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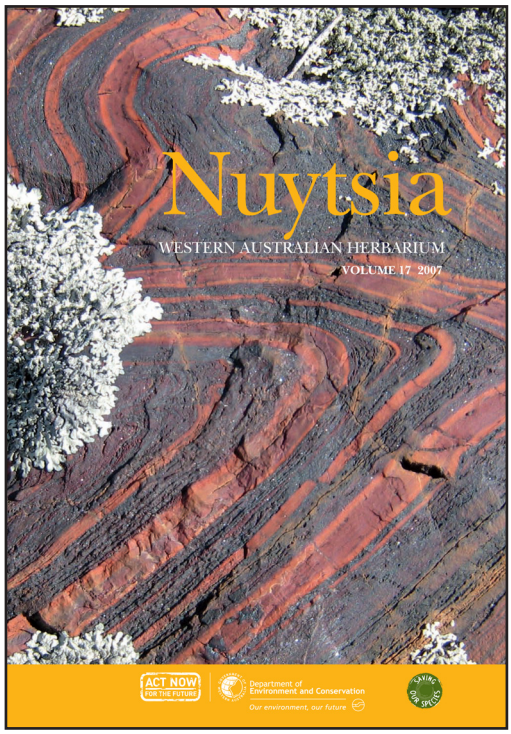

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Taxonomic research and the conservation status of flora in the Yilgarn Banded Iron Formation ranges

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Abstract

Gibson, N., Coates, D.J. & Thiele, K.R. Taxonomic research and the conservation status of flora in the Yilgarn Banded Iron Formation ranges. *Nuytsia* 17: 1–12 (2007). The Banded Iron Formation (BIF) ranges are small, ancient ranges scattered across the Yilgarn Craton in southern Western Australia. Increased exploration and mining of iron ore in Western Australia has resulted in a resurgence of botanical survey on and around the BIF ranges, including the discovery of at least 20 unnamed taxa, nine of which were new to science. Recent taxonomic work, published in this special edition of *Nuytsia*, has concentrated on naming 17 taxa with distributions centred on these ranges and a further 62 taxa of conservation significance in the southern half of Western Australia. Despite this increase in activity, the conservation status of the flora and vegetation remains poorly documented. Patterns in distribution of threatened, rare and poorly known taxa (Declared Rare Flora and Priority Flora) and patterns in endemism are examined on a subset of the 25 ranges most prospective for mining. Preliminary analysis of endemism supports the hypotheses that these ranges represent both refugial habitats of great antiquity and areas of recent speciation. Across Western Australia there are some 2,240 taxa under consideration for formal listing by the Department of Environment and Conservation as threatened; of these, 475 are yet to be formally named. This situation significantly impedes their conservation assessment.

Introduction

Current figures indicate that Western Australia's vascular flora comprises 13,089 taxa, about half of Australia's known flowering plants, ferns and cycads. Of these, 11,554 are published taxa, leading to the alarming statistic that 12% of known taxa are currently undescribed (1096 existing as phrase names and 439 as manuscript names; Chapman 2007). These undescribed taxa currently have minimal descriptive information and lack suitable guides to their identification. Many are poorly known, under-collected or rare. Undescribed taxa present a major impediment to survey and assessment of conservation status, given that the means for their recognition are usually minimal. Yet an accurate assessment of conservation status is important if taxa are to be listed and recognised as rare and threatened and accorded the appropriate conservation management.

Over the last 25 years there has been considerable effort by botanists to develop lists of rare and

threatened flora in Western Australia (see Marchant & Keighery 1979; Rye & Hopper 1981; Hopper *et al.* 1990). The initial source of information for these lists is herbarium collections, and currently the Western Australian Herbarium (PERTH) databases (Western Australian Herbarium 1998–) provide much of the baseline data for Western Australia's flora conservation list in a readily accessible format. Field surveys have also provided data required to gain a better understanding of conservation status of taxa, particularly if they are to be listed as threatened (Declared Rare Flora - DRF) under the Western Australian Wildlife Conservation Act 1950.

Western Australia has 2,622 vascular plant taxa listed as threatened, rare or poorly known, approximately eight per cent of the world's total (Walter & Gillett 1998), making the State one of the major international centres for threatened flora. The present listing system provides six categories of flora: threatened, presumed extinct, and four Priority Flora groups (Atkins 2006). The Priority Flora can be broadly defined as:

- those taxa which have been determined as being rare, but are currently not threatened (categorised as 'rare' in international terminology; IUCN 2001); and
- those taxa which may be rare or threatened but for which there is insufficient survey data available to accurately determine their true status (categorised as 'data deficient' or 'poorly known' in international terminology).

