Report of the 21st Meeting of the World Flora Online Council

Virtual, 13 November 2023

The 21st meeting of the World Flora Online (WFO) Council was held online on Monday 13 November 2023, attended by 26 people representing 18 organisations/institutes.

Attendance:

Adil Güner	Nezahat Gökyiğit Botanik Bahcesi, Istanbul, Turkey
Alan Elliott	Royal Botanic Garden Edinburgh, Edinburgh, UK
Alan Paton	Royal Botanic Gardens, Kew, UK
Catherine Martin	Missouri Botanical Garden, St Louis, Missouri, USA
Chuck Miller	Missouri Botanical Garden, St Louis, Missouri, USA
Eduardo Dalcin	Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, Rio de Janeiro, Brazil
Gunter Fischer	Missouri Botanical Garden, St Louis, Missouri, USA
Joe Miller	Global Biodiversity Information Facility, Copenhagen, Denmark
John Parnell	Trinity College Dublin, Dublin, Ireland
Jordan Teisher	Missouri Botanical Garden, St Louis, Missouri, USA
Lauren Raz	Universidad Nacional de Colombia, Bogotá, Colombia
Marc Sosef	Meise Botanic Garden, Meise, Belgium
Maria Regina Barbosa	Instituto Nacional de Ciência e Tecnologia (INCT), Brazil
Marianne Le Roux	South African National Biodiversity Institute (SANBI), Pretoria, South Africa
Mark Watson	Royal Botanic Garden Edinburgh, Edinburgh, UK
Martin Ricker	National Autonomous University of Mexico (UNAM), Mexico City, Mexico
Nicola Schoenenberger	Conservatoire et Jardin Botaniques, Geneva, Switzerland
Nye Hughes	Associate, Royal Botanic Garden, Edinburgh, UK
Olaf Bánki	Catalogue of Life/Species2000
Peter Fritsch	Fort Worth Botanic Garden, Botanical Research Institute of Texas, Texas, USA
Peter Wyse Jackson	Missouri Botanical Garden, St Louis, Missouri, USA
Ronell Klopper	South African National Biodiversity Institute (SANBI), Pretoria, South Africa
Thomas Borsch	Botanic Garden and Botanical Museum Berlin-Dahlem, Berlin, Germany
Tony Mast	Missouri Botanical Garden, St Louis, Missouri, USA
Visotheary Ung	Muséum National d'Histoire Naturelle, Paris, France
Walter Berendsohn	Botanic Garden and Botanical Museum Berlin-Dahlem, Berlin, Germany

The following is a summary report of the meeting of Council and decisions adopted. Recordings of the meeting, and associated documents, are available on the WFO OwnCloud online storage, https://cloud.worldfloraonline.org

1. Welcome

Council Co-chair Peter Wyse Jackson began the meeting and welcomed all participants. He commenced by remembering William Ulate Rodriguez, who passed away on 20 September 2023. William was a member of staff of the Missouri Botanical Garden since January 2011. He was WFO Gatekeeper since December 2015 and led in the development and data administration of the World Flora Online (WFO) system, database and portals. At the Missouri Botanical Garden, he was a much-loved staff member and colleague, and Senior Project Coordinator in the Garden's Center for Biodiversity Informatics. He also worked as Technical Director of the Biodiversity Heritage Library at the Garden for several years. Prior to coming to the Garden, William worked in Costa Rica for the Instituto Nacional de Biodiversidad (INBio) for ten years on a range of technology projects within its Center for Biodiversity Informatics. He is remembered fondly by his wide circle of friends and colleagues at the Missouri Botanical Garden, in the World Flora Online community, and throughout the world. Condolences were sent to his daughter Maria and family in Costa Rica.

Peter Wyse Jackson also highlighted that the meeting of the WFO Council was being held on this the Council's 10th anniversary, almost ten years to the day since the first WFO Council meeting had been held at the Royal Botanic Garden Edinburgh in 14-15 November, 2013.

Several new WFO participants were welcomed to the meeting attending their first WFO Council – Jordan Teisher, Catherine Martin and Tony Mast. All from the Missouri Botanical Garden. Tony Mast had taken over from William Ulate and will work in data management for the WFO.

The draft agenda was adopted as follows:

1. Welcome and adoption of the draft agenda *Lauren Raz, Mark Watson and Peter Wyse Jackson*
2. Apologies for absence
3. Adoption of the Report from the 20th meeting of the WFO Council (Kew, 14 to 17 March 2023)
4. Update on the Global Strategy for Plant Conservation and links to WFO *Peter Wyse Jackson*
5. New WFO Consortium Members
6. Report from the Taxonomic Working Group *Mark Watson and Alan Elliot*
   Discussion and adoption of recommendations.
7. Report from the Technical Working Group *Chuck Miller and Walter Berendsohn*
   Discussion and adoption of recommendations
8. Report from the Task Force on Identification *Marc Sosef, Eve Lucas and Visotheary Ung*
   Discussion and adoption of recommendations
9. Report from the Task Force on Higher Plant Classification *Alan Elliott and Lauren Raz*
10. Report on progress with the WFO Strategic Plan, including potential WFO Registration as a NGO *Peter Wyse Jackson and Nicola Schoenenberger*
11. Update from the Communications Working Group *Nicola Schoenenberger*
12. Review Action Points from the last meeting (other than those covered above)
13. Plans for the 22nd Council meeting
14. Any Other Business

2. Apologies for absence

Apologies for absence from the meeting were received from Sebsebe Demissew (Ethiopia) and Rashad Salimov (Azerbaijan).

3. Adoption of the Report from the 20th meeting of the WFO Council

The Report of the 20th WFO Council meeting, held in person and with virtual participation 14 to 17 March 2023 in Kew, United Kingdom, was adopted and will be posted on the WFO About Pages.

4. Update on the Global Strategy for Plant Conservation and links to the WFO

Peter Wyse Jackson presented an update on the Global Strategy for Plant Conservation which had recently been included as an agenda item at the 25th meeting of the Subsidiary Body on Scientific, Technical and Technological Advice of the Convention on Biological Diversity (SBSTTA 25). He noted that a Draft Recommendation on Plant conservation (Recommendation 25/3) had been adopted by the meeting, which met recently in Nairobi, Kenya (15-19 October 2023). This recommendation is the outcome of the SBSTTA 25's agenda item 3 (d). The recommendation now goes forward for consideration at the CBD's 16th Conference of the Parties, which will be held during the second half of 2024.

SBSTTA 25 recommended that COP 16 adopt a set of 'voluntary complementary actions related to plant conservation', which were reviewed by the meeting, as an update to the Global Strategy for Plant Conservation (GSPC), to support the implementation of the Kunming-Montreal Global Biodiversity Framework. Peter Wyse Jackson pointed out that the adoption of this recommendation was of considerable importance to the World Flora Online, as several plant conservation actions were included of direct relevance to the World Flora Online, most notably the following:

> **Plant information systems**
>
> 21 (b) Support the development and use of existing comprehensive, authoritative and accessible expertise and online information systems, documentation and inventories, as well as access to biological collections (e.g. through digitization) at the local, national and international levels, making available to all countries information on their floras and the status of known plant species and associated ecosystems, while ensuring the free, prior and informed consent of indigenous peoples with regard to access to traditional knowledge and taking into consideration the ongoing work and processes carried out under relevant organizations, such as the Food and Agriculture Organization of the United Nations and its Commission on Genetic Resources for Food and Agriculture.
>
> 21 (d) Promote the continuous updating of the World Flora Online, including its identification support tools, information on plant distribution and the updating of regional floras.

Peter Wyse Jackson reminded the meeting that no other similar initiative had been recognised like this for inclusion in the GSPC and said that he believed that this is both an extremely important recognition

for the WFO project and a valuable renewal of its mandate amongst the GSPC's priorities. He also noted that the SBSTTA 25 recommendation had expressed its appreciation to the Global Partnership for Plant Conservation, of which the WFO Consortium is a member, for supporting activities related to the development of the voluntary complementary actions related to plant conservation.

5. New WFO Consortium Members

There have been no new members since the last meeting of the WFO Council.

6. Report from the Taxonomic Working Group

Alan Elliott, WFO TEN Manager, provided an update on progress made since the last meeting, including, developing the Rhakhis software to manage the WFO checklist (taxonomic backbone), improving data in Rhakhis, and activities of TENs. The report below is given in the form of the Powerpoint slides presented and received (copy available in the WFO File store on OwnCloud).

