



South African National Plant Checklist Policy

DIVISION: *Foundational Biodiversity Science, Foundational Research and Services*

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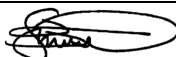
Policy / Procedure Details

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Policy / Procedure Review

Version details	2024 – Version 1
Reason for the review	Updated classification systems used Additional appendices with information on utilising molecular data and managing changes in biogeographic/residence status were added to the policy Terms of Reference for the SA National Plant Checklist Committee was updated
Potential consolidation of policies	
Other policies / procedures that might be impacted by this policy / procedure	e-Flora Policy

pproved / Reviewed by:

Committee / Division	Date	Signature: Chief Director	Review / Approved
<i>Foundational Biodiversity Science, Foundational Research and Services</i>	<i>5 April 2024</i>		<i>Approved</i>

South African National Plant Checklist Policy

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1. Preamble

The South African National Biodiversity Institute (SANBI) is mandated in the National Environmental Management: Biodiversity Act (2004) to coordinate and promote the taxonomy of South Africa's biodiversity, as well as to collect, generate, process, coordinate and disseminate information about biodiversity. SANBI is thus obligated to provide and manage a checklist of South African plants. This South African National Plant Checklist must be regularly maintained to ensure that the public have access to the most up-to-date and accurate taxonomic information. Documented and consistently implemented policy and procedures for the maintenance of national checklists are critical to ensure that all contributors and users understand the rationale for the inclusion of data and for changes and additions made, and also to standardise the approach to updating across taxa. The procedures ensure transparency with respect to how changes are made and who is responsible.

2. Purpose of the policy / procedure

To provide standard guidelines for the decisions and procedures relating to the updating and management of the South African National Plant Checklist ("Checklist") to ensure consistency, transparency, and credibility.

3. Legislation & standards

National Environmental Management: Biodiversity Act, 10 of 2004

4. Link to other SANBI policies and procedures

e-Flora Policy

5. Scope of application

This policy is applicable to SANBI staff of the Foundational Biodiversity Science division, as well as external collaborators contributing to updating the Checklist. The policy impacts on all end-users of the Checklist.

6. Definitions

Indigenous species (syn. native species): species that are found, or were historically found, in South Africa within their documented natural range where they have evolved and expanded into without human intervention (intentional or accidental)

Naturalised species (syn. established): Alien species (as defined below) 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: Alien species (as defined below) that sustain self-replacing populations over several life cycles, produce reproductive offspring, often in very large numbers at considerable distances from the parent and/or site of introduction, and have the potential to spread over long distances.

Alien species (syn. not indigenous, non-native): a 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.

7. Abbreviations

BODATSA – Botanical Database of Southern Africa

SANBI – South African National Biodiversity Institute

8. Policy / Procedure

8.1 South African National Plant Checklist guidelines

A single staff member, with a sound knowledge and understanding of plant nomenclature and taxonomic literature, will have ultimate responsibility for maintaining the plant checklist as the Checklist Coordinator at SANBI.

A Deputy Checklist Coordinator with similar competence in nomenclature and taxonomic literature will have equal editing rights to the database, and will be tasked with responsibilities towards maintaining the plant checklist.

The checklist will be updated on an ongoing basis, with changes identified in the literature being incorporated into the checklist within a reasonable amount of time, following the procedures outlined in Appendix 2.

Scientists employed by SANBI have a responsibility to assist the Checklist Coordinators by providing updated information for families for which they are responsible.

Taxon experts and herbarium curators from outside of SANBI are encouraged to send published articles with new species descriptions or revisions to the Checklist Coordinator to be incorporated into the checklist.

Only published changes will be incorporated; where a publication leaves unresolved issues this may be stated in a notes field.

The latest published, evidence-based classification for a genus, or subdivision of a genus, will be followed.

Experts within SANBI or from other institutions can submit an application to the Checklist Coordinator to refrain from implementing a change to the checklist where a strong objection exists, for example if it will have a major impact on the stability of nomenclature and classification and it is likely to be repudiated within a short period of time by other published research, or where there are two opposing published classifications based on the same evidence. A template for such proposals is available in Appendix 3. These applications will be considered by the South African National Plant Checklist Committee (the Terms of Reference for this committee is available in Appendix 4). When a committee member is an author of a paper under discussion, that member can still contribute towards the discussion and can vote on the matter. Criteria to use as guidelines when deciding on the merits of taxonomic changes based on molecular systematic results are available in Appendix 5.

