (R.L. Barrett *et al.*, unpubl. data; Figure 5). Less than 200 individuals have been found.

In 1993, Pat Dundas' daughter met Alison Barrett, sister of Matt and Russell Barrett, at boarding school and learnt of the family's interest in the Kimberley region's plants. Dundas mentioned this to Dixon, who contacted the Barrett family and arranged a wet season field trip to the station to look for orchids (Figure 6). Thus began a long association between the Barrett brothers and Kings Park. It was also the first of three field trips conducted while the Barrett brothers lived on Beverley Springs (Charnley River) Station, and several new species of orchid were discovered, along with the first

Figure 5. *Typhonium peltandroides*, the first species named by the Barrett brothers, with Alistair Hay. Photographed in Prince Regent National Park, January 2010. Photographs by R.L. Barrett.

Figure 6. A – Kingsley Dixon, Lionel Johnson, Pat Dundas and Matt Barrett on an expedition searching for orchids in the Edkins Range, north-west Kimberley in 1994; B – *Calochilus holtzei*, one of three sexually deceptive beard orchids found in the Kimberley region. Photographs by R.L. Barrett.

record of *Liparis habenarina* (F.Muell.) Benth. for Western Australia. Following his completion of an Engineering/Science (Chemistry) double degree at the University of Western Australia (UWA), Matt Barrett took a short-term contract at Kings Park in 1997. I started working at Kings Park as a Research Assistant to Dixon in late 1998 while completing a Science degree (Botany and Geography) at UWA. Matt Barrett went on to complete a PhD on the genetics of the *Chamelaucium uncinatum* Schauer species complex (Barrett 2006) while I went on to complete a PhD on the systematics and ecology of *Lepidosperma* Labill. and allied sedge genera (Barrett 2012b).

Since then, field trips to the Kimberley region have continued on a regular basis, with a survey conducted for the Australian Heritage Commission on the Yampi Peninsula in 2001 (Barrett *et al.* 2001; Start *et al.* 2001). During the time the Barrett brothers lived on Beverley Springs (Charnley River) Station (1981–1996) a rough track existed that went to the southern border of Prince Regent Nature Reserve (now National Park) and a specific interest in this area developed. The Prince Regent River area, one of the highest rainfall zones in the Kimberley (>1,200 mm *per annum*), comprises a very dissected sandstone plateau matrix with relatively high summits (many peaks and plateaux >600 m high); it has proven to be very rich in plant diversity, with many new species discovered there. Fieldwork has concentrated on the rugged sandstone ranges and plateau tops. Deep gorges provide habitat for monsoon rainforests that are now being found to contain relictual species (Harrington *et al.* 2012; Köhler & Shea 2012).

A major rediscovery was made by me and Maurice O'Connor on a Kings Park expedition in January 2001, with the location of a single juvenile plant of *Auranticarpa resinosa* (Domin) L.W.Cayzer, Crisp & I.Telford (formerly *Pittosporum resinosum* Domin) near the headwaters of the Prince Regent River. This species had only been known from a single fruiting collection made by Allan Cunningham on the Philip Parker King expedition to map the Australian coastline in 1820 (Cayzer *et al.* 2000). The collection location, on the Hunter River in the north-west Kimberley, had at times been suggested to be an error for the Hunter River in Queensland, and the Kimberley distribution was considered doubtful as efforts to relocate the species along the Hunter River in the Kimberley had proved unsuccessful (K.F. Kenneally pers. comm.).

The initial discovery, of a juvenile plant with *Grevillea*-like leaves and a citronella-like scent, could not be matched with certainty to *Auranticarpa resinosa*, as juvenile leaves of the species were unknown, though their similarity to juvenile leaves of *A. ilicifolia* L.W.Cayzer, Crisp & I.Telford made it highly likely. Fortunately, adult and juvenile plants were located by me and Matt Barrett at a separate location a few days later on top of an isolated sandstone massif, though no flowers or fruit could be found at that time. Fruit was finally recollected in 2003, along with young buds, although the flowers of this species remained unknown. While additional populations were discovered in 2007 and 2008, flowering material was not collected until 2010, 190 years after the species was first discovered, when three plants were found with open flowers that were cream and very sweetly scented (Figure 7).

