



## Taking stock of South Africa's flora

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### ABSTRACT

South Africa is rich in plant biodiversity and has a longstanding history of record-keeping of its plant resources. In recent years, updated versions of the South African National Plant Checklist (Checklist) have been published annually in electronic form, reflecting changes from published taxonomic revisions and new species descriptions. The most recent Checklist from 2025 recognises 23 514 taxa and 21 539 species (20 204 indigenous and 1 329 naturalised species). Of the indigenous species, 60.5 % are endemic to the country. The e-Flora of South Africa project (e-Flora) was initiated in 2013 and the first phase was completed in 2020. Both the Checklist and e-Flora data were published online in 2024 on the South African National Biodiversity Institute's Biodiversity Advisor website. The e-Flora adds a layer of descriptive information to the list of names provided in the Checklist, thereby enhancing the utility of these outputs for end-users from a variety of biodiversity-related fields. The e-Flora is a dynamic data source with updates guided by changes incorporated in the Checklist. An overview of the statistics from both the Checklist and the e-Flora, as of March 2025, are provided.

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### 1. Introduction

South Africa is well-known globally for its species richness and for the unique floristic composition, hosting one of the world's most diverse temperate floras (here defined as plant diversity located in regions with a moderate but seasonal climate – with distinct warm summer and cold winter seasons, as well as a clear seasonality in precipitation) (Germishuizen et al., 2006; Linder and Verboom, 2015). The biodiversity of the country is strongly shaped by its varied topography, soils, and climate. Currently, nine biomes and 465 national vegetation types are recognised (A. Dayaram, pers. comm., March 2025).

The most up-to-date inventory of the country's plant riches is the South African National Plant Checklist, which currently includes the names of all indigenous and naturalised plants confirmed to be present in South Africa. It covers the following groups: bryophytes (mosses, hornworts, and liverworts), lycophytes and pteridophytes, gymnosperms, and angiosperms (Victor et al., 2024; South African National Biodiversity Institute, 2025), with a vision of including the marine macro-algae in future. The higher level classification systems followed in the South African National Plant Checklist are:

Bryonames (<https://www.bryonames.org/>) for mosses, hornworts, and liverworts; the Pteridophyte Phylogeny Group I (2016) for lycophytes and pteridophytes; Yang et al. (2022) for gymnosperms; and a revised version of the Angiosperm Phylogeny Group (APG) II classification (Angiosperm Phylogeny Group, 2003) for angiosperms, where new families and family splits post-APG II are accepted, but not family merges. See Victor et al. (2024) for more details on the higher level classification systems implemented. Just more than 20 000 indigenous species are recorded in the Checklist, and considering the global estimated species number of 379 950 species, South Africa's national flora is equivalent to 5.3 % of the world's species (World Flora Online Consortium et al., 2024). More than half of the indigenous species are endemic to South Africa (Klopper and Winter, 2025; South African National Biodiversity Institute, 2025).

Due to a long history of recording and curating the names of plants occurring within South Africa, the country plant checklist is accurate, up-to-date, and forms the taxonomic backbone for other foundational outputs like the e-Flora of South Africa and applied biodiversity actions, like the Red List of South African Plants (<https://redlist.sanbi.org/>). This contribution presents a concise overview of the composition of the South African flora, based on the latest version of the South African National Plant Checklist, and provides a status update that is compared to the previous account by Germishuizen et al. (2006). Additionally, we report, for the first time, statistics on the e-Flora of South Africa's content since its initiation (Le Roux et al., 2017), highlighting progress.

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### 1.1. Checklists

Published checklists are formal inventories, providing the starting point for many fields of applied sciences, like conservation, ecology, and management (Klopper et al., 2007). The first checklist of southern African plants (the Flora of Southern Africa region: Botswana, Eswatini, Lesotho, Namibia, and South Africa) was published in 1984 (Gibbs Russell et al., 1984), and was mainly based on the collections held in the National Herbarium in Pretoria (PRE), South Africa (Germishuizen and Meyer, 2003). It was a simple list of names and was the first fundamental output produced from the PRE Computerised Information System (PRECIS; Gibbs Russell and Arnold, 1989). Building on this work, the checklist was expanded to include synonyms and literature references and an update was published as a second edition in two volumes (Gibbs Russell et al., 1985, 1987). Thereafter, changes to the checklist were published in the journal *Bothalia* between 1988 and 1991. In 1993, a third checklist was published (Arnold and De Wet, 1993) and included regional distribution data. A fourth version was published in 2003 and included the addition of life cycle, life form, plant height, and altitude information (Germishuizen and Meyer, 2003). Then followed the publication of the first formal country-level checklist for South Africa in 2006 (Germishuizen et al., 2006) (also see Victor et al., 2024 for more details on the history of the Checklist).

In 2006, data from the PRECIS database of the South African National Biodiversity Institute (SANBI; i.e. southern African checklist) were amalgamated with the Tropical African Plant Checklist (Lebrun and Stork, 1991, 1992, 1995, 1997), published by the Conservatory and Botanical Garden of Geneva, Switzerland (CJBG), as part of the African Plant Checklist and Database Project – a collaboration between SANBI and CJBG (Gautier et al., 2006; Klopper et al., 2006b, 2007). A hard copy checklist was published (Klopper et al., 2006a) and an online website was established for the African Plant Database (<https://africanplantdatabase.ch/>), which is continually maintained. This was a monumental work, as it served as the first continental checklist for Africa (Klopper et al., 2006b, 2007). It also contributed towards establishing a global plant checklist (published online in 2010 in *The Plant List*) in alignment with the Convention on Biological Diversity's Global Strategy for Plant Conservation (Paton et al., 2008).