In cases where nomenclatural or classification changes need to be treated with caution, or where the latest published treatment is not followed, an explanation should be given in the appropriate notes field in BODATSA.

All new validly published (according to the *International Code of Nomenclature for algae, fungi, and plants*) names of indigenous¹ and naturalised² (including invasive³) plant taxa occurring in South Africa (currently excluding the Prince Edward Islands) will be added to the list, either as the currently accepted name, or as a synonym with reference to the accepted name. If scientists disagree with new names or classification they must publish the synonyms and reasons for the proposed synonymy.

¹ Indigenous species (syn. native species): species that are found, or were historically found, in South Africa within their documented natural range where they have evolved and expanded into without human intervention (intentional or accidental)

² Naturalised species (syn. established): Alien species (as defined here⁴) 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.

³ Invasive species: Alien species (as defined here⁴) that sustain self-replacing populations over several life cycles, produce reproductive offspring, often in very large numbers at considerable distances from the parent and/or site of introduction, and have the potential to spread over long distances.

⁴ Alien species (syn. not indigenous, non-native): a 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.

The ultimate responsibility for maintaining the correct checklist of naturalised plants occurring in South Africa lies with the Deputy Checklist Coordinator.

All plant species with evidence of naturalisation in South Africa must be added to the checklist with their naturalisation status flagged. Criteria for assessing the biogeographic/residence status of plants are available in Appendix 6.

Evidence for occurrence of naturalised plants in South Africa must be in the form of voucher specimens or suitable diagnostic evidence in literature published in peer-reviewed publications.

One higher-level classification system will be used for each phylum in the checklist and adhered to in its entirety. The classification systems chosen for the different groups of plants are given in Appendix 7.

The higher-level classification system will be reviewed every five to ten years and may be amended then.

The Policy may be reviewed annually by the South African National Plant Checklist Committee, or upon request from one of its members, and amended if necessary.

The updated electronic checklist will be disseminated through the SANBI website, preferably with a function that allows a search by date so that the latest changes can be identified by users.

A summary of updates and changes, as well as references of literature incorporated, will be made available through the SANBI website annually.

A feedback function that allows comments by external users is required on the website. The Checklist Coordinators will be responsible for responding to comments.

8.2 The SANBI procedures for maintaining the South African National Plant Checklist

Scientists employed by SANBI have a responsibility to assist the Checklist Coordinators in updating and maintaining the classification and nomenclature of the families for which they are responsible, by communicating additions or corrections required.

Taxon experts and herbarium curators from outside of SANBI are encouraged to send published articles with new species descriptions or revisions to the Checklist Coordinators to be incorporated into the checklist.

Any corrections or additions to the Checklist that are required by other staff should be communicated to the scientist responsible for the family, who will inform the Checklist Coordinators, providing the necessary information and literature for the updates or corrections to be made.

A list of SANBI scientists responsible for each taxon group is maintained by the Deputy Checklist Coordinator and implemented by the Deputy Director: Plant Research.

The Checklist Coordinators will:

- implement changes as requested by SANBI scientists and external experts;
- scan the published literature to which SANBI subscribes for identification of relevant publications;
- establish and communicate regularly with a network of researchers who publish taxonomic papers on South African plants to request copies of newly-published work not in the list of journals to which SANBI subscribes. The editors of some of the more obscure journals will be contacted and a similar request made;
- use an accessible literature database to regularly search for new species and other relevant publications; and
- scan IPNI on a regular basis to identify any publications that might have been missed, and to check the status of names.

If new combinations of a genus are not all published, the Checklist Coordinators will contact the original author to ask for remaining combinations to be made.

Depending on the proportion of names for South African taxa requiring new combinations, updating of the checklist can be postponed until all combinations are made for a group.

The following will be recorded for each change, as appropriate: new species or species for which status has changed; synonyms; reference; date that the change was made; a comment, where required, explaining the change.

