



Report of the 17th World Flora Online (WFO) Council

The 17th World Flora Online Council meeting held on Tuesday, 6th July, 2021. The meeting was held virtually and was two and a half hours in duration, starting at 7.00am, St Louis, USA time. A draft agenda for the meeting was circulated in advance.

Attendance:

Valida Ali-zade	Institute of Botany, Azerbaijan National Academy of Sciences, Baku, Azerbaijan
Olaf Banki	Species2000/Catalogue of Life, Leiden, Netherlands
Walter Berendsohn	Botanic Garden and Botanical Museum Berlin-Dahlem, Berlin, Germany
John Brinda	Missouri Botanical Garden, St. Louis, USA
R C K (Richard) Chung	Forest Research Institute Malaysia (FRIM)
Eduardo Dalcin	Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, Rio de Janeiro, Brazil
Dalila Espirito Santo	European Consortium of Botanic Gardens, Lisbon, Portugal
Sebsebe Demissew	National Herbarium, Addis Ababa, Ethiopia
Alan Elliott	Royal Botanic Garden Edinburgh, Edinburgh, UK
Demetry Geltman	Komarov Institute of Botany, Russian Academy of Sciences, St Petersburg, Russia
Adil Güner	Nezahat Gökyiğit Botanik Bahcesi, Istanbul, Turkey
Thomas Haeevermans	Muséum National d'Histoire Naturelle, Paris, France
Patrick Herendeen	International Association for Plant Taxonomy
Marianne Le Roux	South African National Biodiversity Institute (SANBI), Pretoria, South Africa
Pierre-André Loizeau	Conservatoire et Jardin Botaniques, Geneva, Switzerland
David Middleton	Singapore Botanic Garden, Singapore
Chuck Miller	Missouri Botanical Garden, St. Louis, USA
James Miller	Missouri Botanical Garden, St. Louis, USA
John Parnell	Botany Department of Trinity College Dublin, Dublin, Ireland
Lauren Raz	Universidad Nacional de Colombia, Bogotá, Colombia
Rashad Salimov	Institute of Botany, Azerbaijan National Academy of Sciences, Baku, Azerbaijan
Erik Smets	Naturalis Biodiversity Center, Leiden, Netherlands and Flora Malesiana Foundation, Leiden, Netherlands
Marc Sosef	Meise Botanic Garden, Meise, Belgium
Rob Turner	Royal Botanic Gardens, Kew, London, UK
William Ulate	Missouri Botanical Garden, St. Louis, USA
Visotheary Ung	Muséum National d'Histoire Naturelle, Paris, France
Mark Watson	Royal Botanic Garden Edinburgh, Edinburgh, UK
Anthony Whalen	Australian Biological Resources Study, Canberra, Australia
Peter Wyse Jackson	Missouri Botanical Garden, St. Louis, USA
Kathy Farris	Missouri Botanical Garden, St. Louis, USA
Nye Hughes	RBG, Edinburgh UK

1. Welcome

The Co-chairs Peter Wyse Jackson and Pierre-André Loizeau welcomed all participants in the meeting. They also thanked the teams in St Louis and Edinburgh for their outstanding work on the WFO over the last few months and are excited to have the major upgrade of the WFO portal that is due shortly, with the new taxonomic backbone, more content, new 'About' pages and a vibrant new portal design.

2. Apologies for absence

Apologies for absence from the meeting were received from Thomas Borsch (BGBD, Berlin), Maïté Delmas (MNHN Paris), Geoffrey Levin (FNA), Joe Miller (GBIF), Alan Paton (RBG Kew), Colin Pendry (RBG Edinburgh).

3. Adoption of the Report from the 16th meeting of the WFO Council (held virtually on 16th March, 2021).

The Report of the 16th WFO Council meeting was adopted, with the addition of one point that had been omitted from the action list table in the draft Report circulated prior to the meeting. This point was related to the forming of a promotion sub group from amongst the Taxonomic Working Group membership.