Since 2006, several changes around management of the South African National Plant Checklist (hereafter referred to as the 'Checklist') and the data infrastructure supporting curation of the taxonomic backbone have taken place. In 2013, data in PRECIS were migrated into the Botanical Database and Herbarium Management System (Botanical Research and Herbarium Management System, 2025), and the dataset was renamed the Botanical Database of Southern Africa (BODATSA). A rigorous method was developed to curate and update the Checklist. A detailed overview of the process was published in Victor et al. (2024).

The Checklist provides the taxonomic backbone for other national projects concerning South African plants, such as the e-Flora of South Africa, Red List of South African Plants, curatorial activities in herbaria, and research. Any discrepancies in the taxonomy used in other projects, are usually due to a lag in incorporating updates that were included in the Checklist. The Red List of South African Plants website, for instance, is updated much less frequently than the Checklist and the SANBI Biodiversity Advisor website (<https://biodiversityadvisor.sanbi.org/>). It is important to note that the Checklist does not directly serve as the backbone for many other international resources used by botanists and plant enthusiasts in South Africa. The iNaturalist platform (<https://www.inaturalist.org/>), for instance, is a global initiative and follows the taxonomy of the Plants of the World Online (POWO; <https://powo.science.kew.org/>). It is endeavored to align the Checklist and these resources as closely as possible. Therefore, discrepancies are investigated and resolved, if possible, on a case-by-

case basis, by either updating the Checklist, or the international database as needed. However, due to the different approaches towards classification that are often followed by South African researchers and global databases, it might not always be feasible to exactly match the treatments in these different resources.

From 2020 onwards, official updates of the Checklist was published annually as an electronic spreadsheet and made available on the SANBI's institutional repository (see <https://opus.sanbi.org/items/92b6aaa8-84f9-4b4b-9d80-7cba0497cf8d> or <http://hdl.handle.net/20.500.12143/6880.3>). The most recent version was published on 20 March 2025 (South African National Biodiversity Institute, 2025; see also 10.5281/zenodo.15050848).

### 1.2. e-Floras

Floristics in South Africa has a long history that started in the early 19th century when Thunberg (1823) published the first Flora for South Africa. Thereafter followed four major Flora projects that were specific for or included South Africa: 1) the *Flora capensis* series by Harvey and Sonder (1859–1933); 2) the *Flora of southern Africa* (1963–); 3) the conspectus programme (1997–); and 4) the e-Flora of South Africa (2024, continually maintained; Le Roux et al., 2017, submitted).

The e-Flora of South Africa project (from hereon after referred to as the 'e-Flora') was initiated in response to the updated 2020 targets of the Global Strategy for Plant Conservation. The global plant checklist target of 2010 was converted into creating a global Flora by 2020 (Borsch et al., 2020). Therefore, South Africa committed to create an electronic Flora that was published online in SANBI's Biodiversity Advisor website in 2024 (Le Roux et al., submitted). The e-Flora is a dynamic system that is continually updated. It is based on the Checklist, and amendment and expansion thereof is guided by changes captured in the Checklist.

### 1.3. Checklist and e-Flora access

The Checklist, as a stand-alone unit, is published in the first quarter of each calendar year and is accessible through SANBI's institutional repository (see <https://opus.sanbi.org/handle/20.500.12143/6880.3> or <https://opus.sanbi.org/items/92b6aaa8-84f9-4b4b-9d80-7cba0497cf8d>). It also forms the taxonomic backbone of the Biodiversity Advisor, the website where the e-Flora data are published online. Complete datasets of the Checklist and e-Flora are sporadically submitted to the World Flora Online (<https://www.worldfloraonline.org/>) to support curation of the global online Flora and its taxonomic backbone, The WFO Plant List (<https://wfoplantlist.org/>).

When the Checklist is submitted to the World Flora Online and there are discrepancies, the relevant Taxonomic Expert Networks of the World Flora Online will be notified to see how they want to resolve the discrepancy. For groups where there are not yet a Taxonomic Expert Network, the Checklist is followed, especially as far as the endemic and near-endemic taxa are concerned.

## 2. Floristic composition of South Africa

### 2.1. Overview of taxa

According to the most recent Checklist, published by SANBI (South African National Biodiversity Institute, 2025), a total of 23 514 taxa (including species and infraspecific taxa) are currently recognised in South Africa (Table 1; see also Klopper and Winter, 2025). These include 21 539 species of which 20 204 are indigenous, 12 220 endemic, and 1 329 naturalised. Of the naturalised taxa, 649 species are invasive. The South African National Plant Checklist Policy defines naturalised and invasive taxa as follows: naturalised species are alien

**Table 1**

A comparison between the South African plant checklists published in 2006 and 2025, showing the total numbers of taxa and species.

	Germishuizen et al. (2006)	SANBI (2025)
All species	20 491	21 539
Indigenous species	19 581	20 204
Endemic species	11 700 (estimated)	12 220
Naturalised species	915	1 329
Cultivated species	347	Not available
Invasive species	198	649

species (i.e., species whose documented natural range does not include South Africa, but that is now in the country as a result of human action that has enabled it to overcome a biogeographic barrier) that sustain self-replacing populations for two or more life cycles or over a given period of time without direct intervention by people, or despite human intervention; invasive species are alien species that sustain self-replacing populations over several life cycles, produce reproductive offspring, often in large numbers at considerable distances from the parent and/or site of introduction, and have the potential to spread over long distances (see Blackburn et al., 2011; Essl et al., 2018).

Comparing the current 2025 Checklist with the one published by Germishuizen et al. (2006), shows that an additional 1 048 species (4.9 % increase) are currently recorded for South Africa. This includes an additional 623 indigenous species (3.1 % increase), 520 endemic species (4.3 % increase), 414 naturalised species (31.1 % increase), and 451 invasive species (69.5 % increase) that are recognised. A total of 347 species were noted as cultivated in 2006 but this statistic is not available from the 2025 Checklist as these taxa are not included in the annual release of the Checklist.