Currently, 2,240 taxa are listed as Priority Flora, with 1,909 of these being poorly known. There has been a substantial increase in listed conservation taxa since threatened flora were first listed in 1980 and Priority Flora in 1987 (Coates & Atkins 2001). This increase represents an improvement in knowledge of the State's flora through survey, taxonomic study, and the databasing of the herbarium collections at PERTH. Even so, there is a critical need for further taxonomic research to resolve the many issues of synonymy and identification within the Priority Flora. For example 520 Priority Flora and DRF remain either as phrase names or manuscript names (Table 1).

Of particular interest and relevance in the last few years has been the need to survey and assess the conservation status of flora in areas under consideration for significant developments such as mining. One key area covers the Banded Iron Formation (BIF) ranges of the Yilgarn. Historically, the greenstone ranges of the Yilgarn have been mined for base metals, while more recently the BIF ranges have been targeted for exploration and mining for iron ore, driven by recent increased demand for this commodity in China. Subsequently, there has been a surge in botanical surveys of these areas by both mining companies and government agencies. Such surveys have led to the discovery of new taxa, as well as identifying taxa already represented in herbarium collections but previously not recognised as distinct.

The Yilgarn Craton covers much of the southern half of Western Australia and includes parts of 11 Bioregions (Figure 1) (Department of the Environment and Water Resources 2007). The Craton was formed between 2,630–2,780 Ma and comprises rocks which date back to 3,730 Ma (Myers 1993). It is one of the oldest and most stable parts of the earth's surface, and has apparently never been below sea level. The Craton comprises granitic basement interspersed by both mafic, ultramafic (greenstone) and BIF ranges. The BIFs of the Yilgarn were deposited on the older rocks between 3,100 and 2,700 Ma and are particularly noteworthy as containing diamonds and detrital zircons dated back to 4,252–4,270 Ma (respectively) — the oldest known fragments of terrestrial rocks on Earth (Myers 1993; Brox & Semeniuk 2007; Menneken *et al.* 2007).

Table 1. Total numbers of plant taxa, conservation taxa, undescribed taxa and undescribed conservation taxa for Western Australia, and the subsets from the Yilgarn Craton and 25 BIF ranges, derived from all available collections held in PERTH that were attributed with geocodes (516,394 sheets). Percentages refer to the total State figure. Only currently accepted native vascular plants were included in the analysis. [1] Data updated from Chapman (2007).

		Western Australia	Yilgarn		25 BIF ranges	
			Number	%	Number	%
	Total flora	13,089	8,037	61.4	1,703	13.0
	Area (km²)	2,529,875	616,049	24.4	36,809	1.5
All taxa	**Declared Rare Flora**	376	224	59.6	15	4.0
	Presumed extinct	6	4	66.7	0	0.0
	Priority One	612	341	55.7	48	7.8
	Priority Two	635	295	46.5	24	3.8
	Priority Three	662	396	59.8	52	7.9
	Priority Four	331	215	65.0	9	2.7
	Total	2,622	1,475	56.3	148	5.6
	Undescribed taxa[1]	1,743	947	54.3	172	9.9
Undescribed taxa	**Declared Rare Flora**	45	26	57.8	0	0.0
	Presumed extinct	0	0	0.0	0	0.0
	Priority One	224	130	58.0	18	8.0
	Priority Two	141	60	42.6	5	3.5
	Priority Three	84	44	52.4	10	11.9
	Priority Four	26	16	61.5	0	0.0
	Total	520	276	53.1	33	6.3

The ranges in the Yilgarn are generally of low topography resulting from weathering over a very long period. Their subdued nature, however, belies their biodiversity values. Beard (1981) first recognized the unique nature of the vegetation and flora of these ranges, with his identification of a number of vegetation systems covering some of these ranges representing unique catenary sequences. The results of more recent plot based surveys (e.g. Gibson *et al.* 1997; *ecologia* Environmental 2002; ATA Environmental 2006) has indicated that many of the individual BIF ranges are unique in terms of species composition.