WFO
The World Flora Online

TEN Manager Report
Council

November 2023

Alan Elliott

WFO
The World Flora Online

- Checklist updates March to June WFO Plant List
- Checklist updates July to 1st November
- Checklist plans to December WFO Plant List

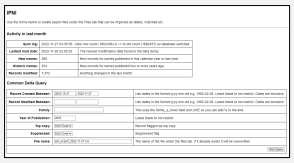
- Rhakhis User Guide
- Use of Rhakhis by the Legume TEN

- Proposals for new TENs

WFO
The World Flora Online

March to June WFO Plant List release

19,236 additional names



	New names
WCVP-Kew	14,524
BryoNames	2188
IPNI	2109
Ericaceae TEN	154
Compositae TEN	131
Fabaceae TEN	102
Other TENs	28

200,807 records had nomenclatural or classification improvements.

WFO
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Summary of changes between December 2022 & June 2023 snapshots

- **TEN** Updated Family classifications have been provided by TENs for: all 232 **Bryophyte** Families. The 6 **Conifer** Families Araucariaceae, Cephalotaxaceae, Cupressaceae, Pinaceae, Podocarpaceae, & Taxaceae and the two **Cycad** Families: Cycadaceae & Zamiaceae. There have also been corrections and updates for Ericaceae, Fabaceae, Mayacaceae, Pontederiaceae, Putranjivaceae, Lowiaceae & Zingiberaceae.
- The following **TEN groups** curate their classification in WCVP, and now follow **WCVP version 11**: Arecaceae, Annonaceae, Cyperaceaae, Poaceae, Sapotaceae & Urticaceae.
- 100 default classifications have been updated to WCVP version 10 or version 11 depending on what data was available at the time up update.

- Full info in June Release: https://about.worldfloraonline.org/june-2023-release

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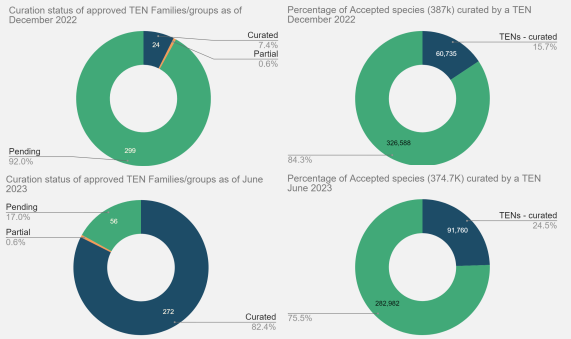

WFO
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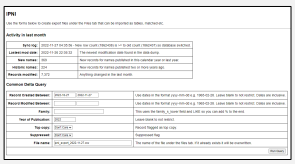
July to November 2023

34,730 additional names



	New names
BryoNames	19830
WCVP-Kew	7711
IPNI	3015
Compositae	2713
Ericaceae TEN	507
Fabaceae TEN	342

950,306 records have had nomenclatural, classification and/or reference improvements.

WFO
The World Flora Online

Activity updates from approved TENs

Changes in progress since June 2023 snapshot

- **Asphodelaceae tribe Aloeae** – active curation in Rhakhis.
- **Begoniaceae** – Updated. More names/updated classification.
- **Bryophytes** updated to include the 19k synonyms – Sept 2023 checklist via CoL checklist bank.
- **Conifers** – Further updates in prep for the classification being given to CoL. (ca. 400+ old infraspecific names still to place)
- **Erica –** further curation ahead of special issue.
- **Fabaceae** 2023 v.4 checklist incorporated
  - Curation in Rhakhis as part of 8th International Legume Conference.
- **Lowiaceae –** active curation.
- **Ochnaceae subfam. Quiinoideae** - Updated.
- **Picramniaceae –** Updated via literature.
- **Zingiberaceae –** curatorial fixes in Rhakhis.

WFO
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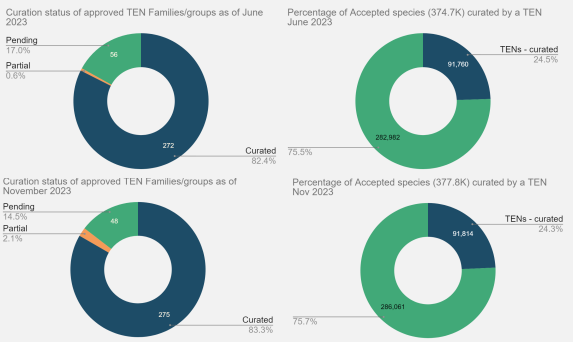
Completed changes for the December 2023 snapshot

- Additional 117 default classifications have been updated to WCVP version 11.
- **197** of **387** default families (**51%**) updated.
- **106k** of **218k** of accepted species (**49%**) updated.
- WCVP v.12 is now available.

WFO
The World Flora Online



WFO
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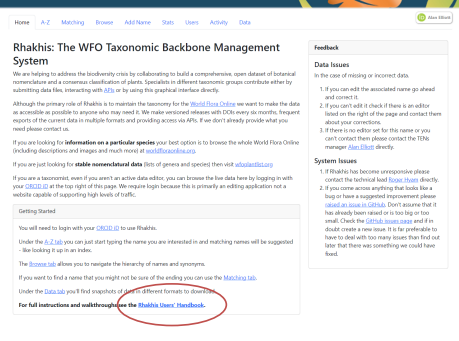
Activity updates from approved TENs

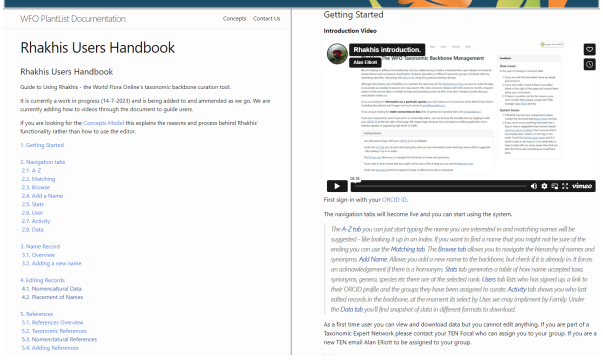
Changes in progress since June 2023 snapshot

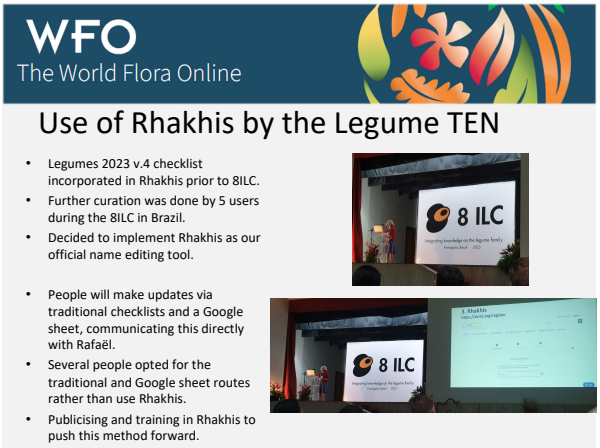
- **Solanaceae** - update in process.
- **Asteraceae** – maybe accepted name update.
- **Dipterocarpaceae -** New names from recircumscription of tribe Shoreae are in. Classification requested.

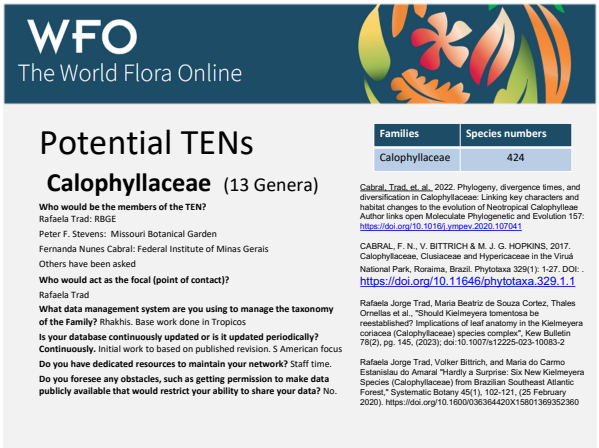
WFO
The World Flora Online

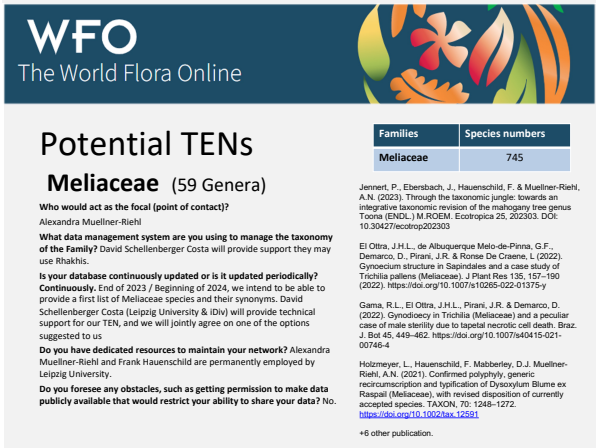


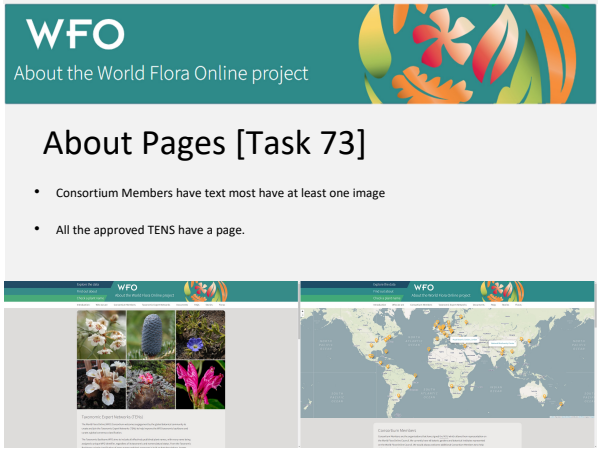
WFO
The World Flora Online











Mark Watson, co-chair of the Taxonomic Working Group, continued the report from the Taxonomic Working Group. The report below is given in the form of the Powerpoint slides presented and received (copy available in the WFO File store on OwnCloud).