In general, relatively low percentages (less than 5 %) of new taxa within the different categories were added to the Checklist since 2006, but there was a steep increase in documenting naturalised and invasive species. This is due to the active work undertaken by SANB's Invasive Species Programme (formerly the Early Detection and Rapid Response Programme), established in 2008, along with the work of the Southern African Plant Invaders Atlas Project that started in 2010 to, amongst others, detect and document new invasions (Wilson et al., 2013), and adding their names to the Checklist.

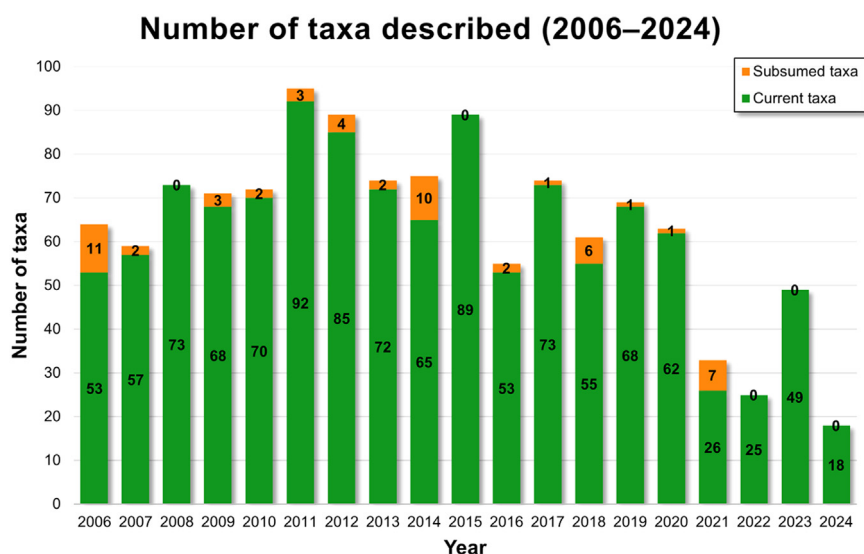
## 2.2. New species and infraspecific taxa

A total of 1 208 new taxa (species and infraspecific taxa) were described from South Africa since 2006, of which 1 153 are still regarded as accepted taxa. On average, a total of 72 taxa were newly described each year (Fig. 1). This number was determined by looking at the trend between 2006 and 2024 (including names that are currently considered synonyms) for taxa newly recognised in the scientific world (i.e. excluding new combinations, replacement names, and changes in rank). It is important to note that: taxa described in 2006 were not included in the 2006 checklist; and the number recorded for 2024 is incomplete as not all publications from 2024 have been incorporated into the 2025 Checklist. Due to the procedure followed for updating the taxonomic backbone, most taxa described in 2024 will only be incorporated by the 2026 release of the Checklist.

The sudden decrease in numbers of new taxa published between 2021 and 2022 is possibly a direct response to the COVID-pandemic that struck in 2020, when human movement was limited with little fieldwork taking place and access to herbarium collections restricted. The number of new taxa published in 2020 remained relatively high, suggesting that these publications relied on data collected before the pandemic, which enabled taxonomists to finalise their work during the lockdown period. In 2023, the number of newly described species nearly doubled compared to 2021 and 2022, hinting at a gradual resurgence in taxonomic research momentum. However, the rate of new species descriptions since 2021 has not yet returned to pre-pandemic levels. With limited data available for 2024, an upward trend toward recovery appears possible, though it remains unclear.

Three outlier years are apparent in terms of taxon numbers: in 2011, 95 taxa were described, in 2012, 89 taxa, and in 2015, 89 taxa. During these three years, a total of eight (73 taxa), five (52 taxa), and eight (50 taxa) publications respectively included the recognition of more than three new taxa (Table 2), while the remainder of taxa (2011: 13; 2012: 18, and 2015: 20 taxa) were described individually.

In the previous decade (2014–2024) a total of 611 new taxa were described from 179 genera, the vast majority (133 genera) with three or less species described during this time. Most new taxa (356 new species and infraspecific taxa) were described as single-species descriptions (sometimes in publications with numerous individual descriptions), while 246 taxa were described as part of taxonomic revisions or in monographic or Flora-type treatments. The remaining



**Fig. 1.** Number of taxa described per year between 2006 and 2024, indicating the number of these new taxa that are still regarded as current taxa (below, in green), and the number that has been subsumed into other taxa (above, in orange).

**Table 2**

A publication list for three outlier years (2011, 2012, 2015) in which more than the average of 72 taxa were described. Number of new taxa published in each journal volume or other publication is provided for each year.

