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Author-formatted, not peer-reviewed document posted on 01/03/2024

DOI: https://doi.org/10.3897/arphapreprints.e121772

Curating an online checklist for *Erica* L. (Ericaceae): contributing to and supporting global conservation through the World Flora Online

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Curating an online checklist for *Erica* L. (Ericaceae): contributing to and supporting global conservation through the World Flora Online

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Abstract

To support the work of the Global Conservation Consortium for *Erica* and update the *Erica* checklist in the World Flora Online (WFO), we have curated the taxonomic backbone in the WFO by expanding it to include updated nomenclatural information from IPNI, missing names present in WCVP, BODATSA, and from the *International register of heather names* database, a data source not readily available online. We also comment on the correct orthography of *Erica heleophila* Guthrie & Bolus and *Erica michellensis* Dulfer, the validity of *Erica tegetiformis* E.G.H.Oliv., and clarify the use of *Erica adunca* Benth. for a South African species rather than *Erica triceps* Link, which is here regarded as insufficiently known and of uncertain application.

Key words: Erica, International register of heather names, World Flora Online

Introduction

Erica L., with 851 accepted species, is the second most diverse genus in the Ericaceae after *Rhododendron* L. and is listed amongst the most species-diverse genera of flowering plants (Frodin 2004). The Global Conservation Consortium (GCC) for *Erica* (https://www.globalconservationconsortia.org/gcc/erica/) was established in 2021 (Pirie et al.

2022) to bring together the world's *Erica* experts, conservationists, and the botanic garden community, with the aim to deploy their unique sets of skills for effective conservation and to prevent species extinctions. Part of the consortium's role is to maintain a checklist of accepted species as a baseline to inform and prioritise conservation work. To do this the GCC-*Erica* is part of the World Flora Online's (WFO) Ericaceae Taxonomic Expert Network (TEN).

Methods

Initial curation

As part of the formation of the WFO TEN for Ericaceae in 2020, the family backbone was supplied by the WFO (WFO Consortium 2019) as a Darwin Core Archive. This seeded a Padme dataset (Elliott et al. 2020), managed by the Royal Botanic Garden Edinburgh. The family data was largely based on *The Plant List* (2013) v1.1. For *Erica*, nomenclatural updated records were compared to the *International Plant Names Index* (IPNI). Additional names published since 2012 were added to the backbone. Taxonomic placement of species was checked mainly using literature sources for the *Flora of southern Africa region* (FSA) (Oliver 1984, 1987, 2000; Oliver and Oliver 2002, 2005; Pirie et al. 2017) and online resources, namely Catalogue of the Plants of Madagascar (Rabarimanarivo et al. 2015) and the Botanical Database of Southern Africa (BODATSA) (South African National Biodiversity Institute 2016). Although the South African data was chiefly accessed through the frontend user interface, the yearly checklist data is available in an archived version (Klopper and Winter 2023).

In 2022 the WFO's Rhakhis tool (Hyam et al. 2022; Hyam and Elliott 2023) became available and data in the WFO taxonomic backbone was synced to the Ericaceae classification from Padme. Curation for Ericaceae then transferred from Padme to Rhakhis.

Global Conservation Consortium for Erica

The initial checklists created for the formation of the Global Conservation Consortium for *Erica* (GCC-*Erica*), based on the World Checklist of Vascular Plants (WCVP; Govaerts 2022), was compared to the WFO list. Missing names were added to the WFO backbone and conflicts in classification were highlighted and largely resolved.

The International Register of Heather Names

In 1970 The Heather Society undertook the role of International Cultivar Registration Authority (ICRA) for the genera *Andromeda* L., *Bruckenthalia* Rchb., *Calluna* Salisb., *Daboecia* D.Don, and *Erica* [these formed a denomination class as defined by the *International code of nomenclature of cultivated plants* 1995 (*ICNCP*) under the International Commission for the Nomenclature of Cultivated Plants]. The published volumes were derived/edited from a database that included more details of the names, including bibliographic references to descriptions and illustrations, history, and etymology of the individual scientific and horticultural (cultivar) names. To preserve these data, the entire IRHN database has been archived (see below).

The first volume of the *International Register of Heather Names* (IRHN; Nelson and Small 2000) was published in four parts and contained all cultivar and botanical names that had then been traced within the genera *Andromeda*, *Bruckenthalia*, *Calluna*, *Daboecia*, and *Erica sensu lato*. This list covered species and subspecific taxa of *Erica* species indigenous in Europe, Asia Minor, the Atlantic islands (Azores, Madeira, and the Canary Islands), and

Africa north of the Tropic of Cancer, and of their natural and man-made hybrids and their cultivars. These are generally known colloquially as "hardy heaths" or "hardy heathers", given the fact that the majority can tolerate the relatively cool climate of the northern hemisphere, north of the Tropic of Cancer.