4. Update on the WFO Portal and Content

William Ulate, WFO Gatekeeper, provided an update on progress made with the WFO portal since the last meeting. He highlighted the following: i) progress on the new version of the portal under construction; ii) the pre-harvest database checks and errors that had been fixed; iii) the work that had been undertaken to update protologue information from the World Checklist of Vascular Plants (WCV) (from Kew) – missing data; iv) efforts to load more taxonomic backbone data from TENS, notably on the Caryophyllales and Solanaceae; v) progress on the preparation of a complete new WFO Taxonomic Backbone version and vi) loading more content data.

He illustrated the current data content of the portal and progress made in incorporating new data by providing the following tables.



Fixed Pre-harvest DB checks

- Synonymy, Family and MajorGroup assignment
 - Synonym of synonym: 24,888
 - Valid name with synonym as parent: 1,615
 - Excluded name as parent: 284
 - Synonym with excluded parentName: 1,912



Fixed Pre-harvest DB checks

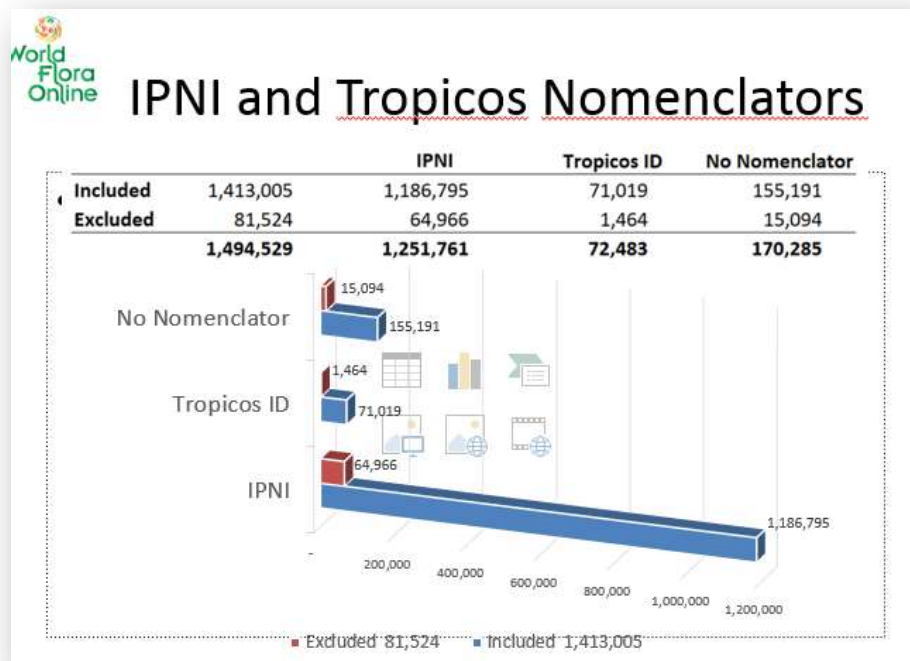
- Synonymy, Family and MajorGroup assignment
 - Valid names with no parent: 72
 - Synonyms with no accepted name: 258
 - Family mismatch of valid taxon and parent: 284
 - Same family, different Major Group: 4,759
 - Orders & families, no parent or Major Group: 319

He mentioned that after the changes made related to incorporation of data from WCV, Major Groups, Pteridophytes and Bryophytes were implemented in the Preharvester DB the following steps were taken:

- A list of issues for the current taxonomic backbone was submitted for review. These came from checks of the synonymy, the family and the Major Group assignment.
- Also included were some minor checks for empty fields where there should be a value, the reference to excluded names from included names, and the coherence of the family and major group assigned throughout the Taxonomic Hierarchy.

In relation to the Taxonomic Backbone, he outlined the following points that had been addressed:

- Pteridophytes major group inconsistency
- Irvingiaceae, including distributions and taxonsource URL
- New names from Flora of Thailand
- Zingiberaceae IDs assigned
- *Meconopsis* and *Cathcartia* classification
- SolanaceaeSource update



IPNI coverage went from 65% to 83.7%.

Nomenclator coverage is 89% (including TROPICOS ID for Bryophytes).

The Table below includes the numbers of names sourced from a range of different datasets that had been incorporated.