2011	Taxa	2012	Taxa	2015	Taxa
Bothalia 41(1)	21	Bothalia 42(2)	25	Bradleya 33	8
Taxon 60(4)	12	Genus <i>Lachenalia</i>	11	Strelitzia 35	8
Bothalia 41(2)	9	Strelitzia 29	8	S. African J. Bot. 97	7
S. African J. Bot. 77(2)	9	Bothalia 42(1)	4	S. African J. Bot. 99	7
Syst. Bot. 36(2)	7	S. African J. Bot. 78	4	S. African J. Bot. 103	6
S. African J. Bot. 77(1)	6	Bradleya 30	3	S. African J. Bot. 98	6
Ferns S. Afr. Compreh. Guide	5	Haseltonia 18	3	Geraniaceae Group Notes 81	4
Bradleya 29	4	S. African J. Bot. 79	3	Phytotaxa 219(1)	4
S. African J. Bot. 77(3)	3	CactusWorld 30(4)	2	Bot. J. Linn. Soc. 179	3
Bot. J. Linn. Soc. 167	2	Feddes Repert. 122(3–4)	2	Bothalia-ABC 45(1)	2
PhytoKeys 5	2	Fl. Zambes. 3(4)	2	Cact. Succ. J. (Los Angeles) 87(6)	2
Syst. Bot. 36(3)	2	Herbertia 65	2	Fl. Pl. Africa 64	2
Aloe 48(3)	1	Syst. Bot. 37(3)	2	Haseltonia 21	2
Aloe 48(4)	1	Aloe 49(1)	1	PhytoKeys 44	2
Alsterworthia Int. 11(2)	1	Anales Jard. Bot. Madrid 69(2)	1	PhytoKeys 48	2
Bot. J. Linn. Soc. 166	1	Cact. Succ. J. (Los Angeles) 83(6)	1	Phytotaxa 239(2)	2
Cact. Succ. J. (Los Angeles) 83(4)	1	Euphorbia World 8(1)	1	Taxon 64(3)	2
Euphorbia World 7(1)	1	Euphorbia World 8(3)	1	Euphorbia World 11(2)	1
Fl. Pl. Africa 62	1	Fl. Trop. E. Africa, Commelin.	1	Fl. Zambes. 8(6)	1
Kew Bull. 65(3)	1	Gen. <i>Agapanthus</i>	1	Geraniaceae Group News 136	1
Nordic J. Bot. 29(5)	1	J. Bryol. 34(4)	1	Nordic J. Bot. 33(1)	1
Novon 21(4)	1	Kew Bull. 67(4)	1	Phytotaxa 192(4)	1
Orchids S. Africa 42(1)	1	Nordic J. Bot. 29(6)	1	Phytotaxa 195(2)	1
Phytotaxa 33	1	Novon 22(1)	1	Phytotaxa 202(3)	1
Pl. Ecol. Evol. 144(2)	1	PhytoKeys 17	1	Phytotaxa 203(2)	1
		PhytoKeys 8	1	Phytotaxa 204(1)	1
		Revis. Gen. Pl. 3[3]	1	Phytotaxa 204(2)	1
		S. African J. Bot. 79(1)	1	Phytotaxa 205(1)	1
		S. African J. Bot. 80	1	Phytotaxa 208(3)	1
		S. African J. Bot. 84	1	Phytotaxa 218(3)	1
		Taxon 61(6)	1	Phytotaxa 221(3)	1
				Phytotaxa 222(1)	1
				Phytotaxa 230(2)	1
				S. African J. Bot. 97	1
				S. African J. Bot. 100	1
				S. African J. Bot. 96	1
				Syst. Bot. 40(4)	1

nine taxa were described in publications reporting on other (mostly phylogenetic) research that highlighted the need for nomenclatural adjustments or the recognition of new species.

Higher numbers of new taxa are generally recognised in groups where active taxonomic research is taking place or where the taxonomy has largely been detangled, establishing clear species concepts and allowing easier recognition of novel taxa. For example, in 2020, a family treatment of Iridaceae in southern Africa was published (Goldblatt and Manning, 2020). Leading up to (since 2006), and in this publication, a total of 39 *Ixia* L. taxa (the genus with the most number of newly recognised taxa since 2006), 38 *Moraea* Mill. (the genus with the second-most newly recognised taxa), 25 *Babiana* Ker Gawl., 17 *Geissorhiza* Ker Gawl., 10 *Hesperantha* Ker Gawl., 8 *Romulea* Maratti, 5 *Lapeirousia* Pourr., 4 *Micranthus* (Pers.) Eckl., 3 *Ferraria* Burm. ex Mill., 3 *Gladiolus* Tourn. ex L., 3 *Thereianthus* G.J.Lewis, 2 *Aristea* Aiton, 2 *Codonrhiza* Goldblatt & J.C.Manning, 2 *Freesia* Eckl. ex Klatt, 2 *Tritonia* Ker Gawl., 1 *Bobartia* L., 1 *Dietes* Salisb. ex Klatt, 1 *Nivenia* Vent., 1 *Psilosiphon* Goldblatt & J.C.Manning, 1 *Sparaxis* Ker Gawl., and 1 *Tritoniopsis* L.Bolus taxa were newly recognised. Similarly, work conducted on *Pelargonium* L'Hér. (Geraniaceae) between the late 1970s and early 2000s (Le Roux, 2016), laid a solid taxonomic foundation that allowed recognition of 34 new taxa (the genus with the third-most newly recognised taxa) since 2006. Recent research focussed on *Indigofera* L. (Fabaceae) (the genus with the fourth-most newly recognised taxa) has also seen the recognition of 33 new taxa since 2006 (e.g. Du Preez et al., 2023a, 2023b, 2024; Grieve et al., 2023, 2024).

### 2.3. Summary of ranks

The current composition of recognised taxa at the individual ranks of family, genus, species, subspecies, variety, and forma is presented in Table 3. The top 20 largest families and genera in terms of total size, indigenous, endemic, and naturalised taxa are presented in Tables 4 and 5 respectively.

In total, South African taxa are classified into 384 families of which 350 families are indigenous, 189 families that include taxa

**Table 3**

Number of taxa that are indigenous, endemic, or naturalised in South Africa (SA), also showing the percentage endemism at each level. For endemic or naturalised taxa, the number of families and genera given contain endemic or naturalised species respectively; these families and genera are not necessarily entirely endemic or naturalised in South Africa (those that are entirely endemic or naturalised are represented by the numbers in square brackets).

Category	Indigenous	Endemic	Naturalised	Total in SA
Families	350	189 (54%) [7; 2%]	146 [34]	384
Genera	2 189	1 071 (49%) [307; 12%]	635 [459]	2 654
Species	20 204	12 220 (60%)	1 329 + 6*	21 539
Subspecies	2 002	1 156 (58%)	90 + 1*	2 093
Varieties	1 906	1 098 (58%)	92 + 1*	1 999
Formas	47	22 (47%)	2	49

\* Cryptogenic taxa: cannot be classified with certainty as indigenous (native) or alien, due to the actual extent of its native range not being known.