8.3 Template for proposals not to follow the latest published classification for a group

SOUTH AFRICAN NATIONAL PLANT CHECKLIST
Proposal not to follow the latest published classification for a group

Taxon group (e.g., genus):

Reference of latest published classification that should not be followed:

Reference of alternate published classification to be followed instead:

Background:

Reasons why the latest reference should not be followed (please clearly cite the relevant part of the checklist guidelines).

In your motivation, kindly include the following aspects:

- a) Specify and explain how end-user benefits could be lost with both classifications, justifying any trade-offs.
- b) Explain how specific end-user benefits could be retained in the alternative classification vs. those that are improved on in the default latest classification (justify the proposed trade-offs).

Name and affiliation of proposer:

Date:

8.4 Terms of Reference for the South African National Plant Checklist Committee

Background	A Plant Checklist Committee was established in 2014 to assist the Plant Checklist Coordinators and to play a leadership role in South African plant taxonomy. This aims to ensure that the National Plant Checklist is maintained at an internationally acceptable standard and that problems regarding the following of certain taxonomic treatments can be dealt with in a transparent manner.
Composition	The committee is comprised of the following members: <i>Chair:</i> SA Plant Checklist Coordinator <i>Core SANBI members:</i> Deputy SA Plant Checklist Coordinator; DD: Botanical Research; e-Flora Coordinator <i>Nominated SANBI taxonomists:</i> 3 senior scientists (Botanical Research Subdirectorate) <i>Nominated Non-SANBI taxonomists:</i> 6 <i>End user consultant:</i> Biodiversity Research Assessment & Monitoring Directorate (e.g. Red List Officer from Threatened Species Programme) – not voting
Representation	Both regional representation and wide taxon-level expertise are required. The committee should consult with end-users, especially those in the field of morphological and molecular systematics to assist sound decision making. Only South African residents can serve on the committee, but international consultation is encouraged.
Term of service	The term of service for committee members will be two years and members can be re-elected for a second term. A member can serve a maximum of two consecutive terms, unless they are nominated again and re-elected. If a member has not contributed to discussions and requests for input for a period of a year, that will be seen as a resignation from the committee and that member will not be eligible for re-election at the end of the term.
Role and functioning	The committee will assist the Checklist Coordinators to make transparent and well-informed decisions regarding classifications followed in the checklist according to the guidelines and procedures set out in the Plant Checklist Policy (see especially Appendix 2, 3, and 5). The committee will meet at least once a year in the first quarter of the calendar year. Exceptional and controversial cases where an application has been submitted to not implement a change in the checklist will be discussed by the committee. Discussions will normally be done via structured email calls for input, which will be compiled and circulated in a single document to the rest of the committee, whereafter a joint decision will be made on the matter or a vote will be called for. If needed, a meeting can be convened or the matter can be discussed in the yearly committee meeting. The Checklist Coordinator can also call on committee members to provide comments on formal proposals to conserve or reject plant names (as published in TAXON) where these are relevant for the South African flora. This will ensure that the South African point of view is conveyed to the Nomenclature Committee for Vascular Plants. Members of the committee also have the option to serve on the Nomenclatural Review Board of the journal Bothalia-ABC to assist with reviewing manuscripts containing nomenclatural changes and other aspects relating to nomenclature.
Decision making	Decisions are made by mutual agreement or by voting on proposals after these were discussed (via email or during online meetings). If voting is required, a simple majority is required to implement a decision. The Chair can exercise a deciding vote in the case of a tie, or call for further discussion and a second round of voting.

Nominations	The existing process of choosing scientists' representatives within SANBI will be used to nominate and vote for SANBI taxonomists to serve on the committee. Nominations for non-SANBI taxonomists to serve on the committee are called for every two years. The nomination form must be signed by both the proposer and nominee. A short CV paragraph highlighting the area of expertise of the nominee is requested. Once nominations are finalised, a summary of the nominees and their expertise is included in the ballot papers, which are circulated to major herbaria and university botany departments in South Africa. Votes are tallied by the Checklist Coordinator and the results disseminated via email.
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8.5 Criteria to use when deciding on the merits of taxonomic changes based on molecular systematic results

Molecular phylogenetic analyses are often used to generate results towards plant taxonomic changes. To decide whether such plant taxonomic changes are justified, the reliability and robustness of the phylogenetic analysis needs to be assessed.