- NYBG: NorthEastern (5,575/229), Neotropica (18,541/120), Brittonia (11,200/72) & Memoirs (21,562/571)
- Fl. Helvetica (5,938 / 131)
- FdAC (Meise) (16,784 / 723)
- Flora of Australia (418 / 31)

Provider	Flora	Initial	Test	Production	Status
1 Solanaceae	Solanaceae Source	1,956	1,956	1,956	Included new names from more up-to-date dataset
2 SANBI	Flora of South Africa	79,130	79,130	79,130	
3 Kew POWOP	Flora of West Tropical Africa	15,982	15,982	15,982	
4 Kew POWOP	Flora of Tropical East Africa	78,165	78,164	78,164	
5 Kew POWOP	Flora Zambesiaca	70,085	70,084	70,084	
6 MBG	Flora Mesoamericana	8,510	8,510	8,510	
7 MBG	Flora de Nicaragua	9,016	9,016	9,016	
8 MBG	Flora of Pakistan	4,666	4,662	4,662	
9 MBG	Flora de Panama	17,290	17,290	17,290	
10 eFloras	Flora of North America	16,438	16,438	16,438	
11 eFloras	Flora of China	37,029	37,029	37,029	
12 MBG	Manual de Plantas de Costa Rica	5,933	5,933	5,933	
13 MBG	Moss Flora of China	1,722	1,721	1,721	
14 MBG	Moss Flora of Central America	704	704	704	
15 MBG	Novon	277	275	277	
16 Turkey	Illustrated Flora of Turkey	282	282	282	
17 FloraColombia	Flora de Colombia	847	847	847	
18 RBGE	Rhododendron Resource Center	857	855	855	
19 NYBG	Flora of NorthEastern US	5,804	5,575	5,085	
20 NYBG	Flora Neotropica	18,661	18,541		
21 NYBG	Brittonia	11,272	11,200		
22 NYBG	Memoirs	22,133	21,562		
23 Geneva	Flora Helvetica (German)	6,069	5,938	5,938	Descriptions truncated. New complete dataset received.
24 Geneva	Flora Helvetica (French)	6,069			Complete dataset received.
25 Geneva	African Plants Database	15,831			Descriptions truncated. New complete dataset expected.
26 Geneva	eFloramaghreb.org				
27 Meise	Flora of Central Africa	17,507	16,784	16,784	Harvested in Production Portal. Name Match required
28 FloraBrazil	Flora do Brasil 2020	105,119	76,908	76,908	Habit and distribution in. New descriptions available.
29 Bahamas	Leon Levy Nature Preserve Flora	1,396	1,104	1,396	647 taxa
30 IrishFlora	Flora of Ireland	1,388			Reviewed Name Match again.
31 Australia	Flora of Australia	418	406		First set of data received and harvested in Test (418).
32 FNA	New FNA data	65,794			Name Matching process redo. Pending harvesting.
33 eMonocot	Araceae	8,373			
34 eMonocot	PalmWeb.org	5,915			
35 RBGE	Flora of Nepal				
36 DNP	Flora of Thailand				Draft descriptions file within a few weeks - Jun.14th
37 KRNatArboretum	Flora of Korea				Would upload Korean information at the end of the year
38 MNHN	Floras MNHN				In progress...
		640,638	506,896	454,991	



The slide below presented the additional information provided for the WFO from the African Plants Database (Geneva).

	Included	Excluded	Total
With a WFO ID	174,693	2,339	177,032
Without a WFO ID	26,920	131	27,051
Total	201,613	2,470	204,083

Finally, he outlined some proposed next priority steps, as follows:

- Load More Backbone Data from TENs – Cactaceae and Aizoaceae underway
- Reload Production Backbone from PreHarvest
- Load More Content Data from the following sources:
 - African Plant Database (truncated descriptions had been received from the African Plant Database so a new version was pending receipt)
 - MNHN
 - Flora of Thailand
 - Korean Plants
 - eMonocot descriptions
 - Australian Floras
 - Flora of Ireland

- New Flora of North America
- Flora of Brazil
- Flora of Nepal
- Add new names from WCVF – As requested per family
- Add new names from IPNI – Periodically

5. Report from the Taxonomic Working Group

Alan Elliott presented a report from the Taxonomic Expert Groups (TENGs). He outlined updates achieved since the last meeting (16th March, 2021) and reminded the meeting that fuller details would be provided in the report from the Taxonomic Working Group (to follow). He addressed the following three topics:

1. Deduplication [Task 44]
2. Activity updates from approved TENGs
3. New TENGs to approve [Task 13.1]

1. Deduplication

In relation to deduplication the following tasks achieved and changes made between March and the end of June:

17,000 duplicate records were identified and addressed which were artefacts from The Plant List. He said that other duplicates had been addressed as they worked through the IPNI and WCVF updates but there was a risk that new duplicates have crept in.