The evolutionary history of the flora of the Yilgarn, although not well known, appears complex and is similar to that described for the South-West Botanical Province, which significantly overlaps with the Yilgarn. A feature of the South-West flora, particularly of newly described species, is the large number of taxa that are rare and geographically restricted. Although in part this is no doubt due to recent widespread land clearing and habitat destruction, many taxa appear to be naturally rare and restricted due to evolutionary and ecological processes that characterize the region. A range of historical processes are thought to have contributed to both rarity and local endemism. The Province

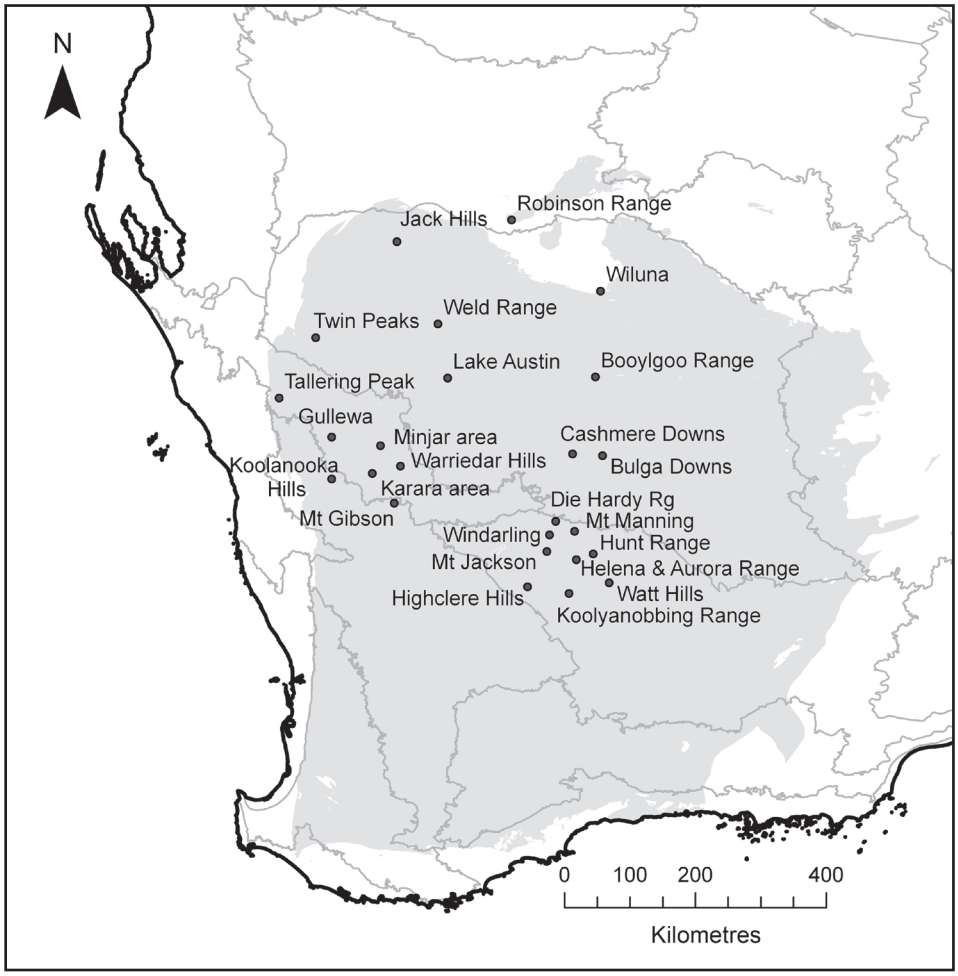

Figure 1. Map showing the IBRA bioregions (Version 6.1, Department of Environment and Water Resources 2007) in Western Australia, the extent of the Yilgarn Craton (shaded) and the locations of the 25 BIF ranges included in the study.

is characterized by a diverse array of evolutionary patterns significantly influenced by widespread climatic and habitat instability experienced since the late Tertiary, leading to cyclic expansion and contraction of mesic and arid zones (Hopper *et al.* 1996; Hopper & Gioia 2004).

There is also increasing palaeo-botanical evidence that a relatively high proportion of the flora of the Province is ancient (McLoughlin & Hill 1996; McLoughlin *et al.* 2001). The post-Tertiary climate cycling may have led to localised extinctions of many species throughout much of their range, resulting in relictual, geographically restricted and fragmented or disjunct population remnants. The BIF ranges, despite their limited topographic relief, may have provided refugia for many species during these phases of localised extinction.