Report of the Taxonomic Working Group
Online virtual meeting, Monday 6 November 2023

Attendees (24)

Mark **Watson**, Co-chair	Edinburgh, UK	Isabel **Larridon**	London, UK
Thomas **Borsch**, Co-chair	Berlin, Germany	Eve **Lucas**	London, UK
Alan **Elliott**, TEN Manager	Edinburgh, UK	Tony **Mast**	St Louis, USA
Walter **Berendsohn**	Berlin, Germany	Chuck **Miller**	St Louis, USA
John **Brinda**	St Louis, USA	Alex **Monro**	London, UK
Ethan **Fried**	Eleuthera, Bahamas	John **Parnell**	Dublin, Ireland
Peter **Fritsch**	Texas, USA	Lauren **Raz**	Botogá, Colombia
Nye **Hughes**	Edinburgh, UK	Rashad **Salimov**	Azerbaijan
Roger **Hyam**	Edinburgh, UK	Marc **Sosef**	Meise, Belgium
Sunitha **Katabathuni**	St Louis, USA	Visotheary **Ung**	Paris, France
Ronell **Klopper**	Pretoria, South Africa	Peter **Wyse Jackson**	St Louis, USA
Nadja **Korotkova**	Berlin, Germany	Nelson **Zamora**	Heredia, Costa Rica

Apologies

Thomas **Haevermans**, Co-chair	Paris, France
Adil **Güner**	Istanbul, Turkey
Jordan **Teisher**	St Louis, USA

Report of the Taxonomic Working Group
Online virtual meeting, Monday 6 November 2023

Main Discussion Topics

- Checklist updates to June release of WFO Plant List (TEN Manager)
- Checklist updates to December release of WFO Plant List (TEN Manager)
- Rhakhis User Guide and use of Rhakhis by Fabaceae TEN (TEN Manager)
- TEN Community and Proposals for new TENs (TEN Manager)
- Rhakhis software and data developments
- Missouri updates - staff, servers, portal data (Technical Working Group)
- Big 4 Checklist paper
- WFO Supra-order Classification (Council agenda item)
- WFO and GSPC/Global Biodiversity Framework (Council agenda item)
- WFO at XX IBC, Madrid July 2024 (Council agenda item)
- Review of Identification tools (Council agenda item)

Report of the Taxonomic Working Group
Online virtual meeting, Monday 6 November 2023

TEN Manager Report – matters arising

Promoting and Supporting the TEN Community

Recommendation 1: Council approve the setting up of a mailing list for communication with the TEN Community (wfo-tens@worldfloraonline.org).

Report of the Taxonomic Working Group
Online virtual meeting, Monday 6 November 2023

TEN Manager Report – matters arising

Inactive/Unresponsive TENs

Recommendation 2: Council to request that the Taxonomic Working Group reviews TENs who are inactive/unresponsive and recommends to Council any which they consider should be de-listed as a WFO TEN.

Report of the Taxonomic Working Group
Online virtual meeting, Monday 6 November 2023

TEN Manager Report – matters arising

Prospective new TENs

Calophyllaceae – Lead: Rafaela Trad (RBGE), 424 species

Ebeneaceae – Lead: Carmen Puglisi (Missouri Botanical Garden), 759 species

Meliaceae – Lead: Alexandra Muellner Riehl (Leipzig University & iDiv), 745 species

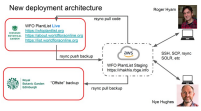
Recommendation 3: Council to authorise TENs for Calophyllaceae, Ebenaceae and Meliaceae.

images: http://www.phytoimages.siu.edu

Report of the Taxonomic Working Group
Online virtual meeting, Monday 6 November 2023

Rhakhis software and data updates

- Server moved from Google Cloud to Missouris BG – with new deployment architecture
- Rhakhis Activity Tracker implemented
- R Package API developed
- Name matching enhancements
- Links to original publication online resources added – now up to 51% of all names
- Links to Type specimen online resources – currently 2%, aiming for 50%
- Separate release of TEN datasets to CheckList Bank – Gymnosperms



How "references" work in Rhakhis

Report of the Taxonomic Working Group
Online virtual meeting, Monday 6 November 2023

Big 4 Checklist

- Paper comparing WFO-Plant List, World Checklist of Vascular Plants, World Plants and the Leipzig List was published in New Phytologist in October 2024
  doi: 10.1111/nph.18961
- Used as the basis for a chapter in *State of The Worlds Plants 2023*
- Based on WFO Dec 2021 data (little better than The Plant List)
- David Schellenberger Costa has repeated the analysis in August showing WFO has gained ground
- Discussions with Kew and WFO towards convergence of WCVP and WFO-Plant List are ongoing.
- PNAS paper on global list governance
  doi: 10.1073/pnas.2306899120

Methods

The big four of plant taxonomy – a comparison of global checklists of vascular plant names

David Schellenberger Costa[1,2] [illegible] and Christian Wirth[1,2]

Widespread support for a global species list with a formal governance system

Aaron M. Lim[a,1] [illegible] and Stephen T. Garnett[b]

Report of the Taxonomic Working Group
Online virtual meeting, Monday 6 November 2023

XX International Botanical Congress, July 2024, Madrid

- WFO Symposium - accepted
- Other Symposia/talks with WFO TEN involvement
- Potential TEN side event
- WFO papers published in TAXON
- Maximising impact for WFO

Recommendation 4: Council to establish a group to coordinate WFO-related activities for the XX International Botanical Congress, Madrid, July 2024.

IBC 2024 XX International Botanical Congress Madrid Spain
July, 21st - 27th, 2024

Report of the Taxonomic Working Group
Online virtual meeting, Monday 6 November 2023

Summary of Taxonomic Working Group Recommendations to Council

1. Council approve the setting up of a mailing list for communication with the TEN Community (wfo-tens@worldfloraonline.org).
2. Council to request that the Taxonomic Working Group review TENs who are inactive/unresponsive, and recommends to Council any which they consider should be de-listed as a WFO TEN.
3. Council to authorise TENs for Calophyllaceae, Ebenaceae and Meliaceae.
4. Council to establish a group to coordinate WFO-related activities for the XX International Botanical Congress, Madrid, July 2024.

On October 30th a study was published in PNAS on user perceptions about the need for global species lists and how they should be governed. It is available here: https://www.pnas.org/doi/10.1073/pnas.2306899120. The study was authored by the Global Species List Working Group, the membership of which was drawn primarily from the Catalogue of Life Global Team. WFO Council members Lauren Raz and Olaf Bánki participated in the research. The main conclusion of the study is that there is broad consensus among taxonomists and other consumers of species level data that a global list of accepted species is a desired end and that it should have a formal governance system, the structure of which must be defined through additional consultations with relevant stakeholders. Members of the working group, led by Stephen Garnett, are currently developing and testing metrics to evaluate the quality and transparency of species lists, using a selection of national and global species lists as test cases.

Council decisions on the Taxonomic Working Group recommendations

1) Council approve the setting up of a mailing list for communication with the TEN Community (wfo-tens@worldfloraonline.org). **APPROVED**

2) Council to request that the Taxonomic Working Group review TENs who are inactive/unresponsive, and recommends to Council any which they consider should be de-listed as a WFO TEN. **APPROVED**

3) Council to authorise TENs for Calophyllaceae, Ebenaceae and Meliaceae. **APPROVED**

4) Council to establish a group to coordinate WFO-related activities for the XX International Botanical Congress, Madrid, July 2024. **APPROVED**

7. Report of the Technical Working Group

Chuck Miller, co-chair of the Technical Working Group, presented the following report from the Taxonomic Working Group. The report below is given in the form of the Powerpoint slides presented and received (copy available in the WFO File store on OwnCloud).