- Preharvester DB quality control check.
 - Synonyms of Synonyms – 25k
 - Accepted name with synonym as Parent – 1.6k
 - Same Family different Major Group – 4.8k
 - Excluded name as accepted name – 1.9k
 - Accepted name with no parent - 72
 - Synonym with no accepted name – 258
 - Family mismatch – 284
 - Hanging Orders – 280 (all excluded)
- Incongruence between WCVF and WFO.
 - Ca. 178K records returned. Much less of an issue than 1st thought
 - Mostly the result of different terminology or TENG families
 - Still needed to edit about ca. 50k records
 - We also found ca.3k WCVF accepted names not in the preharvester.
- Irvingiaceae updated to include taxonsource URL.
- *Meconopsis* and *Cathcartia* done.
- Zingiberaceae classification completed.
- SolanaceaeSource classification completed.
- Caryophyllales preparatory steps.
 - excluded names, names they do not consider part of their TENG.
- Cactaceae, Aizoaceae and Achatocarpaceae classifications being worked on right now.

Activity updates from approved TENS

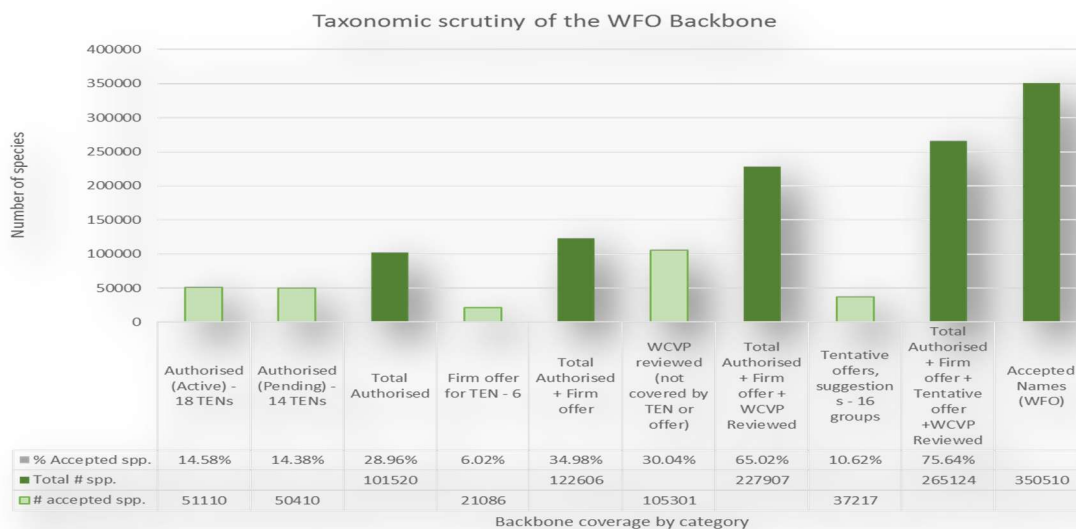
There are currently have 32 approved TENS:

- 18 are active TENS;
- 2 are preparing data (Aquifoliaceae, Bryophytes);
- 16 that have name matched (including partial) - Arecaceae, Begoniaceae, Bryophytes, Caryophyllales, Conifers, Cordiaceae, Ericaceae, MADCAT, Musaceae, Styracaceae, Cycads, *Hypericum*.
- 3 that have partial backbone updates - Caryophyllales (Nepenthaceae, Cactaceae, Aizoaceae, Achatocarpaceae), Begoniaceae
- 4 that have fully updated - Irvingiaceae, Solanaceae, Zingiberaceae, *Meconopsis* & *Cathcartia*

Activity upodates in relation to each of the TENS are as follows:

- Zingiberaceae: Classification updated. Ca. 200 names in the dataset without IDs – mostly names they done want to released or new since the name match. Ca. 126 new taxa published since 2019.
- *Meconopsis* & *Cathcartia*: Classification updated
- SolanaceaeSource: Revised classification, mostly to update the issues relating to inappropriately placed synonyms and duplication of Author and Publications strings. E.g. *Solanum virginianum* L. "L., L., L., and L., Sp. Pl. 187. 1753., 1753."
- Caryophyllales: Achatocarpaceae – Updating; Aizoaceae – Updating, with 1,320 new IDs issues, TEN processing; Cactaceae – Updating. Remaining issues have been dealt with. New names (probably) won't feature in this release.
- Name matching finished and with me, as follows:
 - Begoniaceae - Name matching corrections finished
 - Cycads - Name matching corrections finished

The following diagram outlines the extent of coverage of the taxonomic backbone achieved to date (by July 2021).



3. New possible TENs, and TENs to approve

The following possible new TENs were outlined.

- Paeoniaceae – ca. 33 spp.
- Plantaginaceae – ca. 1.9k spp.
- Rubiaceae – ca. 13k spp.
- Orchidaceae [Regional] – ca. 500 spp.
- Ochnaceae – ca. 650 spp
- Urticaceae – ca. 2.6k spp.

The following new TENs to consider for approval by the Council at this meeting were outlined [Task 13.1]:

- Haloragaceae – 9 genera and 153 spp., + 3 small related Families (Tetracarpaeaceae – 1 sp., Penthoraceae – 2 spp., and Aphanopetalaceae – 2 spp.)
- Commelinales (Commelinaceae – 41 genera and 731 spp., Haemodoraceae – 14 genera and 102 spp., Hanguanaceae – 1 genus and 18-50 spp., Philydraceae – 3 genera and 5 spp. and Pontederiaceae – 2 genera and 33 spp.)
- Mayacaceae – 1 genus and 5 spp.
- Cabombaceae – 2 genera and 10 spp.
- Fabaceae – 765 genera 20K spp.

A list of TENs pending authorization and prospective new TENs was also reviewed.

About Pages

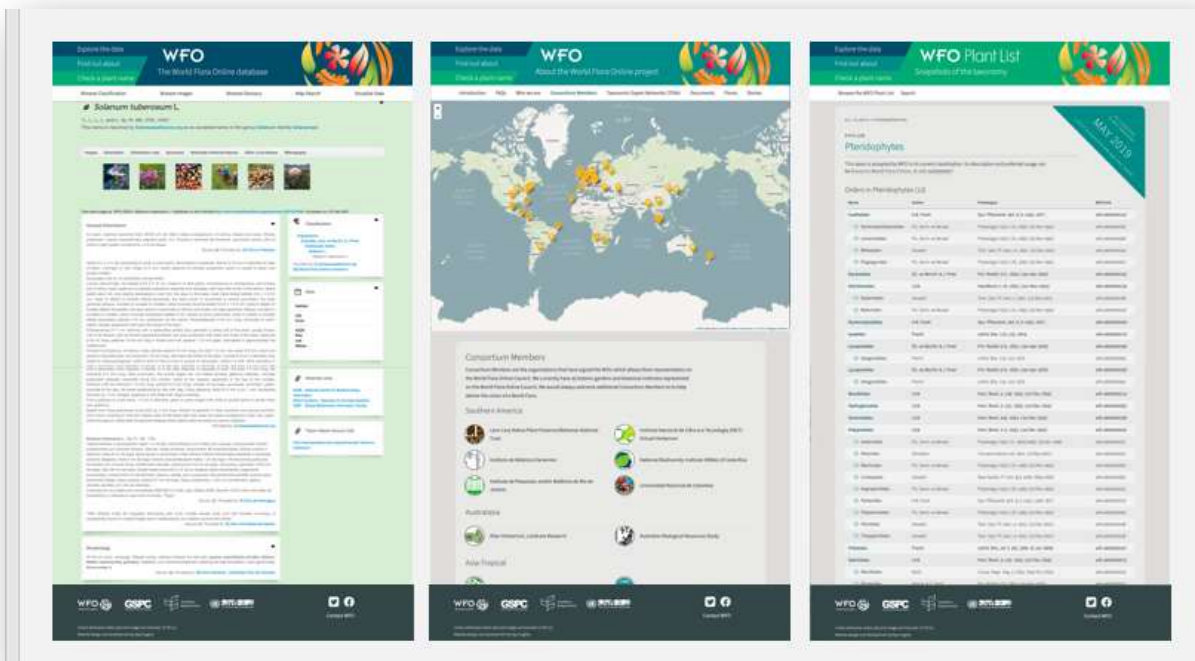
Alan Elliott also gave an update on work on the development of the new 'About Pages' for the Portal. All Consortium Members have text; most have at least one image. All the approved TENS have a page on the WFO website.