**Table 4**

A summary of the 20 largest families in South Africa, and the families with the most indigenous species, endemic species, and naturalised species respectively, as well as the number of species they contain within each category.

Position	SA flora	Indigenous	Endemic	Naturalised				
1	Asteraceae	2 265	Asteraceae	2 124	Aizoaceae	1 426	Fabaceae	143
2	Fabaceae	1 710	Aizoaceae	1 602	Asteraceae	1 352	Asteraceae	140
3	Aizoaceae	1 602	Fabaceae	1 566	Iridaceae	983	Poaceae	123
4	Iridaceae	1 194	Iridaceae	1 189	Fabaceae	961	Myrtaceae	55
5	Poaceae	809	Scrophulariaceae	758	Ericaceae	581	Amaranthaceae	52
6	Scrophulariaceae	766	Ericaceae	744	Scrophulariaceae	562	Solanaceae	48
7	Ericaceae	744	Poaceae	686	Hyacinthaceae	443	Cactaceae	44
8	Apocynaceae	617	Apocynaceae	606	Restionaceae	347	Euphorbiaceae	41
9	Hyacinthaceae	566	Hyacinthaceae	566	Proteaceae	340	Brassicaceae	40
10	Orchidaceae	482	Orchidaceae	481	Asphodelaceae	323	Rosaceae	35
11	Cyperaceae	469	Cyperaceae	462	Apocynaceae	322	Caryophyllaceae	29
12	Asphodelaceae	455	Asphodelaceae	453	Rutaceae	266	Malvaceae	29
13	Proteaceae	369	Proteaceae	355	Orchidaceae	250	Plantaginaceae	26
14	Restionaceae	350	Restionaceae	350	Geraniaceae	233	Boraginaceae	23
15	Malvaceae	346	Malvaceae	317	Cyperaceae	200	Lamiaceae	22
16	Geraniaceae	325	Geraniaceae	315	Campanulaceae	187	Polygonaceae	21
17	Euphorbiaceae	294	Rutaceae	283	Thymelaeaceae	172	Onagraceae	20
18	Rutaceae	285	Acanthaceae	278	Amaryllidaceae	171	Apiaceae	16
19	Acanthaceae	284	Crassulaceae	268	Crassulaceae	164	Verbenaceae	15
20	Lamiaceae	283	Lamiaceae	261	Apiaceae; Oxalidaceae	159	Proteaceae	14

**Table 5**

The 20 largest genera in South Africa, and the genera with the most indigenous species, endemic species, and naturalised species respectively, as well as the number of species they contain within each category.

Position	SA flora	Indigenous	Endemic	Naturalised				
1	<i>Erica</i> L.	743	<i>Erica</i> L.	743	<i>Erica</i> L.	581	<i>Solanum</i> L.	24
2	<i>Aspalathus</i> L.	296	<i>Aspalathus</i> L.	296	<i>Aspalathus</i> L.	261	<i>Euphorbia</i> L.	24
3	<i>Ceropegia</i> L. s.l.	281	<i>Ceropegia</i> L. s.l.	281	<i>Pelargonium</i> L'Hér.	204	<i>Acacia</i> Mill.	23
4	<i>Senecio</i> L.	276	<i>Senecio</i> L.	275	<i>Ruschia</i> Schwantes	199	<i>Melaleuca</i> L.	19
5	<i>Pelargonium</i> L'Hér.	261	<i>Pelargonium</i> L'Hér.	261	<i>Ceropegia</i> L. s.l.	177	<i>Trifolium</i> L.	18
6	<i>Helichrysum</i> Mill.	235	<i>Helichrysum</i> Mill.	235	<i>Senecio</i> L.	164	<i>Oenothera</i> L.	18
7	<i>Indigofera</i> L.	221	<i>Indigofera</i> L.	219	<i>Restio</i> Rottb.	163	<i>Opuntia</i> Mill.	18
8	<i>Oxalis</i> L.	209	<i>Ruschia</i> Schwantes	209	<i>Moraea</i> Mill.	161	<i>Eucalyptus</i> L'Hér.	16
9	<i>Ruschia</i> Schwantes	209	<i>Oxalis</i> L.	207	<i>Oxalis</i> L.	159	<i>Taraxacum</i> F.H.Wigg.	15
10	<i>Moraea</i> Mill.	206	<i>Moraea</i> Mill.	206	<i>Selago</i> L.	144	<i>Senna</i> Mill.	13
11	<i>Euphorbia</i> L.	192	<i>Thesium</i> L.	172	<i>Agathosma</i> Willd.	138	<i>Atriplex</i> L.	11
12	<i>Thesium</i> L.	172	<i>Selago</i> L.	168	<i>Gladiolus</i> L.	137	<i>Rubus</i> L.	11
13	<i>Selago</i> L.	168	<i>Euphorbia</i> L.	168	<i>Lachenalia</i> Murray	137	<i>Pinus</i> L.	10
14	<i>Gladiolus</i> L.	167	<i>Gladiolus</i> L.	167	<i>Thesium</i> L.	129	<i>Amaranthus</i> L.	9
15	<i>Wahlenbergia</i> Schrad. ex Roth	167	<i>Wahlenbergia</i> Schrad. ex Roth	167	<i>Wahlenbergia</i> Schrad. ex Roth	127	<i>Bromus</i> L.	9
16	<i>Restio</i> Rottb.	165	<i>Restio</i> Rottb.	165	<i>Cliffortia</i> L.	126	<i>Malva</i> L.	8
17	<i>Crassula</i> L.	158	<i>Crassula</i> L.	157	<i>Indigofera</i> L.	120	<i>Cenchrus</i> L.	8
18	<i>Disa</i> P.J.Bergius	147	<i>Disa</i> P.J.Bergius	147	<i>Delosperma</i> N.E.Br.	119	<i>Veronica</i> L.	8
19	<i>Delosperma</i> N.E.Br.	143	<i>Delosperma</i> N.E.Br.	143	<i>Phyllica</i> L.	118	<i>Plantago</i> L.	8
20	<i>Aloe</i> L.	143	<i>Aloe</i> L.; <i>Phyllica</i> L.	142	<i>Psoralea</i> L.	116	<i>Hypericum</i> L.; <i>Passiflora</i> L.; <i>Rumex</i> L.; <i>Vicia</i> L.	7