Around fifteen populations of this species have been discovered since 2001, all in the general vicinity of the Prince Regent River, north to near the Roe River. However, most populations are very small and fewer than 100 individuals are known, most too young to be fertile. *Auranticarpa resinosa* appears to be highly fire sensitive, with stems often killed by fire, though we have observed resprouting from lignotubers following 'cool' fires. It is likely that the original populations on the Hunter River seen by Cunningham have been burnt out and the species is now restricted to very dissected sandstone outcrops that naturally exclude or reduce the intensity of fire. An alternative possibility is that Cunningham did make an error in his collecting locality, as his diary for the expedition records the collection of a fruiting *Pittosporum* Gaertn. from the mainland adjacent to St Andrews Island (Curry *et al.* 2001),

Figure 7. *Auranticarpa resinosa*. A – seedling; B – Matt Barrett with adult tree; C – Russell Barrett with flowering branch; D – flowers; E – fruit. Photographs by R.L. Barrett (A, B, D, E); M.D. Barrett (C).

not far from known modern collections. The only other *Pittosporum* species known for the immediate area is *P. spinescens* (F.Muell.) L.W.Cayzer, Crisp & I.Telford, which was at that time unnamed and, until recently, classified in the genus *Citriobatus* A.Cunn. ex Louden.

The genus *Salomonia* Lour. (Polygalaceae) was first collected in Western Australia by me and Matt Barrett on one of our earlier collecting trips to Bachsten Creek at the southern edge of Prince Regent National Park in December 1992, through the collection of *S. ciliata* (L.) DC. (Kenneally 1995). More recent discoveries in the area include the location of the coastal rein orchid, *Habenaria hymenophylla* Schltr., where a small population was located under a dense forest of native nutmeg (*Myristica insipida* R.Br.) in a deep side arm of Pitta Gorge in January 2010 by me, Peter Kendrick and Graeme Sparkes (Brown *et al.* 2013). The nearest known population is near Darwin, some 1,200 km to the north-east. Our observations of Kimberley orchids contributed significantly to the tropical orchid sections of Brown *et al.* (2008, 2013).

An even more remarkable discovery was the Kimberley Lemon Myrtle, *Backhousia gundarara* M.D.Barrett, Craven & R.L.Barrett, first discovered by Dave Dureau and Wayne O'Sullivan, members of the Broome Botanical Society, who were hiking in a remote part of the Prince Regent River area in

2001. They recognised that the tree was unusual, resembling a guava, with smooth bark and opposite leaves, but finding only a few old flowers the identity of the tree was uncertain. In 2003, Queensland botanists Gary and Nada Sankowsky found a second population of the same species near the first site and immediately recognised it as a species of *Backhousia* Hook & Harv. Matt Barrett and I revisited the site several times, eventually collecting fertile material in March 2010 on an expedition funded by BGPA (Harrington *et al.* 2012; Figure 8). The nearest other species of lemon myrtle is in north Queensland; *B. gundarara* may be a relictual species that has survived in fire-protected vine thickets in rugged Kimberley landscapes. The expected imminent arrival of myrtle rust (*Puccinia psidii* G.Winter) in the Kimberley may put this species at risk.