The second volume (Nelson and Small 2004–2005), also published in four parts, contained names for *Erica* species and subspecific taxa indigenous to Africa south of the Tropic of Cancer and the islands of the southern Atlantic and Indian Oceans. Many of these are colloquially known as "Cape heaths" although many do not occur within the Cape provinces of South Africa. This volume also included the names of subspecific taxa, natural and artificial hybrids, and cultivars of the Cape heaths. With the re-circumscription of *Erica* to include previously separate "minor" genera (Oliver 2000), a list of these synonymised genera was included as Annex 1 of Volume 2 and their names, now being synonyms of *Erica* taxa, were also included in that checklist.

Compilation of the IRHN was a major collaborative effort involving members of The Heather Society (1963–2020), particularly its designated registrars, and sister societies in western Europe and North America. Research and publication of the checklist was funded by The Heather Society with additional financial support from the Stanley Smith Horticultural Trust (UK).

Names data from The Heather Society's Access 2000® database, used to produce the IRHN (Nelson and Small 2000, 2004–2005), were matched against the WFO backbone. Names data were extracted from this database. To aid in name matching, authorships were modified to reflect standard author abbreviations according to Biodiversity Information Standards (TDWG) (formerly the Taxonomic Databases Working Group), and names without an author string were initially excluded. Cultivar names were not processed as they are beyond the scope of the WFO. This process of bringing in historic names from IRHN raised homonym issues among Latin binomials that were known but not yet resolved. The required replacement scientific names have been dealt with by Nelson et al. (2023). These new names were registered with IPNI (2023) as part of the pre-publication process and subsequently added to the WFO database.

An IRHN archive (Elliott et al. 2023) has been created in Zenodo (the general-purpose open repository developed under the European OpenAIRE program). This contains the complete, unedited IRHN database, the two volumes (eight parts) as published by The Heather Society (in pdf format), and a csv containing WFO IDs linked to botanical names in the IRHN.

Correctable orthographic variation

Orthographic variation (particularly in the terminations employed in eponyms and toponyms) has been prevalent in the historic literature for *Erica* (Nelson and Oliver 2004; Turner 2016). Existing WFO records were corrected in accordance with the *International Code of Nomenclature for algae, fungi, and plants (ICN,* Shenzhen Code; Turland et al. 2018). Some variants that have featured in botanical and horticultural literature and databases (including SANBI's important Red List of South African Plants for threat status; <u>http://redlist.sanbi.org/genus.php?genus=1820</u>) were added and linked to the currently accepted name (Table 3).

Unplaced names

There are currently 1 413 unplaced names in the backbone. These names require additional checking. They are mostly historic names that may never be adequately placed in the generic classification due to incomplete descriptions, the absence of supporting herbarium specimens or competent scientific illustrations. Most could not be readily placed using the IRHN database. Many have been treated by previous authors as, for example, "imperfectly known species" or "supposed hybrids" (Guthrie & Bolus 1905: 310–315) or "Ungenügend bekannte Arten [insufficiently known species]" or putative hybrids (Dulfer 1968: 139–148). Gradually these names will be re-assessed, and either placed where appropriate, or deprecated from the main checklist. To reduce confusion, deprecated names are maintained in the WFO database but are not made visible in the public checklist.

Cultivars

Modern cultivar names (fancy names), as defined under the *ICNCP* (Brickell et al. 2009), used in the horticultural industry and in gardens lie beyond the scope of the WFO and have therefore been omitted from the checklist. However, during the nineteenth and the early twentieth centuries, there often was no clear distinction between names given to naturally occurring species and subspecific taxa and the names (often in Latin form) applied in horticulture to plants now regarded as selected cultivars, and some of the unplaced names (see above) can be accounted for by this ambiguity. The problem is exacerbated in *Erica* by the often undocumented and unacknowledged artificial and accidental hybridization of plants in European gardens (Nelson and Pirie 2022).

Data on cultivar names published before 2001 can be found in the original Access database format and as a csv in the Zenodo archive (<u>https://zenodo.org/doi/10.5281/zenodo.10255787</u>) (Elliott et al. 2023). We plan also to add the cultivar list to Catalogue of Life's Checklist Bank.

Results

The *Erica* checklist, as published in the WFO December 2023 data release, available in a human readable form at <u>https://wfoplantlist.org/</u>, has 851 accepted species (the 852 in the December 2023 release wrongly included *E. perlata* G.Sinclair as Accepted instead of as Unplaced following Nelson et al. 2023). Table 1 compares the number of accepted species, subspecies, and varieties, as well as the number of synonyms and unplaced name records against *The Plant List* v1.1 and the two previous *WFO Plant List* releases.

Version	Species	Subspecies	Varieties	Synonyms	Unplaced names
The Plant List v.1.1 (2012)	1 044	37	37	1 948	178
WFO Plant List (December 2022)	1 061	56	44	2 540	677
WFO Plant List (June 2023)	853	104	199	2 619	729

Table 1. Comparison of accepted species, subspecies, varieties, and synonyms within *Erica* across versions of *The Plant List* and the *WFO Plant List*.