endemic to South Africa (54 % of taxa within families), and 146 families that include naturalised taxa (34 families with only naturalised species in South Africa). There are seven families that are endemic to South Africa, namely: Bruniaceae, Geissolomataceae, Grubbiaceae, Lanariaceae, Penaeaceae (excl. Oliniaceae), Rhynchochalcaceae, and Roridulaceae (Table 6).

Asteraceae is the largest family in South Africa with a total of 2 265 species (indigenous and naturalised), followed by Fabaceae with 1 710 species, and Aizoaceae with 1 603 species. In terms of indigenous families, Asteraceae remains in the first position with 2 124 species, while Aizoaceae (1 603 species) and Fabaceae (1 566 species) switches positions. Considering the families with the largest number of endemic species, Aizoaceae comes out top (1 426 endemic species, or 89 %), followed by Asteraceae (1 352 species, 60 %), and Iridaceae (983 species, 82 %). Fabaceae has the largest number of naturalised species (143), followed by Asteraceae (140 species), and Poaceae (123 species).

A total of 2 654 genera are present in South Africa of which 2 189 are indigenous, 307 entirely endemic, 1 071 include taxa that are endemic to South Africa (49 % of taxa within genera), and 635 genera

**Table 6**

Seven families that are endemic to South Africa, listing the number of genera recognised in each, and the number of taxa and species.

Family	Number of genera	Number of species	Number of taxa
Bruniaceae	6	81	81
Geissolomataceae	1	1	1
Grubbiaceae	1	3	6
Lanariaceae	1	1	1
Penaeaceae*	1	27	27
Rhynchochalcaceae	1	1	1
Roridulaceae	1	2	2

\* Excludes Oliniaceae.

include naturalised taxa (459 genera are only represented by naturalised taxa in South Africa). The largest genera in South Africa are *Erica* L. (743 species), *Aspalathus* L. (296 species), and *Ceropegia* L. *sensu lato* (281 species). Genera with the largest number of endemic species are *Erica* (581 species, 78 %), *Aspalathus* (261 species, 88 %), and *Pelargonium* L'Hér. (204 species, 78 %). Genera with the most naturalised species are *Solanum* L. (24 species), *Euphorbia* L. (24 species), and *Acacia* Mill. (23 species).

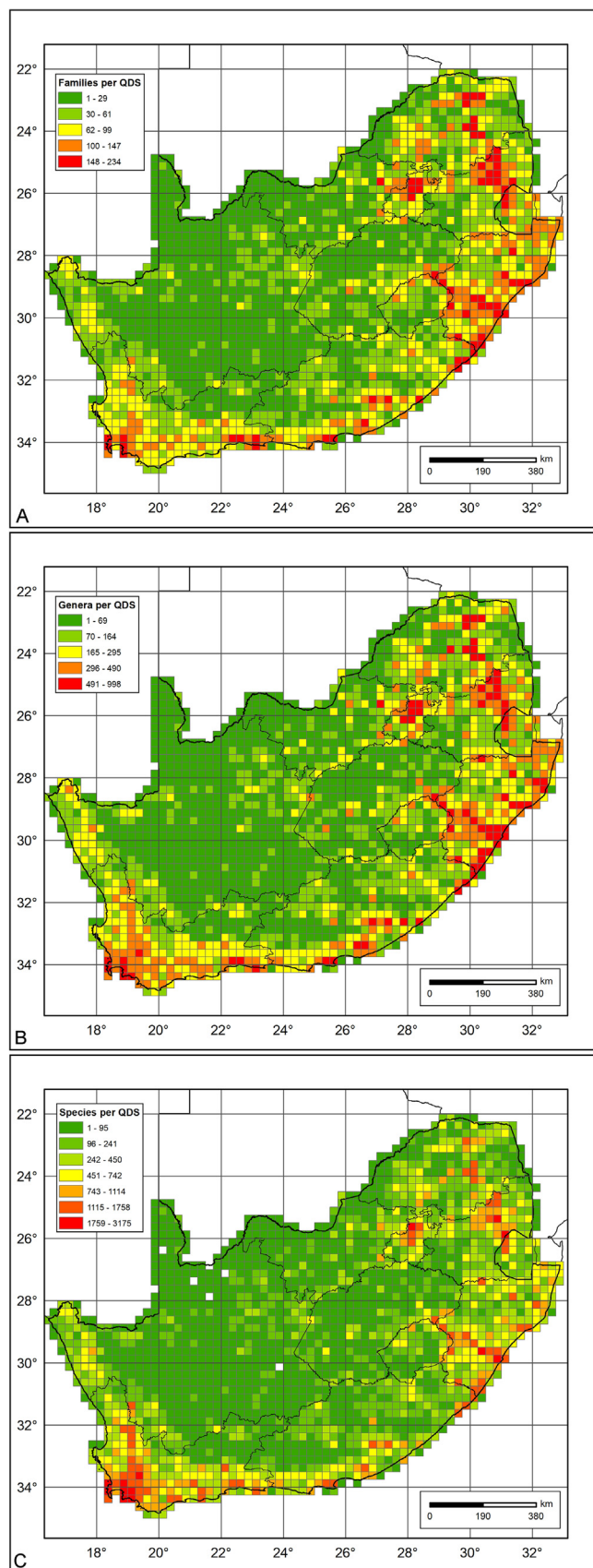
South Africa hosts 21 539 species of which 20 204 are indigenous, 12 220 (60 %) endemic, and 1 329 naturalised. In total, 2 093 subspecies are present, of which 2 002 are indigenous, 1 156 (58 %) endemic, and 90 naturalised. Varieties include a total of 1 999, of which 1 906 are indigenous, 1 098 (58 %) endemic, and 92 naturalised. Lastly, 49 formas are present, of which 47 are indigenous, 22 (27 %) endemic, and two naturalised. There are also six species, one subspecies, and one variety that are considered to be cryptogenic in South Africa. In other words, it is uncertain if these taxa are indigenous or naturalised in the country (Essl et al., 2018) (see Table 3).