The following checklist can assist in determining the merits of taxonomic changes based on molecular systematic results. If the criteria are not met, then the proposed taxonomic changes should be rejected.

Criteria for evaluating the merit of a phylogenetic analysis

The following criteria will influence the merit of a phylogenetic analysis for supporting the classification of the group studied. If any of these criteria are not met, the taxonomic changes based on this analysis should be treated with caution. Some criteria (indicated with a *) have to be met, otherwise the proposed classification can be rejected.

Criteria	Yes	No
Is there congruence between the molecular inference and the morphological characters?	☐	☐
Has maximum likelihood or Bayesian analyses been used, rather than parsimony and distance analyses?	☐	☐
Is the phylogenetic inference based on whole genome scans, rather than single gene sequences?	☐	☐
If single gene sequences are used, was more than one gene sequence used? Indicate how many gene sequences were used:	☐	☐
Were gene sequences from the following sources used:		
Chloroplast?	☐	☐
Nuclear?	☐	☐
Mitochondrial?	☐	☐
Are the gene regions that are used coding, as opposed to non-coding regions?	☐	☐
Were thousands of base pairs used in the phylogenetic analysis, rather than only a few hundred? Indicate how many base pairs were used:	☐	☐
Were sequences aligned automatically followed by manual editing, as opposed to only automatic alignment?	☐	☐
Were indels included in the data analyses?	☐	☐
*Was a consensus tree presented, rather than a single gene tree?	☐	☐
*Were the bootstrap values of supported nodes above 80% in a maximum parsimony or maximum likelihood analysis?	☐	☐
*Were the posterior probability values of supported nodes above 0.95 in a Bayesian analysis?	☐	☐
*Are the phylogenetic tree(s) free of polytomies?	☐	☐
Was the phylogenetic analysis published in a journal where it would be reviewed by phylogeneticists?	☐	☐
Were the taxonomic adjustments published in a taxonomic journal, rather than a general botany journal?	☐	☐
*Are the sequences deposited in a data repository, like GenBank?	☐	☐

*Crucial criteria that have to be met

Factors that can influence the usefulness of a phylogenetic analysis for the purpose of supporting a classification

The following factors can influence the accuracy of a phylogenetic analysis for taxonomic interpretation. If any of these factors are present in the group studied or in the data on which the analysis is based, the taxonomic changes based on these results should be treated with caution.

Factors	Yes	No
Does any of the following occur in the genus or taxon group:		
Polyploidy?	☐	☐
Hybridization?	☐	☐
Is there evidence of ancient hybridization or incomplete lineage sorting in the group?	☐	☐
Are there missing data because of methodological failures (e.g., some sequences shorter than others, or some sequences missing)?	☐	☐
Are there missing data because of extinction since the group is ancient or due to climate change?	☐	☐

[These criteria were compiled based on a document regarding plant molecular phylogenetic analyses and their implications for plant taxonomy, which was compiled by Dirk U Bellstedt and Benny Bytebier in May 2022.]

8.6 Criteria for managing changes to information regarding biogeographic/residence status of a taxon

Definitions for the range of values that reflect biogeographic/residence status:

Cryptogenic: There is not enough evidence to be certain whether South Africa is part of the natural range of the taxon or not.

Indigenous (native): species that are found, or were historically found, in South Africa within their documented natural range into which they have evolved and expanded without human intervention (intentional or accidental).

Endemic: An indigenous taxon whose natural range is documented as being restricted to the area specified, even if it has subsequently been introduced in another area, but not if it is likely that it has merely extended its natural range into a nearby area.

Alien (non-native): a species whose documented natural range does not include South Africa, but that is now in the country because of human action that has enabled it to overcome a biogeographic barrier.

Criteria (based on Essl *et al.* 2018):

Note that the emphasis here is on management of changes, not of declaring a final definitive status per taxon, since we are managing a dynamic checklist to reflect a process of knowledge construction rather than a pattern representing a point in time.