As yet the number of taxa occurring on BIF ranges in the Yilgarn is not known. Recent surveys completed in the Midwest Region indicates a vascular flora of 633 taxa in six areas of BIF (Markey & Dillon a,b, in review; Meissner & Caruso a–c, in review). Earlier surveys on BIF and greenstone

ranges in the Goldfields region suggested 240–350 taxa per range (Gibson 2004). These arid ranges are clearly much richer than previously thought (Jessop 1981).

Despite the incomplete nature of the survey effort, a number of taxa are known to be restricted or largely restricted to BIF and greenstone substrates, some with highly restricted distributions (Rye 2001; Gibson 2005; Wege 2005; Butcher 2007). The number of such taxa is continuing to increase, with recent survey work on 12 BIF ranges identifying at least 20 new taxa (Markey & Dillon a, b, in review; Meissner & Caruso a–c, in review). Of these, nine taxa were collected for the first time while a further 11 were represented in herbarium collections but had not been recognized as distinct taxa. Further survey work is currently underway, with another six ranges being investigated.

A recent research priority at the Western Australian Herbarium, funded by the Western Australian Government's 'Saving Our Species' program, has focused on resolving the taxonomy of undescribed Priority and BIF taxa. The results of this work are described in the papers of this issue. The aim of the present paper is to provide background information on the flora of the BIF ranges and outline the dimensions of the task required to formally name the undescribed BIF taxa and other taxa of conservation significance across the Yilgarn.

Methods

An analysis of the collections databased at PERTH was undertaken to provide statistics on the total flora, the number of taxa currently undescribed (with accepted phrase names or manuscript names) and the proportions of these groups considered rare, threatened, or under consideration for listing as threatened, for both Western Australia as a whole and the Yilgarn Craton. Only native taxa and collections with geographical coordinates were included. In total 516,394 collections fitted these criteria. Specimen records including geocodes were analysed in a GIS environment using Arcview 9.0 (data accessed 2 July 2007).

A second analysis was undertaken to estimate the flora and to identify taxa restricted to or largely restricted to 25 BIF ranges. This subset of ranges are considered as amongst the most prospective for iron ore mining. For each range a polygon was identified that fully encompassed the BIF geology, including a buffer area around each range. These polygons were intersected with the specimen data described above. A percentage endemism value was calculated by dividing the number of collections for each taxon identified within each polygon by the total number of collections of each taxon held in PERTH. This value was used to identify taxa with distributions restricted or largely restricted to the BIF ranges. These data were then used to compile lists of (a) taxa that were endemic to BIF and restricted to a single range; (b) taxa endemic to BIF with distributions covering several ranges; and (c) taxa with distributions centred on BIF ranges. This final category is somewhat arbitrary but included taxa which have only occasionally been collected or seen off BIF (e.g. *Dryandra arborea* C.A.Gardner) and taxa that are restricted to BIF ranges but also grow on laterized BIF (e.g. *Acacia graciliformis* Maslin & Buscumb and *A. muriculata* Maslin & Buscumb).

Results

The Yilgarn Craton occupies 24.4% of the area of Western Australia and has 61.4% of the flora (Table 1). The proportion of DRF and Priority taxa associated with the Yilgarn showed similar values

to the flora as a whole (56.3% of Western Australia's conservation taxa occur on the Yilgarn) as did the proportion of undescribed taxa (54.3%) and undescribed conservation taxa (53.1%). Twelve percent of all DRF in the State are undescribed, and 11.6% of all Yilgarn DRF are undescribed.

While the area of the polygons covering the 25 BIF ranges was only 1.5% of Western Australia, the ranges and buffer areas contained 13% of the flora of Western Australia and 5.6% of DRF and Priority Flora. Three DRF taxa restricted to BIF are described in this volume (Barrett 2007; Bull 2007; Hislop & Chapman 2007) and another three have been described very recently (Butcher 2007; Halford & Henderson 2007). It is likely that several other BIF endemics will be proposed for listing as DRF when sufficient survey has been undertaken to properly assess their status.

Just over 1,700 taxa were recorded from the 25 BIF ranges and the surrounding areas (Table 1), indicating a rich flora. However, the ranges sampled extended over *c.* 650 km, from the Hunt Range to the Jack Hills, and a high gamma diversity may be expected over such a wide area. This estimate is likely to increase in future as the ranges remain poorly collected (median 209, minimum 19, maximum 1,030 collections per range). Survey results suggest that a flora of at least 300 taxa per range may be expected (Markey & Dillon a, b, in review; Meissner & Caruso a–c, in review).