#### 2.4. Provincial floristic composition

South Africa is divided into nine provinces, a system established in 1994. These provinces replaced the country's former four-province structure and range widely in size, population, and geography. For the Checklist, the provinces serve as practical zones to map plant diversity across the country that align with governmental legislative areas, and are in no way reflecting the diverse terrain of the country.

The KwaZulu-Natal Province (331 families) is most diverse in terms of numbers of families represented, followed by the Eastern Cape Province (305 families), and by the Mpumalanga and Western Cape (294 families each) Provinces (Fig. 2A, Table 7). The largest number of genera are found in KwaZulu-Natal (1 718 genera), Eastern Cape (1 576 genera), and Western Cape (1 475 genera) Provinces (Fig. 2B). In terms of species richness, the Western Cape Province (11 379 species) is the most speciose followed by the Eastern Cape (6 855 species) and KwaZulu-Natal (6 193 species) Provinces (Fig. 2C). Unsurprisingly, the Western Cape also has the highest percentage of endemic taxa (58 %), followed by the Northern Cape (25 %), and the Eastern Cape (16 %). The smaller provinces in the interior of South Africa are incidentally also the three provinces that harbour the least amount of taxa each: Free State (2 825 species), Gauteng (2 665 species), and North West (2 394). They also have the lowest endemism level (i.e. 1 %; see Table 7).

The provinces with the most taxa (families, genera, and species) are broadly found in the southern and eastern parts of the country. They roughly follow the Escarpment of South Africa and altitudes within a province can range from sea-level to well over 2 000 m, providing a range of different geographical terrains and habitats that sustain a diverse flora. This is visible in the diversity maps (Fig. 2) where the Western Cape, Eastern Cape, and KwaZulu-Natal Provinces, as well as Mpumalanga and Limpopo, contain several areas of high taxa richness, especially in the mountainous areas. The three least diverse provinces (Free State, Gauteng, North West) are adjacent within the interior plateau of South Africa, where the geography and habitat diversity is not as complex as along the Escarpment of the country. Gauteng does show some areas of high family, genus, and species richness, especially towards the northern parts of the province where the topography is more diverse, but the very small size of the province and the high level of urbanisation prevents it from hosting a large amount of taxa. The large Northern Cape Province harbours 5 058 species, but due to the fairly uniform terrain over much of the province there is not any areas in this province with very high species diversity (Fig. 2C). However, it harbours a very



**Fig. 2.** Plant diversity across the nine provinces of South Africa, indicating (A) family, (B) genus, and (C) species richness per quarter degree grids (QDS). The maps were produced in ArcGIS 10.4, with the size-classes classified according to the Natural Breaks (Jenks Clustering) method.

**Table 7**

Number of families, genera, species, and taxa in each province of South Africa. The number in round brackets following the total number of taxa indicates number of indigenous taxa, and the number in square brackets the number of endemic taxa and percentage endemism in each province. Provinces are arranged in alphabetical order.

Province/ Category	Family	Genus	Species	Taxa
Eastern Cape	305	1 576	6 855	7 304 (6 716) [1 076; 16 %]
Free State	213	904	2 825	2 958 (2 623) [27; 1 %]
Gauteng	228	955	2 665	2 779 (2 347) [28; 1 %]
KwaZulu-Natal	331	1 718	6 193	6 553 (5 948) [482; 8 %]
Limpopo	290	1 420	4 487	4 729 (4 401) [211; 5 %]
Mpumalanga	294	1 426	4 850	5 115 (4 711) [200; 4 %]
North West	203	872	2 394	2 511 (2 252) [25; 1 %]
Northern Cape	167	965	5 058	5 365 (5 116) [1 259; 25 %]
Western Cape	294	1 475	11 379	12 322 (11 640) [6 795; 58 %]

unique flora of which 25 % of taxa are endemic to the harsh environment of this province (Table 7). The relatively low levels of endemism in some of the more species-rich provinces, e.g. KwaZulu-Natal (8 %), Limpopo (5 %), and Mpumalanga (4 %), is because they share many taxa among them and with the neighbouring Eswatini, Lesotho, Mozambique, Zimbabwe, and Botswana.

**Table 8**

Statistics for the e-Flora of South Africa, indicating its completeness and gaps.

Detail	Total
Total number of morphological descriptions	47 275
Number of taxa with descriptions	22 056
Number of indigenous taxa with descriptions	21 201
Number of naturalised taxa with descriptions	851
Number of cryptogenic taxa with descriptions	4
Number of taxa without published descriptions (autonyms)	123
Number of taxa lacking descriptions	1 462
Number of indigenous taxa lacking descriptions	950
Number of naturalised taxa lacking descriptions	510
Number of cryptogenic taxa lacking descriptions	2
Number of literature sources (books, book chapters, Flora chapters, and journals)	4 252

**Table 9**

A comparison of the top 20 publications with taxonomic or floristic information for South African species. The list from 2017 indicates the number of species that could potentially be harvested from these sources and in 2025, the list indicates the number of species for which descriptions were taken from these publications to populate the e-Flora database.