WFO Plant List	852	111	246	2 785	1 397
(December 2023)					

Since the beginning of curation of *Erica* names in early 2023 for GGC-*Erica* and WFO, the number of *Erica* and related synonymised names in Rhakhis has increased by 1 012. Removal of the names of artificial (horticultural) hybrids and duplicate name records has reduced the number of accepted species by 208. The process has added more than 800 synonyms by resolving the unplaced names from now synonymised genera and the addition of historic names from the IRHN database. Following published taxonomic accounts and incorporating infraspecific names from BODATSA and IRHN has increased the number of accepted subspecific taxa substantially. The number of unplaced names has also increased.

Unplaced names are mostly historic and still need to be placed in the classification or deprecated within the WFO. These names, especially those of horticultural origin, may not be useful, especially to ecologists and conservationists who are the primary end-users of the WFO. By maintaining these records, however, the wider WFO names database allows for them to be accounted for by those using the data for taxonomic or historical research purposes.

Number comparison to other Global Lists

The number of accepted species, subspecies, varieties, and synonyms were generated from the *World Checklist of Vascular Plants* (WCVP; v.11.0) (Govaerts 2023), the *Synonymic Checklists of the Vascular Plants of the World* (v.16.4, Sep 2023) (Hassler 2023), and *The Leipzig catalogue of vascular plants* (v.3.01) (Freiberg et al. 2020) using datasets deposited in the Catalogue of Life Checklist Bank (https://www.checklistbank.org/). Table 2 shows the comparison across the four datasets.

Table 2. Comparison of accepted species, subspecies, varieties, and synonyms within *Erica* across the four major global checklists.

Global list	Species	Subspecies	Varieties	Synonyms
GCC- <i>Erica</i> Checklist in WFO Plant List (December 2023)	852	111	246	2785
<i>Leizpig</i> Catalogue of Vascular Plants v.3.01 (November 2020)	893	79	116	1196
Synonymic Checklists of the Vascular Plants of the World v.16.4 (September 2023)	839	112	143	2782
World Checklist of Vascular Plants v.11 (20 April 2023)	859	97	247	2688

Nomenclatural notes

Nomenclatural issues have been dealt with by Nelson et al. (2023) as part of the systematics, natural history, and conservation of the *Erica* (Ericaceae) collection. We do however comment on the following:

Erica tegetiformis E.G.H.Oliv. in Bothalia 20(1): 46. 1990. IPNI: <u>urn:lsid:ipni.org:names:941276-1</u> WFO: wfo-0000673371

Oliver (1990) raised *E. senilis* var. *australis* Dulfer to species level since it is significantly different from *E. senilis* Klotzsch ex Benth. The epithet '*australis*' was not available for this taxon at species level because of the earlier name *E. australis* L. (in Mant. Pl. Altera: 231. 1771) that remains the valid name for one of the European species. Therefore, Oliver (1990) published the new name *E. tegetiformis* E.G.H.Oliv. for this taxon. We consider this name to be validly published. In other lists is it considered to not be validly published due to the omission of the full reference of the replaced synonym. There is a partial reference made with the combination "*E. senilis* Klotzsch ex Benth. var. *australis* Dulfer: 32 (1963)". There is only one Dulfer reference in the bibliography of the article by Oliver (1990). While the *ICN* recommends refraining from this practice (see Rec. 41A.1; Turland et al. 2018), it is permissible to have the full and direct reference separate from the newly published name or combination. The year of the journal volume for the Dulfer reference is cited as 1964 (instead of 1963), but we consider this to be a correctable error under Art. 41.6 (Turland et al. 2018). For these reasons we treat *E. tegetiformis* (in Bothalia 20: 46. 1990) as validly published.

Erica heleophila Guthrie & Bolus in Fl. Cap. (Harvey) 4(1.1): 110–111. 1905. IPNI: <u>urn:lsid:ipni.org:names:328833-1</u> WFO: <u>wfo-0000672224</u>

This orthographic issue was dealt with in Nelson and Small (2004–2005) but is revisited here. The original published spelling of the species epithet was '*heliophila*' (Guthrie and Bolus 1905: 19, 110). However, in the Corrigenda at the end of the Index in the same volume and section of *Flora Capensis and in the index* (Thiselton-Dyer 1909: 1126, 1146, 1168), the epithet was amended to '*heleophila*', changing the meaning of the epithet to "of the marsh" rather than "of the sun". It is unclear why this amendment has been largely overlooked. The original publication date of part 1 of volume 4 of *Flora Capensis* was May 1905 (Stafleu & Cowan 1979: 76) and the correction was published in February 1909 (part 6 of the volume), albeit in the same volume and section (volume 4 section 1). Despite the time lag, we consider the name *E. heleophila* as a correction of an orthographic (potentially, typographic; Nelson & Small 2004–2005) error permissible under Art. 60.1 (Turland et al. 2018), as there is no restriction on time or place of correction under this article.