The analysis of the 25 BIF ranges identified 24 taxa as occurring on individual BIF ranges, a further six taxa restricted to BIF but occurring across several ranges, and 14 that had their distributions centred on BIF ranges (Table 2). Of these 44 taxa, 17 are described in this issue (Barrett 2007; Bull 2007; Conn & Shepherd 2007; Hislop & Chapman 2007; Macfarlane 2007; Maslin 2007; Maslin & Buscumb 2007a, 2007b; Meissner & Markey 2007; Rye 2007; Shepherd 2007; Shepherd *et al.* 2007), however a further 13 require formal description.

Both the Helena and Aurora Range and Koolanooka Hill had the most single-range endemics (five taxa on each) followed by Mt Jackson with four, Karara, Mt Gibson and Windarling Range with two each, and the Jack Hills, Die Hardy, Koolyanobbing and Robinson Ranges with one each. None of the remaining 16 ranges have any known locally endemic taxa.

Four of the six taxa that are endemic to BIF but occur across several ranges occurred in the Die Hardy Range – Mt Jackson – Helena and Aurora Range – Koolyanobbing Range area (Table 2). No taxa endemic to BIF or with distributions centred on BIF were recorded for eight of the 25 ranges (Booylgoo Range, Cashmere Downs area, Gullewa area, Lake Austin area, Tallering Peak, Twin Peaks, Warriedar Hill and Watt Hills).

Declared Rare and Priority Flora were concentrated in the Mt Gibson, Helena and Aurora Range and Karara areas, although not all of these taxa were restricted to BIF. Three ranges appear to have no DRF or Priority Flora (Table 3).

Discussion

There is an urgent need to formally name the many undescribed DRF and Priority One taxa in Western Australia. The 269 taxa in these two categories encompass both threatened taxa and taxa with restricted distributions that are in urgent need of threat assessments. Unambiguous descriptions allowing identification of these taxa would assist both threatened taxon management and assessment of conservation status of Priority One taxa.

Table 2. Distribution patterns of taxa restricted to BIF ranges or with their distributions centred on these ranges and conservation status (at 11 September 2007), ★ indicates taxa named in this issue. A list of the 25 BIF ranges is given in Table 3.