Publication title	2017	Publication title	2025
Flora of southern Africa	2 196	Flora of southern Africa	3 189
Flora Zambesiaca	1 335	Strelitzia	2 195
Illustrated Handbook of Succulent Plants	1 289	Journal of South African Botany	1 206
Flora Capensis	1 227	Flora Capensis	1 005
Journal of South African Botany	884	Bothalia	957
Annalen des Naturhistorischen Museums in Wien	704	South African Journal of Botany	730
Bothalia (including ABC Journal)	689	Flora Zambesiaca	492
Contributions from the Bolus Herbarium	530	Orchids of Southern Africa	440
Memoirs of the Botanical Survey of South Africa	449	The Manuleae: a tribe of Scrophulariaceae	297
Journal of South African Botany Supplement	434	Mitteilungen der Botanischen Staatssammlung München	284
Orchids of Southern Africa	414	Opera Botanica	274
Opera Botanica	384	Phytotaxa	268
Strelitzia	361	Contributions from the Bolus Herbarium	266
Botanische Jahrbücher für Systematik	331	Compositae in Natal	242
Kew Bulletin	321	Kew Bulletin	211
Compositae in Natal	305	The Tribe Selagineae (Scrophulariaceae)	170
The Manuleae: a tribe of Scrophulariaceae	302	Stapeliads of southern Africa and Madagascar	151
South African Journal of Botany	289	Botanical Magazine Monographs	133
Mitteilungen der Botanischen Staatssammlung München	284	Hepaticae of South Africa	131
The African Restionaceae: an interactive key identification and description system. Version 6.	284	Notes on Mesembrianthemum and allied genera	129

## 2.5. e-Flora of South Africa

The e-Flora of South Africa dataset currently includes a total of 47 275 morphological descriptions representative of 22 052 accepted taxa – 21 201 indigenous taxa, 874 naturalised taxa, and four cryptogenic taxa (Table 8). Descriptions in the e-Flora database accumulate, and there are often more than one description per taxon, hence the large number of descriptions stored compared to the number of taxa. The most recent or the preferred description is flagged accordingly to appear first on the relevant species page on the Biodiversity Advisor website (Le Roux et al., submitted). There are 123 autonyms that lack descriptions and until such a time when they are defined in published literature, these will remain unpopulated.

Currently, the e-Flora database lacks descriptions for 1 462 taxa, of which 950 are indigenous and 510 naturalised. As first priority, descriptions for indigenous species were collected. Then followed the collection of descriptions for indigenous infraspecific taxa. The indigenous taxa that are currently lacking descriptions are due to changes made to the Checklist during the previous year, as well as some infraspecific taxa for which no description has yet been sourced. Once the indigenous taxa all have descriptions, the focus will shift to naturalised taxa that are still lacking descriptions.

All descriptions that have been sourced to date come from 4 252 publications. At the start of the e-Flora project, an analysis was done to determine how many taxonomic treatments were available that could be used to populate the e-Flora (Le Roux et al., 2017). Now that the e-Flora database is populated, an update of the analysis indicates that the *Flora of Southern Africa* series (3 189 species) remains the source with the most information for South African taxa, followed by the *Strelitzia* series (excluding the conspectus volumes) with 2 195 species, and the *Journal of South African Botany* with 1 206 species (Table 9). In total, descriptions for 24 041 accepted species (24 863 taxa) were taken from the conspectuses published in the *Strelitzia* series (Retief and Herman, 1997; Goldblatt and Manning, 2000; Manning and Goldblatt, 2012; Snijman, 2013; Retief and Meyer, 2017; Bredenkamp, 2019), but these descriptions are often cryptic, unlike the descriptions in, for instance, the *Flora of Southern Africa* series. The much higher number of descriptions taken from certain publications (such as *Bothalia* and *South African Journal of Botany*), compared to the estimates made in 2017, are likely due to taxonomic revisions and species descriptions published in these journals since 2017.

### 3. Summary and conclusions

The Checklist forms the taxonomic backbone for South Africa's plant diversity, annually documenting accepted angiosperms, gymnosperms, pteridophytes, lycophytes, mosses, liverworts, and hornworts. The current version records 23 514 taxa and 21 539 species (20 204 indigenous, 12 220 endemic, 1 329 naturalised, and 649 invasive). The e-Flora adds another layer of data to the names in the Checklist, providing descriptive data for 22 052 accepted taxa (21 201 indigenous, 874 naturalised taxa, and four cryptogenic). Both resources are continually updated with data from existing and new publications and are available online in the SANBI Biodiversity Advisor and the World Flora Online, contributing to Target 1 of the Global Strategy for Plant Conservation and providing foundational data towards the Kunming-Montreal Global Biodiversity Framework targets.

Gaps in floristic data persist due to incomplete sourcing, but ongoing revisionary work aims to address these. The latest Checklist and e-Flora data can be used to evaluate progress of accumulated taxonomic effort of priority groups as identified in Victor (2020). It can also be used to determine new priorities as a result of improved perspectives or changes in circumstances. A re-analysis of research progress and new priorities that emerged since publication of Victor (2020) is needed.

Together, the Checklist and e-Flora form an indispensable foundation that provides not only vital information needed to support herbarium curation, conservation assessments, ecological studies, the National Biodiversity Assessment, and biodiversity policy planning and monitoring, but also in applied research like climate change modelling, and unlocking biotechnological discoveries. It is therefore of utmost importance to maintain a high standard and ease of access to these data tools, to ensure they remain robust for science in South Africa and beyond.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### CRediT authorship contribution statement

**M. Marianne le Roux:** Writing – review & editing, Writing – original draft, Visualization, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Ronell R. Klopper:** Writing – review & editing, Visualization, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

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