World Flora Online
Technical Working Group
Report to WFO Council

Chuck Miller
Walter Berendsohn

Zoom
November 13, 2023

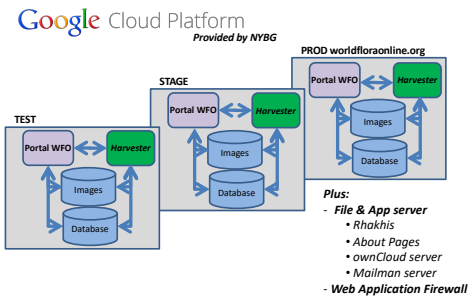
Technical Working Group

Chuck Miller, Co-Chair	Missouri BG
Walter Berendsohn, Co-Chair	Berlin BG and Botanical Museum
Eduardo Dalcin	Rio de Janeiro BG
Brenda Daly	South African National Biodiversity Institute
Habip Burak Can Erdönmez	Nezahat Gökyiğit Botanic Garden
Anne Fuchs	Australian National BG
Roger Hyam	RBG Edinburgh
Sunitha Katabathuni	Missouri BG
Marianne LeRoux	South African National Biodiversity Institute
Tony Mast	Missouri BG
Andreas Müller	Berlin BG and Botanical Museum
Rob Turner	RBG Kew
Visotheary Ung	Muséum National d'Histoire Naturelle Paris
Kim Watson	New York BG
Aaron Wilton	Landserve, New Zealand

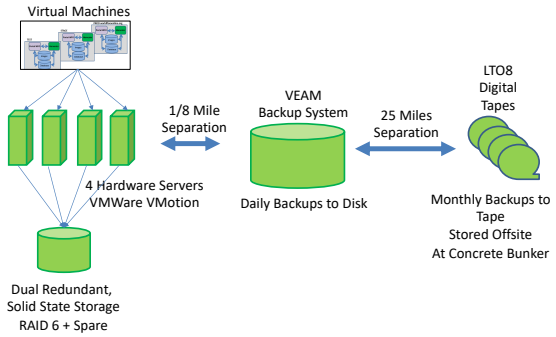
Technical Working Group Progress Since March 2023

- **1 Virtual Meeting**
- **WFO Servers migrated from Google to MBG**
- **Portal, Backbone and Content Progress**
- **Rhakhis, WFO Plant List Progress**
  - Mark's report

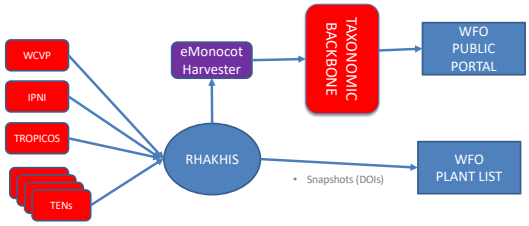
Action Item 91: Migrate WFO GC Servers to MBG - Completed



WFO Server Resilience

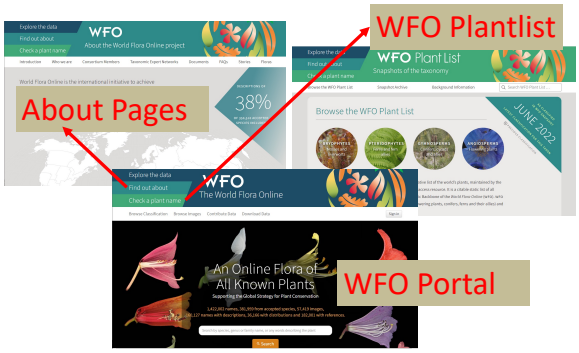


WFO Taxonomic Backbone Curation



WFO Portal (Oct 30, 2023)

World Flora Online Public Portal



Taxonomic Backbone Data

- Portal currently using
  - December 2022 data from Rhakhis
  - March 2023 update
- June 2023 Rhakhis backbone data is in work

Content Data Update

- Pending Harvesting of June 2023 Rhakhis backbone
- Content will be Harvested following backbone
- Estimate: 20-45 days to complete Harvesting of June 2023 backbone and content data

Content Harvested from March

Brittonia
Central_American_Mosses
Flora d'Afrique Centrale
Flora of Australia
Flora do Brazil 2020
Flora of China
Flora of Colombia
Flora Helvetica
Dendroflora of Hungary
Flora of Levy Preserve (Bahamas)
Flora_Mesoamericana
Flora Neotropica
Flora_of_Nicaragua
Flora of NE US
Flora of North America
Flora of Pakistan
Flora of Panama
Flora of South_Africa
Flora of Thailand
Flora of E Tropical Africa
Flora of Turkey
Flora of W Tropical Africa
Flora Zambesiaca
Global Tree Search
Irish Names
IUCN
Manual_de_Plantas_de_Costa_Rica
Memoirs NYBG
MBG_Images
Moss_Flora_of_China
Novon_Content

57,419 images -160,097 descriptions - 36,159 distributions

Content Data Pending…

- Flore du Gabon – in process
- Plants of Nepal – not received
- eFlora of S Africa – available, pending
- eFlora Maghreb – pending
- New FNA – pending
- Solanaceae Source – pending
- Flora Helvetica – French descriptions, pending
- eMonocot, PalmWeb – pending
- African Plants Database descriptions – pending
- Caryophyllales content from EDIT - pending
- Illustrated Treatments of Korea – Word document

Action Items Progress

6. **Add descriptive data – As reported by Chuck**
91. **Google Server migration to MBG – Complete**
113. **Notify TNRS - TNRS was updated to March 2023 backbone - Complete**

Ongoing/Pending Action Items

6. **Enhance Production Portal with Descriptive Data - Ongoing**
7. **Create a Harvester/Admin Guide - Ongoing**
15. **Develop Markup Tools for a Toolkit – Deferred at St Louis**
48. **Make modifications to the Portal - Ongoing**
81. **Give percentages of what data have been uploaded from what is published for each source of Content – Pending**
108. **Review guidance on Data Downloads on the WFO website – Ongoing**

Ongoing/Pending Action Items

108. **Explore use of badges for kind of object on Portal pages – Pending**
109. **Send request to Pensoft for adding WFO papers to Zenodo WFO Community - Pending**
111. **Update Contributor Guides with Rhakhis info – Pending**
112. **Complete Harvesting of WCVP Distributions. Restore Geo Server. - Pending**

Recommendation

1. **Tie Action Item 109 (Badges) to future rebranding of WFO**
   - **Low priority**

Recommendation

2. **Create a subgroup to develop a Technical Strategic Plan**
   - A short document that outlines the systems and people/roles involved in running the WFO now
   - For each one a "vision" of what will replace it/them either in case of emergency or as part of planned improvements.

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Technical Strategic Plan

- Take a step back and scan the horizon
- **"Black/Cold Start"**
  - Limited meaning: Kick it off again if all hardware was destroyed
  - Challenging meaning: Could someone start from our data but no code or people?
- **Succession planning**
  - Systems
  - People
- **Resource commitments**
  - Systems
  - People
- Nobody can predict the future but we should have a narrative explanation of how we see things evolving.
- Role of subgroup would be to maintain a single, short document that provides this narrative.

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Technical Working Group Next Steps

- **Bring Tony Mast up to speed as WFO Gatekeeper**
- **Organize Technical Strategic Plan subgroup**
- **Complete June Taxonomic Backbone Data Reload on Public Portal**
- **Reload March 2023 Content Data with June 2023 Backbone**
- **Recover pending Content Data files from data storage**
  - **Continue name matching**
- **Restart communications with Content Providers**
- **Harvest new content with December 2023 Backbone on Public Portal**
- **Continue integration of Rhakhis into Content Harvesting process**
  - **Update Contributor Guides**

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Council decisions on the Technical Working Group recommendations

1) Tie Action Item 109, Explore use of badges for the kind of object and institution on Portal pages, to future rebranding of WFO and consider low priority. **APPROVED**

2) Create a subgroup to develop a Technical Strategic Plan. **APPROVED**

8. Report from the Task Force on Identification

Marc Sosef gave the following report on behalf of the Task Force on Identification. The report below is given in the form of the Powerpoint slides presented and received (copy available in the WFO File store on OwnCloud).

Task Force Identification

Report to the WFO Council

November 13th, 2023

Assignment:

To investigate what identification services are available and if and how these can be offered to the users of the WFO Portal.

Visotheary Ung (P)

Marc Sosef (BR)

Eve Lucas (K)

Main question:

Should the World Flora Online provide identification tools/services, besides the Taxonomic Backbone and Content information?