	Taxa	Distribution	Status
	BIF endemics restricted to single range		
	Acacia adinophylla Maslin	Helena & Aurora Rg	P1
	Acacia sp. Bungalbin Hill (J.J. Alford 1119)	Helena & Aurora Rg	P1
	Acacia sp. Jack Hills (R. Meissner & Y. Caruso 4)	Jack Hills	P1
★	*Acacia woodmaniorum* Maslin & Buscumb	Karara	P2
	Baeckea sp. Mt Jackson (G.J. Keighery 4362)	Mt Jackson	
	Caesia sp. Koolanooka Hills (R. Meissner & Y. Caruso 78)	Koolanooka Hills	
	Caladenia sp. Muddaming Hill (S.D. Hopper 4013)	Mt Jackson	
	Darwinia masonii C.A.Gardner	Mt Gibson	DRF
★	*Dodonaea scurra* K.A.Sheph. & R.A.Meissn.	Koolanooka Hills	P1
★	*Drummondita rubroviridis* R.A.Meissn.	Koolanooka Hills	P1
	Jacksonia jackson Chappill	Mt Jackson	P1
★	*Lepidosperma bungalbin* R.L.Barrett	Helena & Aurora Rg	P1
★	*Lepidosperma gibsonii* R.L.Barrett	Mt Gibson	DRF
	Lepidosperma sp. Koolanooka (K.R. Newbey 9336)	Koolanooka Hills	
★	*Leucopogon spectabilis* Hislop & A.R.Chapm.	Helena & Aurora Rg	DRF
	Micromyrtus acuta Rye	Karara	P1
★	*Pityrodia iphthima* K.A.Sheph.	Robinson Rg	P1
	Ricinocarpos brevis R.J.F.Hend. & Mollemans	Windarling Rg	DRF
	Sclerolaena sp. Koolanooka Hills (R. Meissner & Y. Caruso 437)	Koolanooka Hills	
	Tetratheca aphylla F.Muell. subsp. *aphylla*	Helena & Aurora Rg	DRF
★	*Tetratheca erubescens* J.P.Bull	Koolyanobbing Rg	DRF
	Tetratheca harperi F.Muell.	Mt Jackson	DRF
	Tetratheca paynterae Alford subsp. *cremnobata* R.Butcher	Die Hardy Rg	DRF
	Tetratheca paynterae subsp. *paynterae*	Windarling Rg	DRF
	BIF endemics occurring across several ranges		
	Beyeria sp. Jackson Range (R. Cranfield & P. Spencer 7751)	Mt Jackson to Koolyanobbing Rg	P1
	Beyeria sp. Murchison (B. Jeanes s.n. 7/7/2005)	Weld Rg to Bulga Downs	P2
★	*Lepidosperma ferricola* R.L.Barrett	Die Hardy Rg to Koolyanobbing Rg	P1
	Millotia dimorpha P.S.Short	Karara to Koolanooka Hills	P1
★	*Neurachne annularis* T.Macfarlane	Die Hardy Rg to Koolyanobbing Rg	P3
	Stenanthemum newbeyi Rye	Die Hardy Rg to Koolyanobbing Rg	P3
	Taxa with distributions centered on BIF		
★	*Acacia cockertoniana* Maslin	Weld Rg to Wiluna	
★	*Acacia graciliformis* Maslin & Buscumb	Koolanooka Hills	P1
★	*Acacia karina* Maslin & Buscumb	Karara to Mt Gibson	P2
★	*Acacia muriculata* Maslin & Buscumb	Koolanooka Hills	P1
★	*Drummondita fulva* A.S.Markey & R.A.Meissn.	Karara to Yalgoo	P3
	Dryandra arborea C.A.Gardner	Die Hardy Rg to Koolyanobbing Rg	
	Grevillea georgeana McGill.	Die Hardy Rg to Kangaroo Hills	P3
	Grevillea zygoloba Olde & Marriott	Mt Jackson to Koolyanobbing Rg	
	Hibbertia lepidocalyx J.R.Wheeler subsp. *tuberculata* J.R.Wheeler	Helena & Aurora Rg to Hunt Rg	P1
★	*Micromyrtus trudgenii* Rye	Karara to Yalgoo	P3
	Mirbelia sp. Helena & Aurora (B.J. Lepschi 2003)	Koolanooka Hills to Bremer Rg	P3
	Polianthion collinum Rye	Karara to Yalgoo	P3
★	*Prostanthera ferricola* B.J.Conn & K.A.Sheph.	Robinson Rg to Wiluna	P3
	Spartothamnella sp. Helena & Aurora Range (P.G. Armstrong 155-109)	Karara to Helena & Aurora Rg	P3

Table 3. Distribution of Declared Rare Flora and Priority taxa recorded on the 25 ranges included in the analysis. Also shown is the area of polygons used in the analysis, this includes both the BIF range and a buffer area. Not all DRF and Priority taxa are restricted to BIF.

Range	DRF	Priority Flora	Area (km^2)
Mt Gibson	3	13	1,511
Helena & Aurora Range	2	12	646
Mt Jackson	2	7	577
Windarling	2	2	408
Karara area	1	15	1,497
Koolyanobbing Range	1	3	484
Koolanooka Hills		9	1,101
Die Hardy Range		7	1,048
Minjar area		7	1,360
Weld Range		7	4,671
Highclere Hills		6	1,562
Hunt Range		5	354
Mt Manning		5	270
Jack Hills		5	7,785
Warriedar Hill		4	1,184
Gullewa area		3	1,395
Watt Hills		3	822
Lake Austin area		2	3,491
Bulga Downs area		1	1,053
Robinson Range		1	2,103
Tallering Peak		1	363
Twin Peaks		1	764
Booylgoo Range			1,228
Cashmere Downs area			773
Wiluna			1,148

Of the Yilgarn flora, the highest proportion of DRF and Priority taxa (44%) are found in the Avon-Wheatbelt bioregion of the highly diverse South-West Botanical Province (Table 4). This is the bioregion that has been most significantly impacted by clearing (84% cleared; Gibson *et al.* 2004), largely for cereal crop production. Considerably fewer DRF and Priority Flora are known from the three adjoining Yilgarn bioregions of the Eremaean Botanical Province (Coolgardie, Yalgoo and Murchison), primarily as a result of vegetation in these mainly pastoral regions being largely intact.