The WFO ID of the original orthographic variant can be found in the Table 3.

Erica michellensis Dulfer in Ann. Naturhist. Mus. Wien 67: 85. 1963. IPNI : <u>urn:lsid:ipni.org:names:329124-1</u> WFO: wfo-1000055012

This orthographic issue was also dealt with by Nelson and Small (2004–2005) but is revisited here. The name *E. saxatalis* L.Bolus (in Ann. Bolus Herb. 3: 177. 1923) is an illegitimate later homonym of the earlier name *E. saxatilis* Salisb. (in Prodr. Stirp. Chap. Allerton: 295. 1796) (= *E. carnea* L.). Dulfer (1963) therefore published a new name for this taxon, namely *E. mitchelliensis*, with that original spelling. The type collection of *E. saxatalis* L.Bolus was given as "Cape Province; South-Western Region; Ceres Div., Mitchells Peak, Mitchells Pass, "growing on rocks, rare," alt. 4500 ft., fl. Dec. 1920, *T.P. Stokoe 66*" (Bolus 1923: 177). The

peak and pass commemorate Charles Cornwallis Michell (1793–1851), Surveyor-General of the Cape of Good Hope and Superintendent of Works in 1848 when the pass was originally opened (Raper et al. 2014). Dulfer (1963) chose 'mitchelliensis' as his epithet, using the "Mitchell" spelling as it was found in the *E. saxatilis* protologue (Bolus 1923), and derived from the label on Stokoe's specimens.

Dulfer (1963) also constructed the name with an additional "i" before the -ensis. This has been considered a correctable error in previously published works. The corrected orthography, *E. mitchellensis*, is used in the South African National Plant Checklist (Klopper and Winter 2023) and Red List of South African Plants (Turner 2008).

The IRHN (Nelson and Small 2004–2005) further corrected the name to *E. michellensis* due to the incorrect spellings of "Mitchell's Peak" and "Mitchell's Pass", when they should have been Michell's Peak and Michell's Pass as on modern maps of the region. The correction in the IRHN has not been widely adopted or used, but there is nothing in the *ICN* to suggest that Nelson's entry in the IRHN is incorrect. We therefore suggest that *E. michellensis* is the correct orthography to follow for this name. Both orthographic variants are in the WFO as separate entries and synonymised to *Erica michellensis*.

The WFO IDs for the orthographic variants can be found in the Table 3.

Resolving the application of the name *Erica adunca* Benth. (1839), rather than *Erica triceps* Link (1821)

Erica triceps Link in Enum. Hort. Berol. Alt. 1: 371. 1821. IPNI: <u>urn:lsid:ipni.org:names:329771-1</u> WFO: <u>wfo-0000673442</u> *Erica adunca* Benth. in Prodr. 7: 618. 1839. IPNI: <u>urn:lsid:ipni.org:names:328152-1</u> WFO: <u>wfo-0000671312</u>

Although previously treated as separate species (e.g., in Schumann et al. 1992: 193 and 195), Oliver (in Oliver 2012 and in Oliver and Forshaw 2012) treated these two names as synonymous. The name *E. triceps* is the older of the two names and thus has priority (Art. 11.1; Turland et al. 2018). However, a note in the ID aid from Oliver (Oliver and Forshaw 2012) stated that the type in Berlin was destroyed during the Second World War and the description in the protologue (Link 1821: 371) is insufficient to definitively associate it morphologically with *E. adunca* or any other known species. No type was designated in the protologue, but the original material can be assumed to have been in Herb. B, representing plants cultivated at the Berlin Botanical Garden in 1808. We have not traced other original material. Dulfer (1964: 116) cited a specimen at Herb. W as type (namely: "Ohne Fundortsangabe: Cap. b. sp. (Regel, W)"), but we do not regard this as a typification of the name.

Nomenclatural resolution depends on the relative use of *E. triceps* and *E. adunca* for the species as currently circumscribed. Use of the older name, *E. triceps* Link, and its application is uncertain due to the lack of original type material and the ambiguity of the description in the protologue (Link 1821: 371). Should *E. triceps* and *E. adunca* be regarded as synonymous, unequivocal use of the younger name, *E. adunca* Benth., would require formal rejection of the older *E. triceps* Link under Art. 56 (Turland et al. 2018). Such action at this stage would be premature as further investigation might reveal information that can clarify

the application of *E. triceps*. We believe the best course of action is to regard *E. triceps* as an insufficiently known name that cannot be applied to any extant taxon with certainty, and we do not treat it as a synonym of *E. adunca*. We apply only the name *E. adunca* to the South African taxon that has previously been treated as either *E. adunca* or *E. triceps*, the latter probably a misapplication.