TF Identification to perform a feasibility study to support a decision to be made by the WFO Council

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Three categories of identification tools:

1. Dichotomous keys
2. Multi-entry keys
3. Image recognition (using AI)

PS. DNA Barcoding considered out-of-scope

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1. Dichotomous keys

two types:

bracketed key

1. - Flowers yellow 2
   - Flowers white 10
2. - Style 1 3
   - Styles 3 5
3. - .....
   - .....

indented key

1. Flowers with stamens of different lengths
   2. Leaves orbicular to reniform, 1.2-2.5 cm long, wider than long; petioles longer than leaves. Rare in northeastern Somalia ..... *S. cymbalarifolium*
   2. Leaves ovate to elliptic or lanceolate, 2-14 cm long, longer than wide; petioles shorter than leaves. Arid eastern and northeastern Africa.
      3. Stem prickles dense, acicular, less than 0.5 mm wide at base, pale yellow; fruit fully concealed by the accrescent calyx ..... *S. coagulans*
      3. Stem prickles absent or sparse, if present wider than 1 mm at base, yellow to orange or brown; fruit at least partly exposed ..... *S. melastomoides*
1. Flowers with all stamens equal in length. Widespread.
   4. Flower one per inflorescence, peduncle and rachis absent; corolla pentagonal, lobed for ¼-½ of the way to the base, 0.9-1.3 cm in diameter, Southern Africa ..... *S. supinum*
   4. Flower usually more than one per inflorescence, peduncle and/or rachis present in at least some inflorescences; corolla usually stellate, lobed for more than ½ of the way to the base, or if lobed for ¼-½ of the way to the base then corolla of long-styled flowers broader than 1.3 cm in diameter. Widespread. ..... *S. tuberosum*

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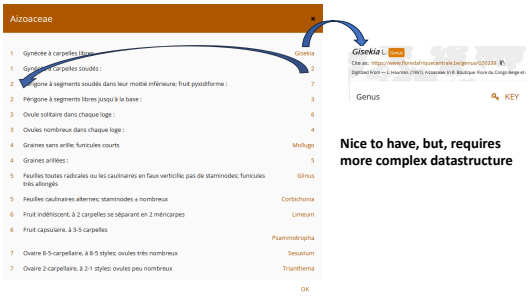
1. Dichotomous keys

'interactive', linking within and linking out



Nice to have, but, requires more complex datastructure

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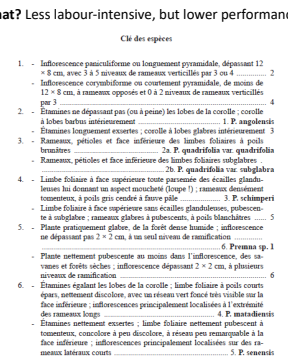
1. Dichotomous keys

PDF format? Less labour-intensive, but lower performance (not clickable)



Clé des espèces

1. - Inflorescence paniculiforme ou longuement pyramidale, dépassant 12 × 8 cm, avec 3 à 5 niveaux de rameaux verticillés par 3 ou 4 2
   - Inflorescence corymbiforme ou courtement pyramidale, de moins de 12 × 8 cm, à rameaux opposés et 0 à 2 niveaux de rameaux verticillés par 3 4
2. - Étamines ne dépassant pas (ou à peine) les lobes de la corolle ; corolle à lobes barbus antérieurement ..... 1. **P. angolensis**
   - Étamines longuement exsertes ; corolle à lobes glabres intérieurement 3
3. - Rameaux, pétioles et face inférieure des limbes foliaires à poils brunâtres ..... 2a. **P. quadrifolia** var. **quadrifolia**
   - Rameaux, pétioles et face inférieure des limbes foliaires subglabres ..... 2b. **P. quadrifolia** var. **subglabra**
4. - Limbe foliaire à face supérieure toute parsemée des écailles glanduleuses lui donnant un aspect mouchetté (loupe !) ; rameaux densément tomenteux, à poils gris cendré à fauve pâle ..... 3. **P. schimperi**
   - Limbe foliaire à face supérieure sans écailles glanduleuses, pubescente à subglabre ; rameaux glabres à pubescents, à poils blanchâtres 5
5. - Plante pratiquement glabre, de la forêt dense humide ; inflorescence ne dépassant pas 2 × 2 cm, à un seul niveau de ramification ..... 6. **Premna** sp. 1
   - Plante nettement pubescente au moins dans l'inflorescence, des savanes et forêts sèches ; inflorescence dépassant 2 × 2 cm, à plusieurs niveaux de ramification 6
6. - Étamines égalant les lobes de la corolle ; limbe foliaire à poils courts épars, nettement discolore, avec un réseau vert foncé très visible sur la face inférieure ; inflorescences principalement localisées à l'extrémité des rameaux longs ..... 4. **P. matadiensis**
   - Étamines nettement excertes ; limbe foliaire nettement pubescent à tomenteux, concolore à peu discolore, à réseau peu remarquable à la face inférieure ; inflorescences principalement localisées sur des rameaux latéraux courts ..... 5. **P. senensis**

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1. Dichotomous keys

Or, link out to keys provided in external e-Flora's and portals .....

2. Multi-entry keys

Based on a Taxon / Character datamatrix

	Life form			Leaf width			Flowers		Corolla shape			Fruit colour	
	tree	liana	herb	1-5 mm	5-10 mm	10-30 mm	solitary	fasciculate	star	cup	trumpet	yellow	red
Aus a	1	0	0	0	0	1	1	0	1	0	0	1	0
Aus b	1	0	0	0	0	1	1	0	1	0	0	1	0
Aus c	0	0	1	0	1	0	1	0	1	0	0	1	0
Bus x	0	1	1	1	1	0	1	1	1	0	0	0	1
Bus y	0	1	0	0	1	1	1	0	0	0	1	0	1
Bus z	0	0	1	0	0	1	1	0	0	0	1	0	1
Cus m	0	1	1	1	0	0	0	1	0	1	0	0	1
Cus n	1	0	0	1	0	0	0	1	0	1	0	0	1
Cus o	0	0	1	0	1	0	1	0	0	1	0	0	1

2. Multi-entry keys

Various systems available (DELTA, LUCID, Linnaeus, etc.)
Most promising seems to be the Xper2-Xper3 platform (managed in Paris) freely available; clear interest to collaborate with WFO

Xper2 = stand alone version
Xper3 = web-based version

- implements TDWG SDD Standards, export data to SDD, Nexus, Delta
- associated tools to check the consistency of the data
- generates both dichotomous and multi-entry keys

2. Multi-entry keys

Interesting model at Flora do Brasil
Data and keys internally created, but also linking out to ones existing elsewhere.

2. Multi-entry keys

How to fill the taxon / character matrix…?

- **TRY (Plant Traits Database)**: few data useful for identification purposes
- **GIFT (Global Inventory of Floras and Traits)**: focus on species with a specific ecological interest (c. 100,000 species now)
- **BIEN (Botanical Information and Ecology Network)**: some 60 traits, but focus not on morphology (rather ecology)
- **DELTA (DEscription Language for TAxonomy)**: applications mostly local and only for some groups (grasses), but with a world plant family key

2. Multi-entry keys

How to fill the taxon / character matrix…?

The future challenge seems to be to find out how to use **Artificial Intelligence** (AI) to (semi)automatically data-mine the thousands of plant descriptions available within the WFO portal ….

Can we use ChatGTP to realize that?

3. Image recognition

- **Rapid improvement of recognition software over the last decade**
- **Rapid growth of 'annotated' photos (= with validated identification) to train the models**
- **Works amazingly well in W. Europe (how about the US?), but still rather poor in most tropical regions.**

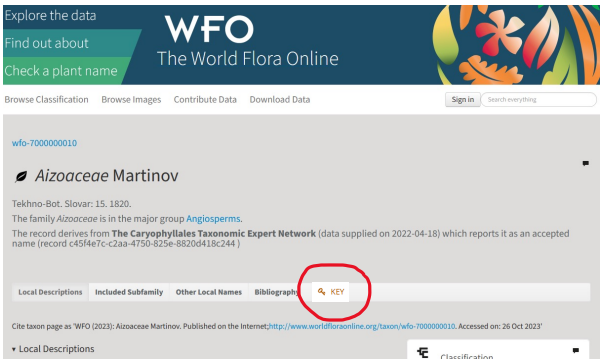
3. Image recognition

- **Various systems available (Google lens, ObsIdentify, PlantClef, iNaturalist Seek, ….)**
- **Pl@ntNet** (Montpellier, France) **stands out and is very open to collaboration with WFO.**
  - multilingual, on-line service
  - governed by a consortium of 4 research organizations (CIRAD, Inria, INRAE and IRD) and the Agropolis Foundation
  - business model looks sustainable
- **Identification of herbarium material tested, but no promising results yet.**

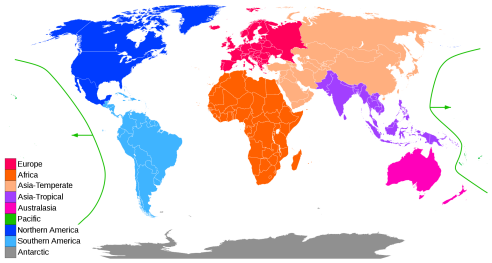
3. Image recognition

Conclusion of Task Force: WFO Portal can best direct users to available external tool(s) for this type of identification

All Identification actions should have an entry point



Select the region from which your plant/moss originates



Can you refine further? (TDWG level 2 or 3)

Which identification tool are you looking for?

