



Rich sister, poor cousin: Plant diversity and endemism in the Great Winterberg–Amatholes (Great Escarpment, Eastern Cape, South Africa)



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ABSTRACT

The Great Winterberg–Amatholes (GWA) is part of the Great Escarpment in southern Africa and ‘sister’ to the Sneeuberg and Stormberg ranges in the Eastern Cape. It comprises a historically well-sampled Amathole Component, and a poorly known Great Winterberg Component. Accordingly, overall plant diversity and endemism have been unknown. Here we define the boundaries of the GWA as an orographic entity and present a comprehensive list of taxa compiled from existing collection records supplemented by intensive fieldwork. With a flora of 1877 taxa, the GWA is surprisingly richer than the adjacent and larger Sneeuberg, but predictably poorer than the very much larger Drakensberg Alpine Centre (DAC). With 1.9% floristic endemism, the GWA could marginally qualify as a new centre of floristic endemism (complementary to the adjacent Sneeuberg Centre), but formal recognition as a discrete Centre should await comprehensive floristic comparison with the adjacent, poorly studied Stormberg. Due to restricted distributions and pressure from commercial forestry, almost half of the 35 endemics have conservation listings as Rare or stronger, with one Presumed Extinct and three Endangered. Five endemics are still only known from their type specimens. Intensive fieldwork and accurate collation of available data is thus shown as essential for accurate biodiversity assessment and conservation planning in South Africa’s montane regions.

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1. Introduction

The Great Escarpment in the Eastern Cape Province, South Africa, has remained one of South Africa’s least researched montane areas (Clark et al., 2011c), with available data collections often dating to the 1800s. Despite evidence of local montane endemism and complex phytogeographical affinities, very little floristic data has been available for detailed comparisons and conservation planning in this ecologically important region (Bester, 1998; Van Wyk and Smith, 2001). While broad-scale vegetation mapping and phytosociological surveys in the Eastern Cape have been very effective and informative in recent decades (Acocks, 1988; Palmer, 1988, 1990, 1991; Hoare and Bredenkamp, 1999, 2001; Low and Rebelo, 1998; Mucina and Rutherford, 2006, etc.), rigorous biodiversity inventory based on intensive fieldwork is essential as a complementary, fine-scale assessment of biodiversity.

The Cape Midlands in the Eastern Cape Province are bounded by three sets of mountains – the Sneeuberg, Stormberg and Great Winterberg–Amatholes (GWA; we have adopted ‘Amathole’ over ‘Amatola’ here) – that form part of the Great Escarpment in southern Africa (Clark et al., 2009, 2011c; Fig. 1B). Of the three, the Sneeuberg is now the most well documented floristically (Clark et al., 2009, 2011a; Nordenstam et al., 2009; Martínez-Azorín et al., 2011; Stirton et al., 2011), the GWA moderately well so, and the Stormberg the most poorly. This study addresses data deficiencies in the GWA.

The GWA is some 130 km long by 70 km wide, covering 7382 km², located between 32°00′–32°45′S and 25°50′–27°40′E (Fig. 1A–C; Plates 1–2; the study area delimitation method is provided in the Online Supplementary Material (OSM): Section 1). The highest altitude reached is 2367 m (Great Winterberg peak). The towns of Bedford, Adelaide, Fort Beaufort, Alice and Stutterheim occur along the southern edge at the foot of the Escarpment, with Tarkastad, Sada/Whittlesea and Cathcart along the northern edge. The GWA is divided into two roughly equal-sized parts (the Great Winterberg and Amathole Components) by

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the Hackney and Readsdales valleys, these being deep incisions into the GWA from the north and south, leaving a narrow montane bridge east of Devil's Bellows Nek on the R351 (near the Katberg Pass). We have termed this the 'Readsdales Constriction' (Fig. 1A).

Although William Burchell passed through the Sneeuberg in 1812–1813 (McKay, 1943) he did not visit the GWA, nor did Thunberg (Phillipson, 1987). The earliest botanical records from the GWA are thus those of C.F. Ecklon & C.L.P. Zeyher (collected from 1831–1832), 18 years after Burchell's Sneeuberg visit. Since then, the Amathole Component has been relatively well collected, with a large number of specimens lodged in the Selmar Schonland Herbarium (GRA), University of Fort Hare (UFH) and National Herbarium (PRE; Phillipson, 1987; a complete list of known collectors to the GWA is provided in the OSM: Section 2). From the mid-1950s to the 1980s, regular student excursions to the Hogsback area were organised by A.R.A. Noel, A. Jacot Guillarmod and R.A. Lubke (specimens in GRA). Phillipson (1987) indicates that by 1986 ca. 3000 specimens had been collected in the Amatholes. Although the Great Winterberg Component received more attention in the latter 1800s than the Amathole Component – through the efforts of *inter alia* J.F. Drège, E.E. Galpin and P. MacOwan – it has been largely neglected since then. This collecting bias since the early 1900s may be due to the Amathole Component's proximity to the larger population centres (e.g. King Williams Town and East London), the University of Fort Hare (in Alice, near its southern base), and the Dohne Agricultural Research Station. Road access onto the Amathole Component is also better than onto the Great Winterberg, particularly with the steady deterioration of the Katberg Pass in recent years (now only accessible by 4 × 4).