Future work

We believe that *Erica* in the December 2023 version of the WFO Plant List is now the most robust global classification for *Erica*. The need to maintain and update the checklist is essential if it is to be the baseline for conservation efforts.

Immediate work is required to reduce the number of Unplaced names, by placing names that can be traced to wild plants in the classification and deprecating those of horticultural origin.

While some names have a taxonomic reference, i.e. the citation from where the taxonomic concept or circumscription is derived (see Berendsohn 1995), there are many more references that are needed. These references are currently omitted because the relevant publications lack a doi or stable URL to link with, which is a requirement for references in Rhakhis. Use of a taxonomic concept reference is implemented throughout the Ericaceae TEN and follows the best practice adopted by the Caryophyllales TEN (Fassou et al. 2022; Korotkova et al. 2021).

The *Erica* checklist will be continually edited, when appropriate, via the WFO Rhakhis tool to contribute to the Ericaceae TEN and the wider WFO project. The 6-monthly releases, apart from providing achievable deadlines for incremental improvements, also allow for a stable citable taxonomy that can be referenced and compared across time through the WFO Plant List API.

The *Erica* classification was extracted from the December 2023 WFO Plant List release to synchronise the classification in the *Erica* identification aid (Oliver et al., 2024). Synchronisation to future WFO Plant List releases will continue.

In working through the developing WFO pipeline with Catalogue of Life (CoL), the *Erica* checklist will be incorporated into the annual CoL Checklist and from there can be utilised by the Global Biodiversity Information Facility (GBiF).

Acknowledgements

John McNeill is thanked for his input on various nomenclatural issues that we raised while working through the data for the checklist. Tim Pearce and Jo Osborne for discussions and assistance with WCVP data. We acknowledge the support of The Heather Society (now disbanded) in the development of the International Register of Heather Names that has contributed greatly to the improvement of the WFO data. The Royal Botanic Garden Edinburgh is supported by the Scottish Government's Rural and Environment Science and Analytical Services Division.

AUTHOR CONTRIBUTIONS

ACE: Data Curation, Investigation, Writing - Original draft, Writing - Review and Editing. SPB: Data Curation, Writing - Review and Editing. RRK: Data Curation, Writing - Review

and Editing. ECN: Data Curation, Investigation, Writing - Review and Editing. MDP: Data Curation, Investigation, Writing - Review and Editing.

References

- Berendsohn W (1995) The concept of "potential taxa" in databases. Taxon 44(2): 207–212. https://doi.org/10.2307/1222443
- Bolus HML (1923) *Erica saxatilis* L.Bolus, in Novitates Africanae. The Annals of the Bolus Herbarium 3: 177. <u>https://www.biodiversitylibrary.org/page/62601280</u>
- Brickell CD, Alexander C, David JC, Hetterscheid WLA, Leslie AC, Malecot V, Jin X, Cubey JJ (2009) International Code of Nomenclature for Cultivated Plants (ICNCP or Cultivated Plant Code). Regnum Vegetabile 151 / Scripta Horticulturae 10: 1–184. https://www.actahort.org/chronica/pdf/sh_10.pdf
- Dulfer H (1963) Revision der südafrikanischen Arten der Gattung *Erica* L. 1. Teil. Annalen des Naturhistorischen Museums in Wien 67: 79–147. https://www.jstor.org/stable/41769215
- Elliott A, Nelson EC, Pirie MD (2023) International Register of Heather Names archive. https://doi.org/10.5281/zenodo.10255788[Accessed 21.12.2023].
- Elliott A, Purivs D, Pullan M (2020) Ericaceae Resource Centre. https://padme.rbge.org.uk/ericaceae/welcome[Accessed 01.05.2022].
- Fassou G, Korotkova N, Nersesyan A, Koch MA, Dimopoulos P, Borsch T (2022) Taxonomy of *Dianthus* (Caryophyllaceae) overall phylogenetic relationships and assessment of species diversity based on a first comprehensive checklist of the genus. PhytoKeys 196: 91–214. <u>https://doi.org/10.3897/phytokeys.196.77940</u>
- Freiberg M, Winter M, Gentile A, Zizka A, Muellner-Riehl AN, Weigelt A, Wirth C (2020) LCVP, The Leipzig catalogue of vascular plants, a new taxonomic reference list for all known vascular plants. Scientific Data 7: a416 [pp. 1–7]. https://doi.org/10.1038/s41597-020-00702-z
- Frodin DG (2004). History and concepts of big plant genera. Taxon 53(3): 753–776. https://doi.org/10.2307/4135449
- Govaerts R (2022) World Checklist of Vascular Plants (WCVP) Version 10. <u>https://doi.org/10.34885/nswv-8994</u>
- Govaerts R (2023) World Checklist of Vascular Plants (WCVP) Version 11. https://doi.org/10.34885/ccpn-9465
- Guthrie F, Bolus H (1905) I. *Erica*, Linn. In: Thiselton-Dyer WT (Ed.) Flora capensis, Vol. 4, sect. 1, part 1–2. L. Reeve, Kent, 4–315. https://www.biodiversitylibrary.org/page/713491
- Hassler M (2023) Synonymic Checklists of the Vascular Plants of the World. In: Bánki O, Roskov Y, Döring M, Ower G, Hernández Robles DR, Plata Corredor CA, Stjernegaard Jeppesen T, Örn A, Vandepitte L, Hobern D, Schalk P, De Walt RE, Ma K, Miller J, Orrell T, Aalbu R, Abbott J, Adlard R, Adriaenssens EM, et al., Catalogue of Life Checklist (16.4, Sep 2023). <u>https://www.worldplants.de</u> [Accessed 12.11.2023].
- Hyam R, Elliott A (2023) A strategy for building the WFO Plant List. Biodiversity Information Science and Standards 7: e111338. https://doi.org/10.3897/biss.7.111338
- Hyam R, Elliott, A, Ulate, W. (2022) Rhakhis: A workflow for managing the WFO taxonomic backbone. Biodiversity Information Science and Standards 6: e91432. https://doi.org/10.3897/biss.6.91432