Dichotomous key	Multi-entry key	Image recognition
Answer fixed questions about your plants' morphology	Provide information on random characters of your plant	Have your photo of a plant identified by Artificial Intelligence

Recommendations from the Task Force Identification:

Rationale: The World Flora Online is the response of the global botanical society to Target 1 of the Global Strategy for Plant Conservation 2011-2020: "An online flora of all known plants." The WFO consortium has made great progress in creating the taxonomic backbone of plant names, the WFO Plant List, as well as gathering huge amounts of content information (morphological descriptions, distributions, ecology, illustrations, etc.).

Given the crucial importance of correct and reliable identification of animal, fungal or plant material for any biological study, including conservation-related activities, one can imagine the GSCP meant to also strengthen plant identification processes. Users of a World **Flora** might also *expect* to find the tools to assess the identity of their plant material?

Recommendation 1:

The WFO Council recognizes plant identification as a third element, apart from the taxonomic backbone & content information, falling within the scope of the World Flora Online initiative.

Recommendation 2:

Dichotomous keys: The WFO Council is recommended to further investigate the feasibility of building a resource of dichotomous keys (either stored within the WFO environment or via linking out to where these are available, or both), each of them linked to the appropriate taxon level and with a geographical indication (TDWG level 2 or 3 table).

[For most Content providers it is probably too much effort to deliver such in a 'smart', clickable format, which will also need additional software development within WFO. Hence, incorporate them as PDF, or link out to external sources (web-based platforms, literature) seems like the best feasible option.]

Recommendation 3:

Multi-entry keys: The WFO Council is recommended to actively pursue strategic alliances with existing initiatives and organizations, notably Xper3, GIFT, PI@ntnet, …, to stimulate a common effort to develop a global plant-character database, to be managed outside of, but linked to the WFO structure.

[WFO can focus on its primary objectives, the taxonomic backbone and content information. Specific expertise is available elsewhere (but they may become members of the Consortium?). Also to explore using AI to data-mine the descriptive content available within WFO.]

Recommendation 4: **Image recognition**: The WFO Council is recommended to organize a partnership with Pl@ntNet, to try and realize a strong link between both facilities, pointing users to this external option for identification of plant images. [Pl@ntNet seems the only organization with a strong interest in such a collaboration. WFO can also stimulate Consortium members to provide reliably identified photographs, further improving the AI routines. Identification using digital images of herbarium material to be investigated further.]	

Council decisions on the Task Force on Identification recommendations

1) The WFO Council recognizes plant identification as a third element, apart from the taxonomic backbone & content information, falling within the scope of the World Flora Online initiative. **APPROVED**

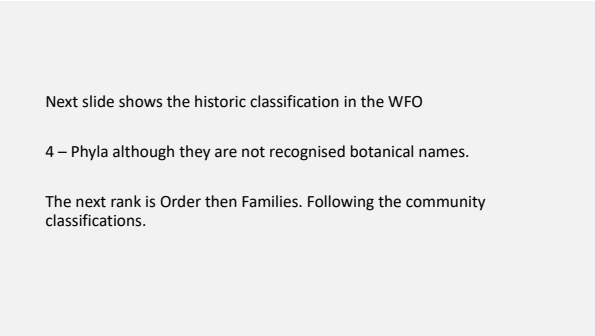
2) The WFO Council to further investigate the feasibility of building a resource of dichotomous keys (either stored within the WFO environment or via linking out to where these are available, or both), each of them linked to the appropriate taxon level and with a geographical indication (TDWG level 2 or 3 table). **APPROVED**

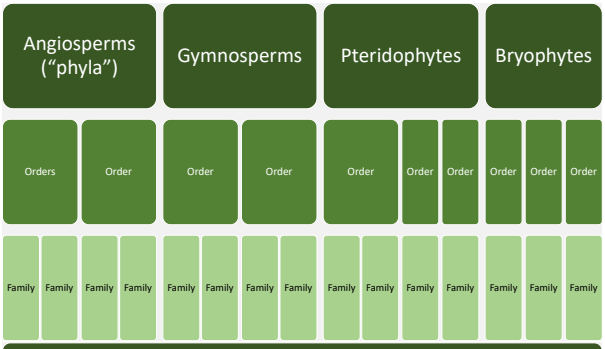
3) The WFO Council to actively pursue strategic alliances with existing initiatives and organizations, notably Xper3, GIFT, Pl@ntnet, …, to stimulate a common effort to develop a global plant-character database, to be managed outside of, but linked to the WFO structure. **APPROVED**

4) The WFO Council to organize a strategic allinace with Pl@ntNet, to try and realize a strong link between both facilities, pointing users to this external option for the identification of plant images. **APPROVED**

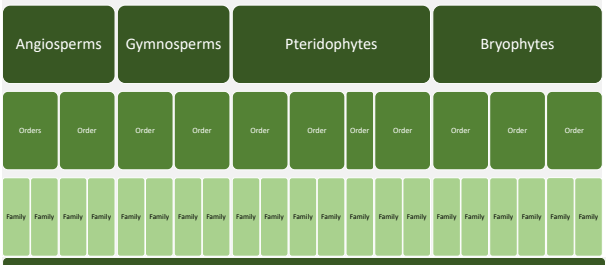
9. Report from the Task Force on Higher Plant Classification

Alan Elliott gave the following report on behalf of the Task Force on Higher Plant Classificaiton. The report below is given in the form of the Powerpoint slides presented and received (copy available in the WFO File store on OwnCloud). Good progress has been made for all non-Angiosperm groups, with the results implemented in Rhakhis. Work on the Angiosperms will be completed before the next Council and a proposal put to the Taxonomic Working Group to recommend to Council that the completed higher classification be adopted.



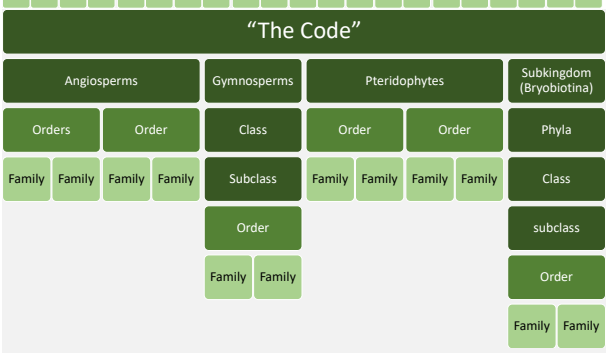


When WFO backbone moved to Rhakhis we added a root node rank of Code, which references the Shenzen Code. This was needed as we in effect had 4 unlinked backbones.



The current backbone has changed since we brought in Conifer and Bryophyte with additional ranks.

This is the rank structure for the Major Groups in the backbone.



The following was created using guidance with input from Conifer TEN, Bryophyte TEN and Michael Sundae who will be part of the PPG community.

Bryophytes are already implemented as it came from the TEN. Using Puttick et al. 2018 and modifying it using Doweld 2001.

For the other 3 Major Groups Angiosperms, Gymnosperms and Pteridophytes. We used Puttick et al. 2018 as a start point, then Ruggiero et al. 2015 and Doweld 2001 to modify.

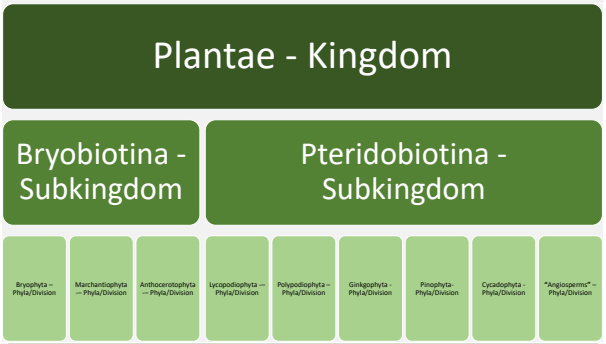
The aim is to use name that can be Typified and not use informal names that are outside the scope of the Code, as per the Bryophyte data.