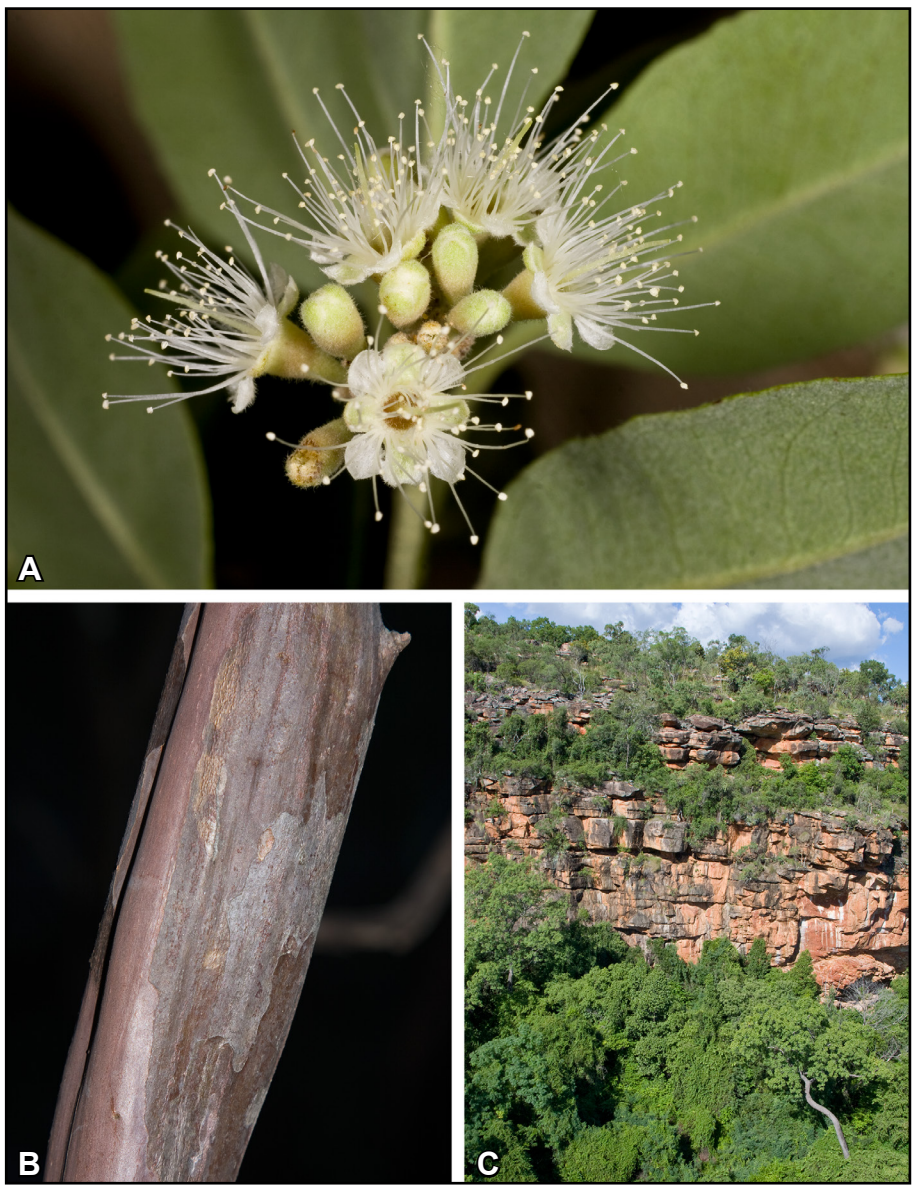

Figure 8. The rare Kimberley Lemon Myrtle, *Backhousia gundarara*, is only known from two locations in the upper Prince Regent River area growing at the base of large cliffs. A – flowers; B – guava-like bark; C – habitat. Photographs by R.L. Barrett.

These species occur in vine thickets, at the base of tall, sandstone cliffs below extensive sandstone plateaux. This set of environmental features provides a relatively stable environment with a higher degree of resilience to climatic fluctuations than many of the surrounding habitats, due to the accumulation of water within the sandstone matrix of the plateau during the wet season, which is then able to feed through rock fissures and supply water as small springs and seepage to the base of the cliffs. This constant water supply provides a unique protected environment during the long dry seasons naturally experienced across the Kimberley region. As much of the rainfall runs off the landscape as surface flows, the amount of water that soaks into the sandstone matrix is probably not significantly reduced during periods of low wet season rainfall, thus creating a climatic refugium at the base of such cliffs.

Access to remote areas of the Kimberley is often difficult, especially during the wet season, which is the best time of year to collect fertile plant material. For much of the region, where there are no roads, access can only be gained by helicopter, at times by quad bike, or on foot across rugged terrain (Figure 9). Access to these areas is the first of a number of challenges, with the collection of specimens an equally challenging task; plants are often located on cliff faces, or flowers and fruit high in tree-tops. It is then difficult to dry the collections before they get mouldy in very humid conditions, often without access to power (Figure 10). But visiting the region in the wet season is botanically rewarding.

Figure 9. Access to many remote areas of the Kimberley region requires a helicopter, quad bikes or walking. A – Prince Regent National Park; B – Lawley River National Park; C – quad bike loaded with specimens, Doongan Station; D – Peter Kendrick and Michi Maier exploring the remote Prince Regent National Park on foot. Photographs by R.L. Barrett.

Figure 10. Plant collecting in the Kimberley has many challenges including collecting plants in remote locations, working in humid conditions and drying plants without power. Photographs by M. Maier (A); R.L. Barrett (B).

In particular, cliff faces are important places to collect plants, with several new species apparently restricted to these habitats having been discovered in recent years.

The richest areas for new species discovery have been sandstone pavements. These environments are very highly seasonal, with thin sandy soils and shallow, ephemeral rock pools providing distinct habitats for many annual species and hardy perennials such as the resurrection grasses (genus *Micraira* F.Muell.) and woody shrubs such as *Calytrix gomphrenoides* M.D.Barrett & Craven (Barrett *et al.* 2009b) (Figure 11). While most of these habitats occur in the higher rainfall zone of the north-west Kimberley, a number of locally endemic species are also found on sandstone and limestone habitats in the south-east Kimberley (Figure 12). Aquatic environments, although usually highly ephemeral in the Kimberley, include a number of distinctive and endemic species, including *Myriophyllum callitrichoides* subsp. *striatum* Orchard and the highly reduced *Nymphaea ondinea* Löhne, Wiersema & Borsch (previously *Ondinea purpurea* Hartog; Figure 13). Saline aquatic environments are also plentiful and diverse along the complex Kimberley coastline, with one of the highest diversities of mangrove species in the world (Duke 2006).