- IPNI (2023) International Plant Names Index. The Royal Botanic Gardens, Kew, Harvard University Herbaria, and Libraries and Australian National Herbarium. http://www.ipni.org [Last Accessed 18.12.2023].
- Klopper RR, Winter PJD (2023) South African National Plant Checklist: yearly release and official documentation. 2023 release. <u>http://hdl.handle.net/20.500.12143/6880</u> [Accessed on 23.01.2024].
- Korotkova N, Aquino D, Arias S, Eggli U, Franck A, Gómez-Hinostrosa C, Guerrero PC, Hernández HM, Kohlbecker A, Köhler M, Luther K, Majure LC, Müller A, Metzing D, Nyffeler R, Sánchez D, Schlumpberger B, Berendsohn WG (2021) Cactaceae at Caryophyllales.org – a dynamic online species-level taxonomic backbone for the family. Willdenowia 51(2): 251–270. <u>https://doi.org/10.3372/wi.51.51208</u>
- Link HF (1821) Enumeratio Plantarum Horti Regii Botanici Berolinensis Altera, vol. 1. G. Reimer, Berlin, 458 pp. <u>https://doi.org/10.5962/bhl.title.66</u>
- Nelson EC, Oliver EGH (2004) Cape heaths in European gardens: the early history of South African *Erica* species in cultivation, their deliberate hybridization and the orthographic bedlam. Bothalia 34(2): 127–140. <u>https://doi.org/10.4102/abc.v34i2.427</u>
- Nelson EC, Pirie M (2022) Where have all the heathers gone? Sibbaldia the International Journal of Botanic Garden Horticulture 21: 75–92. https://doi.org/10.24823/Sibbaldia.2022.1887
- Nelson EC, Small D (Eds) (2000) International Register of Heather Names. Volume 1: Hardy cultivars and European species. The Heather Society, Creeting St Mary.
- Nelson EC, Small D (Eds) (2004–2005) International Register of Heather Names. Volume 2: African species, hybrids and cultivars. The Heather Society, Creeting St Mary.
- Nelson EC, Oliver EGH, Pirie MD (2023) Erica L. (Ericaceae): homonyms amongst published names for African species and proposed replacement names. PhytoKeys 236: 157–178. <u>https://doi.org/10.3897/phytokeys.236.110498</u>
- Oliver EGH (1984) Studies in the Ericoideae. IV. New species and some taxonomic and nomenclatural changes in the Cape Flora Region. South African Journal of Botany 3(5): 267–284. https://doi.org/10.1016/S0022-4618(16)30016-X
- Oliver EGH (1987) Studies in the Ericoideae (Ericaceae). VII. The placing of the genus *Philippia* into synonymy under *Erica*; the southern African species. South African Journal of Botany 53(6): 455–458. <u>https://doi.org/10.1016/S0254-6299(16)31379-5</u>
- Oliver EGH (1990) New species of *Erica* (Ericaceae) from the Cape Province. Bothalia 20(1): 41–48. <u>https://doi.org/10.4102/abc.v20i1.892</u>
- Oliver EGH (2000) Systematics of Ericeae (Ericaceae: Ericoideae). Species with indehiscent and partially dehiscent fruits. Contributions from the Bolus Herbarium 19: 1–483.
- Oliver, EGH (2012) Ericaceae. In: Manning J, Goldblatt P (Eds), Plants of the Greater Cape Floristic Region. 1: The core Cape Flora. Strelitzia 29. South African National Biodiversity Institute, Pretoria, pp. 482–511.
- Oliver EGH, Forshaw N (2012) Genus *Erica* An Identification Aid Version 3.00. https://doi.org/10.5281/ZENODO.10362291 [Accessed 12.12.2023].
- Oliver EGH, Forshaw N, Oliver IM, Volk F, Schumann AWS, Dorr LJ, Hoekstra RD, Musker SD, Nürk NM, Pirie M, Rebelo AG (2024) Genus Erica: An Identification Aid Version 4.00. ARPHA Preprints 5: e117930. https://doi.org/10.3897/arphapreprints.e117930
- Oliver EGH, Oliver IM (2002) Six new species and one new subspecies of *Erica* (Ericaceae) from Western Cape, South Africa. Bothalia 32(2): 167–180. https://doi.org/10.4102/abc.v32i2.480
- Oliver EGH, Oliver IM (2005) The genus *Erica* (Ericaceae) in southern Africa: taxonomic notes 2. Bothalia 35(2): 121–148. <u>https://doi.org/10.4102/abc.v35i2.388</u>