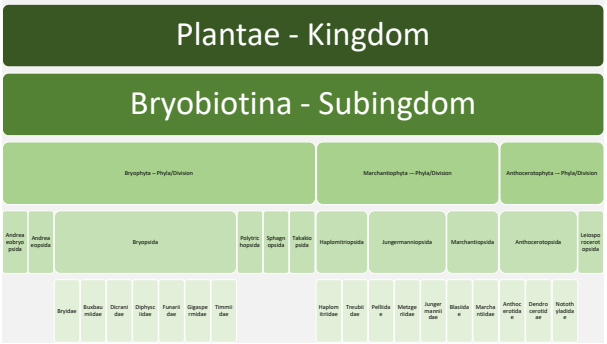
A single subkingdom *Pteridobiotina* appears to be the most appropriate name for the remaining three Major Groups.

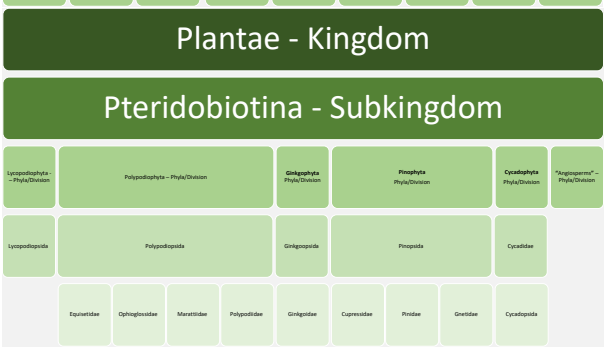
Ferns – 2 phyla, each with 1 class, 1 class with 4 subclasses. This aligned with PPG1.

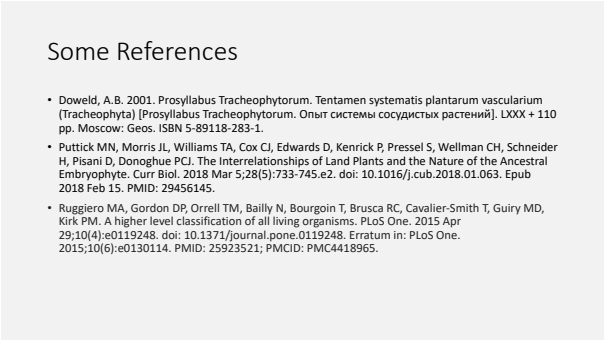
Gymnosperms – Community Classification WFO follows provided up to classes. The three classes each are given phylum each.

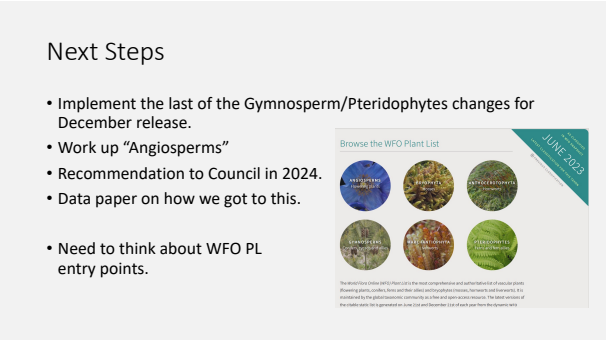
Angiosperms – This still needs worked on. It is likely we will add classes.











10. Report on progress with the WFO Strategic Plan

Peter Wyse Jackson mentioned that work was being undertaken to prepare the next draft of the WFO Strategic Plan, incorporation the suggestions and comments made by Council members during the 19th WFO Council meeting, held at Kew earlier in the year. He said that this would be made available for review for the next in-person (21st) WFO Council meeting, when there would be more time available to review the draft plan in detail.

Following the presentation on the possibility of the registration of WFO as an international NGO in Switzerland at the 20th Meeting of the World Flora Online Council (Kew), Nicola Schoenenberger was requested by the WFO Council to further review possibilities. In the meantime, he has received clearance from his political superiors to proceed with a proposal for the establishment of an international association. At first glance, our current MoU contains most of the elements of an association statute, the necessary changes would likely be more in form than in content. A more concrete proposal will be presented and discussed at the next council meeting.

11. Update from the Communications Working Group

The Communication Working Group needs to be reactivated. In the past, it was not the ideas that were lacking, but rather the people who could practically implement communication campaigns on WFO, i.e. the professionals at the consortium member's institutes. A first meeting with Catherine Martin, Senior Public Information Officer at Missouri Botanical Garden who will work with the working group, took place in St Louis in September 2023 with Nicola Schoenenberger. All consortium members wishing to participate in the working group or delegate someone from the communication departments of their institute are asked to write to Nicola Schoenenberger (Nicola.schoenenberger@ville-ge.ch), who will organise an online meeting of the renewed Communications Working Group in the first quarter of 2024.

12. Review of Action Points from the last meeting

All Action Points were covered in previous discussions during the meeting.

13. Plans for the 22nd meeting of Council

Peter Fritch reported on several dates in March and April 2024 when the WFO Council could meet at Fort Worth Botanic Garden, Botanical Research Institute of Texas, USA.

Subsequent to the Council meeting, it was confirmed that the date chosen for the meeting would be the week beginning 18 March 2024.

14. Any Other Business

There were no matters brought up.

Annex 1

WFO –ACTION ITEMS FROM 21st COUNCIL MEETING – Virtual November 2023

#	TASKS	WHO?	WHEN?	COMMENTS
1	**Presentations on WFO.** Take advantage of the meetings we attend to promote the WFO. Presentations to be uploaded to WFO Presentations folder in ownCloud.	All	Standing Item	Recent and next presentations: TDWG, October 2023, WFO presentations by Roger and Chuck. XX IBC 2024, Madrid, July, WFO symposium accepted.
2	**Update current signatories.** Secretariat to maintain an archive of hard copies of any formal agreements with WFO. List of Consortium members on the WFO website to be updated.	Peter Wyse Jackson	Standing Item	No new members had joined the Consortium since the Meise meeting.
3	**Update Social Media.** Keep updating FaceBook, Twitter, etc with news and current information.	Comms Working Group	Standing Item	Richelle Wiehe (MBG) will do the updates, send images and news items to her.
5	**Videos.** Links to videos by partner institutions to be included on WFO Website.	All	Standing Item	Anyone with videos relevant to WFO, please send to Alan Elliott.
6	**Enhance Production Portal with Descriptive Data.** Production portal should be enhanced with descriptive data content as advised by Taxonomic WG/Council. Send a tweet as content is loaded to Production.	Tony Mast	Standing Item When ready, Tony Mast will touch base with the intermediary contacts of the Content providers for the next digital resources to bring into the WFO Portal, as determined by the Taxonomic WG in order to increase the diversity of content and geographic coverage.	See Meise Tax WG report for revised priority list for harvesting. Initial harvesting of content for names matched in first name-matching process prioritized for as many datasets as possible (rather than resolving the residual un-matched names). • Fl. Trop. East Africa & Fl. Trop. West Africa (Kew) – descriptions divided, need to be combined • IUCN Conservation Status – Pending new Version. • Improve Metadata for Images from Solanaceae & Flora of China - Pending Continue to load remaining and new datasets: • Solanaceae Source – Contacted back to coordinate an updated dataset

#	TASKS	WHO?	WHEN?	COMMENTS
				• NYBG – Harvested all descriptions in Test: NorthEastern US, Neotropica, Brittonia & NYBG Memoirs • Catalogo de las Plantas de Colombia –26K names - harvested. • Australian Floras – First dataset of descriptive data harvested. • Flora of Nepal – No data received. • Illustrated Treatments for Korea - Got a response, coordinating to convert Word documents into structured data • Fl. Helvetica –French descriptions pending. • Flora do Brazil – more descriptions being provided. • eMonocot descriptions (Kew, TBC) –PalmWeb descriptions pending harvesting • New FNA data - Got data and content sample. Issues with Authors format. Reviewed file's DwCA format. Repeated Name Matching process as requested. • African Plants Database – (distributions, ecology, biology) 200K names, 78K taxa. - Pending. • eFloramaghreb.org - 6400 taxa – Pending. • Flora of Ireland – Implementing corrections to Name Matching Report. • Caryophyllales- Harvested Nepenthes taxa. Pending other taxa and all content from EDIT platform.
7	**Create a Harvester administration/operations guide.** The development of a Harvester administration/operation guide should be carried out immediately through testing and collaboration.	Tony Mast	Ongoing	New updates should be included. Created documentation for "Name-Matching" process and made code and SQL Stored Procedures available for Geneva in Github (private MBG-CBI repository)
13	**Taxonomic Expert Networks (TENs)** 1) Encourage proposals of new TENs by contacting potential	TEN Manager Alan Elliott	Standing Item	1) TENs approved by Council November 2023: Calophyllaceae