The main objectives of this paper are:

- (1) To provide a comprehensive plant checklist for the GWA that will serve as a baseline reference for taxonomic, floristic, phylogenetic and ecological research and conservation in these mountains.
- (2) To determine the level of floristic endemism in the GWA, particularly in relation to the Sneeuberg and Drakensberg Alpine Centres (DAC) of Floristic Endemism.
- (3) To provide a comprehensive overview of the endemic and near-endemic taxa occurring in the GWA.

2. Methods

2.1. Compilation of the plant checklist

The following method was used to compile the plant checklist for the GWA:

- (1) The starting point for a complete GWA checklist (Pteridophytes, Gymnosperms and Angiosperms) was Phillipson's (1987) list of 1192 taxa (the 23 'sp.' and 'spp.' being excluded) for his 900 km² portion of the Amathole Component (Fig. 1A). This was then augmented by a list of taxa obtained from the National Herbarium's Computerised Information System (PRECIS; Arnold and Steyn, 2005), creating a draft checklist.
- (2) Extensive fieldwork was undertaken by VRC (et al.) from 2009–2011 in the Great Winterberg Component, totalling 2181 specimens (Table S1). These collections represent among the most recent and comprehensive field data for the Great Winterberg Component. The fieldwork systematically sampled all vegetation types in order to get representation across the broad climatic and altitudinal spectra. Particular topographic features of focus were the highest peaks, the extensive plateau wetlands, cliff-lines, and gorges. Specimens were identified in GRA. For some groups (Aizoaceae, *Alchemilla*, Apiaceae, Brassicaceae, *Cineraria*, *Cliffortia*, Cyperaceae, *Erica*, *Euryops*, Fabaceae, *Hermannia*, *Kniphofia*, *Lycium*, Orchidaceae, petaloid monocotyledons, Polygalaceae, Pteridophytes, Restionaceae) assistance

from taxonomists was obtained (see Acknowledgements). The majority of the specimens are lodged in GRA, with duplicates sent primarily to the Bolus Herbarium (BOL), Compton Herbarium (NBG), Missouri Botanical Garden (MO), PRE and Swedish Museum of Natural History (S).

- (3) Detailed fieldwork had been done in the Mpofu area in 2006 by CB, with members of the Botanical Society of South Africa and Mpofu Nature Reserve staff (specimens referenced to Bredenkamp CL and Mpupa L, Middelberg G, Steenkamp LP, and Van Stadon D in OSM: Appendix A). This resulted in 298 specimens from this poorly sampled lower to mid-altitude section of the Great Winterberg Component. The specimens were identified by staff at PRE, where they are also lodged.
- (4) CM has been undertaking photographic botanical exploration of the GWA – particularly the lesser known inland parts of the Amathole plateau – for many years, resulting in the discovery of several local endemics and numerous important range extensions (Goldblatt, 2003; Dold, 2006; McMaster, 2007, etc.).
- (5) APD has undertaken numerous exploratory trips to the GWA, notably the Katberg and the farm 'Glen Etive', and the inland margins of the GWA nearer Whittlesea/Sada.
- (6) Additional collection records were obtained from H.P. Linder (Katberg Orchidaceae) and N.A. Helme (Great Winterberg, Finella Gorge and the Elandsberg).
- (7) Available literature in GRA (notably taxonomic revisions) was perused for endemics and possible GWA records. Everard and Hardy's (1993) detailed forest work in the GWA was used to supplement forest taxa.
- (8) Additional locality information for taxa with ambiguous localities was obtained using the African Plants Database (2013) and JSTOR's Global Plants (jstor.org/global-plants), as these sites provide the original taxonomic treatments/description citations of many poorly known taxa.
- (9) Taxa on the plant checklist which could not be referenced through any of the above means (being mostly specimens from PRECIS) were checked against the locality descriptions of voucher specimens in GRA, and either assigned a voucher reference or deleted if their occurrence in the GWA could not be confirmed. A side benefit of the exercise was that many historical vouchers from early GWA botanical pioneers (notably E.E. Galpin, T.R. Sim, R. Story, etc.), which had not been included in Phillipson (1987), were added. Consequently, reliable data from two herbaria (i.e. GRA and UFH, which was Phillipson's, 1987, primary source) is reflected in the final plant checklist.
- (10) Problematic specimens and taxa excluded from Appendix A are detailed in the OSM: Section 3.

As it would have been possible in Appendix A to reference many of the taxa from several sources (e.g. new vouchers, historical vouchers, photographs, literature citations etc.), the following referencing priority was employed: (1) VRC specimens, (2) CB (Mpofu) specimens, (3) Phillipson (1987), (4) other literature, (5) GRA specimens and other records such as those of APD, H.P. Linder and N.A. Helme, (6) and lastly, CM records (as these are mostly photographic; simply referenced as 'CM, pers. rec.'). Names were standardised according to Roux (2001) for Pteridophytes, and the African Plant Database (2013) for the remainder, with the exception of *Searsia* (which follows Moffett, 2007) and *Restio* (which follows Linder and Hardy, 2010).

2.2. Endemism

The plant taxa endemic to the GWA were determined from botanical revisions and publications available in GRA and on the internet (notably SANBI, 2012, the African Plants Database, 2013, and JSTOR's Global

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