Pirie MD, Blackhall-Miles R, Bourke G, Crowley D, Ebrahim I, Forest F, Knaack M, Koopman R, Lansdowne A, Nürk NM, Osborne J, Pearce TR, Rohrauer D, Smit M, Wilman V (2022) Preventing species extinctions: A global conservation consortium for *Erica*. Plants People Planet 4(4): 335–344. <u>https://doi.org/10.1002/ppp3.10266</u>

- Pirie MD, Oliver EGH, Gehrke B, Heringer L, Mugrabi De Kuppler A, Le Maitre NC, Bellstedt DU (2017) Underestimated regional species diversity in the Cape Floristic Region revealed by phylogenetic analysis of the *Erica abietina/E. viscaria* clade (Ericaceae). Botanical Journal of the Linnean Society184(2): 185–203. https://doi.org/10.1093/botlinnean/box021
- Rabarimanarivo M, Phillipson P, Andrianarivelo S (2015) Catalogue of the Plants of Madagascar: *Erica* L. Missouri Botanical Garden. http://legacy.tropicos.org/Name/40004967?projectid=17 [Accessed 7.17.23].
- Raper PE, Moller, LA, Du Plessis TL (2014) Dictionary of Southern African Place Names. 4th edition. Jonathan Ball Publishers, Johannesburg & Cape Town, 566 pp.
- Schumann D, Kirsten G, Oliver EGH (1992) Ericas of South Africa. Fernwood Press, Vlaeberg, South Africa, 272 pp.
- South African National Biodiversity Institute (2016) Botanical Database of Southern Africa (BODATSA). <u>https://posa.sanbi.org</u> [Last Accessed 12.2023].
- Stafleu FA, Cowan RS (1979) Taxonomic literature. Vol.2 (H–Le). Bohn, Scheltma & Holkema, Utrecht, & dr. W. Junk b.v., The Hague.
- The Plant List (2013) Version 1.1. <u>http://www.theplantlist.org/</u> [Accessed 12.11.2023 via <u>https://www.checklistbank.org/</u>].
- Thiselton-Dyer WT (Ed.) (1909) Corrigenda. In: Thiselton-Dyer WT (Ed.) Flora capensis, Vol. 4, sect. 1, part 6. L. Reeve, Kent, 1168.

 <u>https://www.biodiversitylibrary.org/page/714653</u> Turland NJ, Wiersema JH, Barrie FR, Greuter W, Hawksworth DL, Herendeen PS, Knapp S, Kusber W-H, Li D-Z, Marhold K, May TW, McNeill J, Monro AM, Prado J, Price MJ, Smith GF (Eds) (2018) International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. Regnum Vegetabile 159. Koeltz Botanical Books, Glashütten. https://doi.org/10.12705/Code.2018

- Turner IM (2016) Rather for the nomenclaturist than for the scientific botanist: The *Botanical Cabinet* of Conrad Loddiges & Sons. Taxon 65(5): 1107–1149. <u>https://doi.org/10.12705/655.13</u>
- Turner RC (2008) *Erica mitchellensis* Dulfer. National Assessment: Red List of South African Plants version 2020.1. <u>http://redlist.sanbi.org/species_php?species=1820-584</u>[Accessed on 23.01.2024].
- WFO Consortium (2019) World Flora Online Taxonomic Backbone. https://doi.org/10.5281/ZENODO.7462137 [Accessed 17.05.2019].

Table 3. Orthographic variants of species and hybrids in *Erica* that have featured in botanical and horticultural literature and databases [as discussed in Nelson and Small (2004–2005) and in Nelson and Oliver (2004) where numerous other orthographic variations are also listed] that were added to WFO and linked to the currently accepted name. (*WFO ID added since December 2023 release. Link will become live from June 2024)