Another area of the Kimberley where we have made extensive collections includes Doongan and Theda Stations in the North Kimberley, and the adjacent Drysdale River National Park. A large number of new species have been discovered on these stations, particularly on sandstone pavements at Theda Station, with ten species from this area described in this special issue. Two wattle species collected around Theda Station have already been named, as *Acacia anastomosa* Maslin, M.D.Barrett & R.L.Barrett and *A. perpusilla* Maslin, M.D.Barrett & R.L.Barrett (Maslin *et al.* 2013). *Solanum zoeae* R.L.Barrett was named from a single location on Doongan Station (Barrett 2013). A smut fungus, *Tilletia micrairae* R.G.Shivas, M.D.Barrett, R.L.Barrett & McTaggart, the only species known from the unusual resurrection grass genus *Micraira*, has also been named, known from just two populations on Theda Station (Barrett *et al.* 2009a).

Understanding the biological diversity of the Kimberley region is critical to long-term management of the region. In such a large, sparsely populated region, landscape management has many challenges,

Figure 11. A, B – sandstone pavements, with shallow soils that only briefly support plants during the wet season, have been rich areas for the discovery of new species; C – *Calytrix gomphrenoides* is only known from the vicinity of the Prince Regent River; D – *Drosera caduca* is the only carnivorous plant known to spend most of its life cycle in a non-carnivorous state, possessing insect-traps only on its first few, juvenile leaves. Photographs by R.L. Barrett.

the primary one being fire. Around a third of the Kimberley region is burnt every year and much is burnt every three years, a rate that is detrimental to many fire-sensitive species (Vigilante & Bowman 2004). The effects of frequent fire are particularly evident in the pindan, the dominant vegetation of the Dampierland bioregion, where the majority of species are either killed by fire or resprout from ground level, causing a very dramatic reduction in biomass and cover (Figure 14).

It is critical for conservation and the development of appropriate management strategies that we understand what species exist, where they occur and their ecological requirements for survival. The 50 species named in this special issue also draw attention to the fact that several hundred additional species are known from the Kimberley that remain unnamed, and little is known of their ecology. Many of the species described in this special issue are locally restricted in distribution and may be rare or threatened. Formal scientific description of these species is the first step to ensuring their conservation. It is hoped that presenting these species descriptions in a special issue will promote further research on the systematics, ecology and conservation of the Western Australian flora.

Figure 12. A number of localised species can be found in the semi-arid south-east Kimberley. A – *Boronia minutipinna*; B – *Hibiscus squarrulosus*; C –sandstone hill south-west of Kununurra, habitat for *Lindernia cleistandra*; D – limestone ridge near the Parker Range where a new species of *Triodia* was discovered. Photographs by R.L. Barrett.

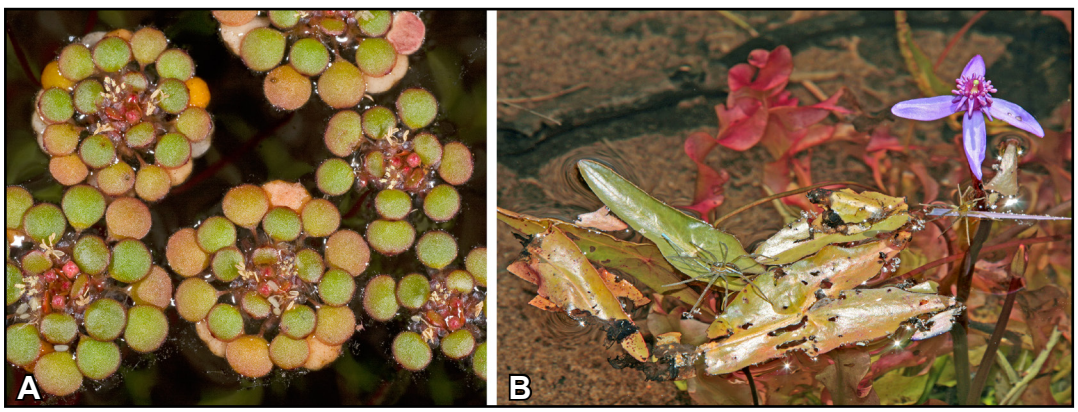

Figure 13. Several unusual aquatic plants are endemic to the Kimberley region. A – floating leaves and flowers of *Myriophyllum callitrichoides* subsp. *striatum*; B – *Nymphaea ondinea* (previously *Ondinea purpurea*), an odd water lily with the petals usually reduced to staminodes. Photographs by R.L. Barrett.

Figure 14. Around a third of the Kimberley landscape is burnt every year. This high fire frequency is highly detrimental for many ecosystems and fire sensitive species of plants and animals. The effects of fire can be clearly seen in the Pindan, where dense *Acacia* thicket is being rapidly replaced with open, annual grasslands and sparse shrubs. Photograph by R.L. Barrett.

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