#	TASKS	WHO?	WHEN?	COMMENTS
	taxonomic experts and supporting them in the formulation of a TEN. 2) Update and publish the Order/Family coverage/gap analysis on About Pages of WFO website 3) Build on the offer of a Fern TEN to involve wider community opinions 4) Rafaël Govaerts to advise on WCSP/WCVP reviewers as potential TEN focals 5) Connect with CoL Brassicaceae experts 6) Connect with IUCN SSC Specialist Groups not already approached 7) Highlight inactive TENs for consideration of removal [NEW]			Ebenaceae Meliaceae 2) Gap analysis for plant families to be updated for higher classifications has started. 3) Ongoing. 4) Done. 5) Ongoing 6) Done
15	**Develop markup Tools for a Toolkit.** Consolidate the Markup Tools being used; develop them to integrate them into a toolkit. - SANBI has developed Markup tools and are available for others to use. Available from GitHub: github.com/rudivs/SpeciesMarkupAddIn	Technical Working Group	Deferred at St Louis	
18	**Save the Dates** of next meetings of Council	Peter Wyse Jackson	22nd Meeting – In Person, Botanical Research Institute of Texas, Fort Worth, Texas. USA. Week of 18 March 2024	Post the report of the previous Council Meeting on the WFO website. Date of next physical meeting to be reviewed by Co-Chairs
33	**Resolve insufficient resources to support:** a) Software development staffing.	WFO Council	Ongoing	a) Missouri is committed to providing Tony Mast's role, but we have an issue with software development staffing. Rhakhis software developed by Roger Hyam (RBGE).
48	**Make modifications to the Portal**	Technical Working Group	Ongoing	NB Code changes required 18. Pending

#	TASKS	WHO?	WHEN?	COMMENTS
	18. Assess how to provide page hit statistics by data provider. 28. Reveal hidden fields (e.g. Basionym) 29. Enable alternate classifications			28. Deferred at St. Louis 29. Deferred at St. Louis
80	**Develop Criteria for judging authorisation of potential Content Providers**	Taxonomic Working Group	Pending (revisit with strategic review)	Criteria (scientific credibility, completeness, substantial contribution, currency, etc.), similar to those used for assessing TENs. Another approach is to list what we would not accept.
81	**WFO to give percentages of what data have been uploaded from what is published for each source of Content**	Technical Working Group	Pending	Possibly include in a Content stock take and show against source in the Flora page in About Pages. Derive percentages from table of content data records maintained by Tony Mast.
84	**Contact Consortium Members to solicit additional Content datasets**	WFO Council Co-chairs	Ongoing	
86	**Explore formalising WFO's relationship with IPNI with a written agreement covering the nature of the collaboration and the exchange of data**	WFO Council	Pending	
91	**Google Cloud servers** Migrate WFO servers on Google cloud to Missouri.	Missouri	Done	All WFO servers migrated to MBG infrastructure. Mailman, OwnCloud installed and functional. Web application firewall implemented and Production Portal placed into a DMZ for security.
92	**WFO post 2020 strategic review and forward planning**	Council Co-chairs to lead	2023/24	Consider Garnett et al. (2020) '*Principles for creating a single authoritative list of the world's species*' Review the WFO Portal interface (previously #63) – Tax WG Review suppressing display of Taxonomic Status for names above Species in the search results and Taxon

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				Page and adding them to Taxon Pages (previously #77) – Tax WG At Meise: a strategic planning subgroup to be formed to take forward the key objectives put forward by the Working Groups.
93	**Conduct stock take of Content and approved providers**	WFO Gatekeeper and TEN Manager	For next Council	To be done after December/January relaunch
105	**Reconstitute a Communications Working Group to promote WFO**	Communications Working Group	In process	Nicola Schoenenberger drafted a media promotion campaign and is taking a lead in reforming this WG
106	**Explore registration of WFO as an NGO in Switzerland**	Nicola Schoenen-berger	In progress	Nicola Schoenenberger presented options at the March 2023 Council, to follow up
107	**Review consistency of terminology used in WFO webpages and guidelines**	Marc Sosef	Next Council	Done, and followed up with web page changes
108	**Review guidance on Data Downloads on the WFO website**	Tony Mast, Alan Elliott	Next Council	Replace text and downloads on 'Download Data' page of the WFO Portal with instructions on how Content and classification data can be downloaded, e.g. links to Zenodo, ChecklistBank, WFO Plant List, Portal downloads by registered users, etc.
109	**Explore use of badges for the kind of object and institution on Portal pages.**	Roger Hyam, Tony Mast	Deferred at November 2023 Council	Badges for kind of object to be deferred until a future rebranding of WFO. This is considered low priority.
110	**Send request to Pensoft Publishers to put papers that mention WFO into the WFO Zenodo community (DOIs).**	Technical Working Group	Next Council	In progress
111	**Update Contributor Guides with latest data process changes after addition of Rhakhis.**	Tony Mast, Roger Hyam	Next Council	In progress

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112	**Complete harvesting of WCVP Distributions. Restore GeoServer on the Portal.**	Tony Mast	Next Council	In progress
113	**Contact Taxonomic Names Resolution Service (TNRS) to update their WFO version.**	Technical Working Group	Completed	TNRS is now utilizing the March 2023 WFO backbone and are aware of WFO updates.
114	**Consensus classification data development in Rhakhis** 1) Incorporate updates from TENs 2)Update non-TEN groups with data from WCVP, or other published classifications approved by the Taxonomic WG 2) Report on deduplication in curation metrics	TEN Manager Alan Elliott		1) 252 TEN families updated since Kew meeting 2) ca. 200 WCVP families updated since Kew meeting 3) not reported, but currently stands at around 5,000 name pairs. What names are included in the Rhakhis? Currently 'All effectively published names' • Correctable original spellings? • Orthographic variants from providers? • Used for name-matching and providing feedback on searches • For internal use, not to be shown on the public portal •Sub-group set up to support the development of names handling in Rhakhis - *Pending further investigation*
115	**Consider modifications to the Family and Higher order classifications**	Taxonomic Working Group	Ongoing	Activity on this is under Task 116
116	**Establishing a supra-order classification**	Lauren Raz Taxonomic Working Group	Next Council	Supra-order classification to be decided by Taxonomic WG and provided to Catalogue of Life. Higher classification under review, all bar Angiosperms done, to complete by next Council meeting.
117	**Building a TEN global community** 1) Run a WFO TEN side event at XX IBC Madrid July 2027	Taxonomic Working Group	Ongoing	Creation of wfo-tens@ mailing list approved.

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	2) Develop an annual WFO TEN online symposium to share lessons learned and promote collaboration between TENs			1) Part of new IBC coordination group activity [see Task 122] 2) Seek to run an online symposium. Nadja Korotkova and Caryophyllales to organise the first of these in 2023. [not progressed yet]
118	**IUCN Red List to adopt WFO Plant List as its accepted classification**	Peter Wyse Jackson (Missouri and Kew)	Next Council	WFO to request to the IUCN Red List governing body to adopt WFO Plant List as the accepted classification used by IUCN for plant groups covered by WFO
119	**Promote WFO in the development of GSPC Complementary Actions supporting the Kunming-Montreal Global Biodiversity Framework**	Peter Wyse Jackson	SBSTTA Nairobi, October 2023	Done. WFO explicitly included in SBSTTA Recommendation
120	**Review of Identification Tools provided/recommended by WFO**	Marc Sosef Taxonomic Working Group	Completed	Report given to Council with recommendations. Follow-up see #125-127
121	**Create a subgroup to develop a Technical Strategic Plan**	Technical Working Group	Next Council	Subgroup to create a short document that outlines the systems and people/roles involved in running the WFO now and for each one a "vision" of what will replace it/them either in case of emergency or as part of planned improvements. This plan will address WFO current technical infrastructure only.
122	**Create a group to coordinate activities for the XX IBC, Madrid, July 2024**	Thomas Borsch and Council Co-chairs	Next Council	To maximise opportunities for engagement with and promotion of WFO linked to the XX IBC, e.g. TEN side event, WFO symposium, linked publications in TAXON
123	**Create mailing lists for the TEN network and the Communications Working Group**	Missouri Botanical Garden	As soon as possible	To facilitate communication with the TEN community and for the reformed Communications WG

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124	**Review inactive/unresponsive TENs and if necessary recommend to Council any to be de-listed**	Taxonomic Working Group	Next Council	
125	**Investigate the feasibility of building a resource of dichotomous keys.**	Taxonomic and Technical Working Groups	Ongoing	Include in the future developments of software infrastructure
126	**Pursue strategic alliances with Xper3, GIFT, etc. for collaborating with identification resources**	Taxonomic Working Group	Ongoing	To stimulate common efforts in developing a global plant character database, e.g, study the feasibility of using AI to datamine the WFO descriptive content.
127	**Develop a collaboration with Pl@ntnet to offer support to users in identifying images using AI image recognition tools**	Taxonomic Working Group	Ongoing	Increasing the usability of the WFO portal by offering support in identification to users.