Most of the BIF ranges studied to date occur in the Coolgardie, Yalgoo and Murchison bioregions. While the numbers of DRF and Priority Flora do not reach the level found in the South-West, their proportions in terms of the Yilgarn flora are comparable, despite the very much smaller area involved.

Table 4. Area and number of DRF and Priority taxa in four bioregions (IBRA Version 6.1, Department of Environment and Water Resources 2007) in comparison with the 25 BIF ranges. Percentages calculated based on 1,485 DRF and Priority taxa known from the Yilgarn.

	Area (km^2)	DRF & Priority taxa	% DRF & Priority taxa
Yilgarn	617,117	1,485	
25 BIF ranges	36,609	149	10.0
Avon Wheatbelt	95,171	654	44.0
Coolgardie	129,122	269	18.1
Murchison	281,206	163	11.0
Yalgoo	50,872	96	6.5

These data support previous work on individual ranges suggesting that the BIF ranges are biodiversity hotspots of the Eremaean (Butcher *et al.* 2007).

The degree of endemism and number of DRF and Priority Flora vary considerably between the BIF ranges (Tables 2 & 3). On current data some ranges (such as Helena and Aurora Range, Koolanooka Hills, Mt Jackson, Mt Gibson and Karara) have much higher conservation significance than others in terms of supporting high numbers of endemics and/or listed taxa. The numbers of DRF and Priority taxa are correlated with the number of taxa recorded from the range ($R^2 = 0.53$, $P < 0.01$). However, no such relationship is apparent for the restricted endemics, and the reasons for these patterns remains unclear.

Preliminary analysis also indicates that individual BIF ranges generally support compositionally different vegetation units, even over short geographical distances. Some of these vegetation units have very restricted distributions within individual ranges (*ecologia* Environmental 2002; ATA Environmental 2006; Markey & Dillon a, b, in review; Meissner & Caruso a–c, in review).

Recent detailed research on leafless *Tetratheca* Sm. species in the area around Mt Jackson has illustrated the relictual nature of some of the endemics, with phylogenetically distinct taxa occurring on adjacent ranges (Butcher *et al.* 2007). Other endemic taxa have closely related taxa in near proximity (e.g. *Lepidosperma* spp., R.L. Barrett unpubl. data), indicating recent radiation has also contributed to the endemics of the BIF ranges. Hence, the origin of the endemics of these ranges systems may be ascribed to both recent evolutionary divergence and an ancient relictual component. Similar patterns of relictual and recent taxa are seen in the *Acacia* Mill. centre of species richness along the eastern margin of the Southwest Interzone (Hopper & Maslin 1978).

The overall pattern of endemism in the BIF ranges is similar to other ranges of the South-West (Barrett 1996; Hopper & Gioia 2004), the Pilbara (van Leeuwen & Bromilow 2002) and central Australia (Morton *et al.* 2004) across a range of geologies. These patterns are likely to have resulted from the widespread climatic and habitat instability experienced since the late Tertiary (Hopper *et al.* 1996) and may also be related to the very long period of stability this region has undergone and the opportunity for fine scale niche partitioning of very ancient soils, or a combination of both processes. Recent surveys of analogous ranges in Brazil (Jacobi *et al.* 2007) have likewise reported high levels of alpha and beta diversity, endemism and the occurrence of unique ecosystems.

In conclusion, the flora of the BIF ranges show clumped patterns in distribution of both endemics and threatened and Priority Flora. While the patterns in DRF and Priority flora generally reflect richness of the local species pool, distribution of restricted endemics do not. Preliminary analysis of the vegetation of the ranges confirms the unique catenary sequences first described by Beard (1981). The irreplaceability (*sensu* Pressey 1999) of many of these ranges in terms of community, species and genetic levels of diversity is likely to make the achievement of a comprehensive, adequate and representative reserve network difficult.

There also remains an unacceptably high number of DRF and Priority Flora awaiting formal description. The State-wide pattern is reflected in the Yilgarn flora, but is less evident in the BIF flora due to the recent targeted taxonomic effort. Lack of formal descriptions inhibits both threatened flora management and assessment of Priority taxa for listing as threatened flora. The 44 papers in this volume, in which 95 taxa are newly described, 78 of which are listed as DRF or Priority Flora, make a significant contribution to ameliorating this problem, however, much more work is needed.

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