Retrospectively, we treat each taxon by default as it is recorded at 1 May 2022 in BODATSA.

For a taxon record that is queried:

Cryptogenic status to be refined: Is there further information (evidence) of its native range? Is there a good understanding about whether certain occurrences are a result of inadequate prior search effort or of human introduction? If not, it is kept as cryptogenic. If occurrences can be shown to be the result of introductions, it is changed to alien (not indigenous), e.g., *Rubus niveus*. If even one occurrence can be explained as a natural range extension or as natural yet only recently discovered, it is changed to indigenous, e.g., *Persicaria limbata*. The proximity of the known native range to the country's borders should be considered, as well as known natural migration dispersal routes / pathways.

Indigenous (native) status queried: Is there evidence that the taxon was not in the country prior to known introduced occurrences? Is it widespread elsewhere in the world with a South African disjunction? Is it known to be widely used by humans? Example: Two *Elatine* aquatic species recorded for South Africa only since 1934, but widely used in the Aquarium community. They are absent from most of Africa but otherwise cosmopolitan. If they weren't used, these could be reclassified as cryptogenic, however human introduction is almost certain, so they should be treated as alien.

Alien (not indigenous / non-native) status queried: If even one occurrence can be explained as a natural range extension or as natural yet only recently discovered, it is changed to indigenous. Weediness is not a criterion, e.g., *Pseudognaphalium luteo-album*. A putative hybrid origin involving an alien parent is not a criterion, e.g., *Rubus thaumasius*. Where there is a high level of uncertainty about the native range, it should be reclassified as cryptogenic, e.g., *Pseudognaphalium luteo-album*, *Diplocyclos palmatus*, at least until such doubt is removed.

If there are both introduced populations and natural populations, the native status predominates, but if introduced populations are restricted to provinces, the status within a province can be indicated as distinct from the national status. This will not be practical to maintain for all species, but for some, e.g., the fern *Adiantum hispidulum*, it may be useful to discern at this level.

For a new entry, the default is indigenous, or cryptogenic if e.g. there are only recent records in the country but it has long been known to occur or have all close relatives in another distant country. Once the native range is known with reasonable certainty, it can be revised e.g. to endemic or alien depending on whether the country (SA) coincides or overlaps with the known native range or not. Care must be taken to discern any introduced occurrences from those that are natural.

Reference

Essl, F. *et al.* (2018) Which taxa are alien? Criteria, applications, and uncertainties. *BioScience* 68(7): 496–509. <https://doi.org/10.1093/biosci/biy057>

8.7 The higher level classification systems chosen for the different groups of plants

Angiosperms: Angiosperm Phylogeny Group [APG] II system, using the bracketed families. New families described after publication of APG II, as well as family divisions recognised in APGIII and IV, are incorporated. However, where families were combined post-APGII, these are not accepted.

The Angiosperm Phylogeny Group. 2003. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG II. *Botanical Journal of the Linnean Society* 141(4): 399–436. <https://doi.org/10.1046/j.1095-8339.2003.t01-1-00158.x>

The Angiosperm Phylogeny Group. 2009. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG III. *Botanical Journal of the Linnean Society* 161(2): 105–121. <https://doi.org/10.1111/j.1095-8339.2009.00996.x>

The Angiosperm Phylogeny Group. 2016. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. *Botanical Journal of the Linnean Society* 181(1): 1–20. <https://doi.org/10.1111/boj.12385>

Gymnosperms: Yang, Y., Ferguson, D.K., Liu, B., Mao, K-S., Gao, L-M., Zhang, S-Z., Wan, T., Rushforth, K. & Zhang, Z-X. 2022. Recent advances on phylogenomics of gymnosperms and a new classification. *Plant Diversity* 44(4): 340–350. <https://doi.org/10.1016/j.pld.2022.05.003>

Ferns and lycophytes: Pteridophyte Phylogeny Group [PPG] 1. 2016. A community-derived classification for extant lycophytes and ferns. *Journal of Systematics and Evolution* 54(6): 563–603. <https://doi.org/10.1111/jse.12229>

Mosses, liverworts, and hornworts: The Bryophyte Nomenclator (<https://www.bryonames.org/>)