Correct orthography	WFO ID	orthographic variant	WFO ID
Erica aitonii Masson ex		Erica aitonia	wfo-0000671323
Andrews, non Willd.*	wfo-1000061246	Erica aitoniana	wfo-0000671324
<i>Erica argyraea</i> Guthrie & Bolus	<u>wfo-0000671411</u>	Erica argyrea	wfo-1000055018
<i>Erica banksii</i> Andrews, non Willd.	<u>wfo-0000671465</u>	Erica banksia	wfo-1000057523
Erica banksii subsp. comptonii (T.M.Salter) E.G.H.Oliv. & I.M.Oliv.	<u>wfo-0000671466</u>	Erica banksia subsp. comptonii	<u>wfo-0001440938</u>
Erica baueri Andrews	<u>wfo-0000671485</u>	Erica bauera	wfo-1200068674
		Erica beaumontia	wfo-0000671488
Erica beaumontiae Andrews	<u>wfo-1000057504</u>	Erica beaumontiana	wfo-0000671489
Erica blandfordii Andrews	wfo-0000671517	Erica blandfordia	wfo-1000054989
Erica bonplandiana Sims	wfo-0000671531	Erica bonplandii	wfo-0000671530
Erica bowieana G.Lodd.	wfo-0000671543	Erica bowia	wfo-0000671542
Erica coventryi Andrews	wfo-0000671767	Erica coventrya	wfo-1000054990
		Erica ethelae	wfo-1000056273
<i>Erica etheliae</i> L.Bolus	wfo-0000671983	Erica ethelii	wfo-1000055005
Erica eweriana Dryand.	wfo-1000057515	Erica ewerana	wfo-0000671987
<i>Erica fastigiata</i> var. <i>coventryi</i> Bolus	wfo-1200011362	Erica fastigiata var. coventryana	wfo-1200068673
		Erica gordonia	wfo-0000672178
Erica gordoniae J.Forbes	wfo-1000057514	Erica gordonii	wfo-1000055024
<i>Erica heleophila</i> Guthrie & Bolus	wfo-0000672224	Erica heliophila	wfo-1000056274
Erica hendricksei H.A.Baker	wfo-0000672226	Erica hendricksi	wfo-1000056275
Erica hibbertii Andrews	wfo-0000672237	Erica hibbertia	wfo-1000054992
Erica irbyana Andrews	wfo-0000672344	Erica jrbyana	wfo-1000057513
<i>Erica lawsonii</i> Sims	wfo-0000672436	Erica lawsonia	wfo-1000056276

		Erica lawsoniana	wfo-1000056277
Erica leei Andrews	wfo-1000054993	Erica leea	wfo-1000057512
Erica linnaei Andrews	wfo-0000672483	Erica linnaea	wfo-1000057511
Erica massonii L.f.	wfo-0000672581	Erica massonia	wfo-0000672580
Erica maximilianii Guthrie &			
Bolus	wfo-0000672585	Erica maximiliani	wfo-1000057510
		Erica mitchellensis	wfo-1000056285
Erica michellensis Dulfer	wfo-1000056285	Erica mitchelliensis	wfo-0000672628
Erica monsoniana L.f.	<u>wfo-0000672640</u>	Erica monsoniae	wfo-1000055014
Erica newdigateae Dulfer	wfo-0000672700	Erica newdigatei	<u>wfo-1000057505</u>
Erica nivenii Andrews	wfo-1000055003	Erica nivenia	wfo-0000672714
Erica patersonii Andrews	wfo-0000672833	Erica patersonia	wfo-1000056281
Erica petiveri L.	wfo-0000672890	Erica petiveriana	wfo-0000672895
		Erica plukenetiana	wfo-0000672950
Erica plukenetii L.	<u>wfo-0000672951</u>	Erica plukenetia	wfo-1000057848
Erica plukenetii subsp.			
<i>penicillata</i> (Andrews) E.G.H.Oliv. & I.M.Oliv.	wfo-0000672958	Erica plukenetii subsp. penicellata	wfo-0001441063
<i>Erica priorii</i> Guthrie & Bolus	wfo-0000672992	Erica priori	wfo-1000057509
Erica sainsburyana Andrews	wfo-0000673173	Erica sainsburya	wfo-1000057507
Erica salisburii Andrews	wfo-1000054995	Erica salisburia	wfo-0000673176
		Erica savilliae	wfo-0000673187
		Erica savileana	wfo-0000673185
<i>Erica savileae</i> Andrews	wfo-0000673184	Erica savilea	wfo-1000057506
Erica shannonii Andrews	wfo-0000673248	Erica shannonea	wfo-1000056279
Erica solandri Andrews	wfo-0000673268	Erica solandra	wfo-1000054997
Erica sparrmanii L.f.	wfo-1000055043	Erica sparrmanni	wfo-0000673276
Erica thunbergii Montin	wfo-0000673417	Erica thunbergia	wfo-1000056283
Erica uhrii Andrews	wfo-1000057518	Erica uhria	wfo-0000673487
Erica walkeri Andrews	wfo-0000673622	Erica walkeria	wfo-1000056280
Erica wendlandiana Klotzsch	wfo-0000673627	Erica wendlandii	wfo-1000055071
<i>Erica zeyheri</i> Bartl.	wfo-0000673654	Erica zeyheriana	wfo-0000673655