6. Update on WFO Portal changes

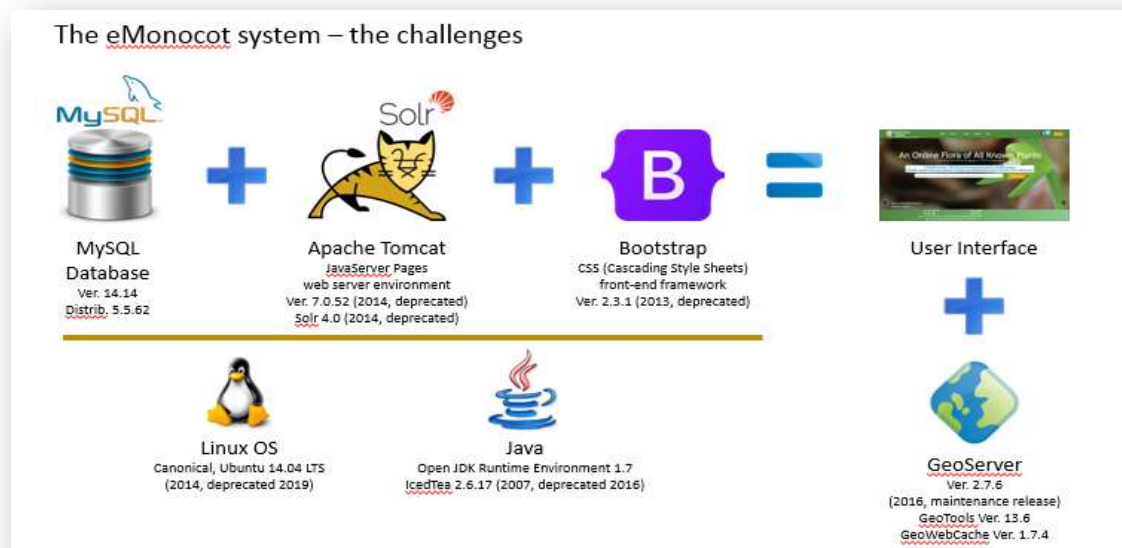
Mark Watson provided a report on the WFO website development, also on behalf of the following: Alan Elliott, Nye Hughes, Roger Hyam, Sunitha Kathabathuni, Chuck Miller, Colin Pendry, William Ulate.

He outlined how a functionality review on The Plant List had been undertaken in March, 2021, to identify which elements of that could be incorporated into the new WFO Plant List. New features for the development of The WFO Plant List were i) Improving the search function; ii) Search moved to navbar; iii) Intuitive dropdown short list developed; iv) Synonym display improved and v) API changes to support new behavior. In addition, a dynamic statistics function was added that was not present in The Plant List. Script to crawl the hierarchy to generate the statistical data had been written and a dynamic user interface of the statistics had been developed. The new WFO Plant List had also been user tested, including the following categories of users: WFO members, taxonomists, horticulturists and a conservation biologist. A test server has been created at <https://wfo-about.rbge.info/plant-list>

He followed with a demonstration of the new WFO Plant List and its features, as well as the improved and updated design for the WFO portal (example given below).



He highlighted the ongoing challenges in operating the WFO portal and database within the confines of the eMonocot system and explained i) the complex legacy code base with outdated, unsupported technologies (including potential security issues, difficult to integrate with current systems); ii) the need for programmers to learn/relearn old coding languages, and iii) dependencies/software libraries no longer available (cannot rebuilt from scratch without reprogramming).

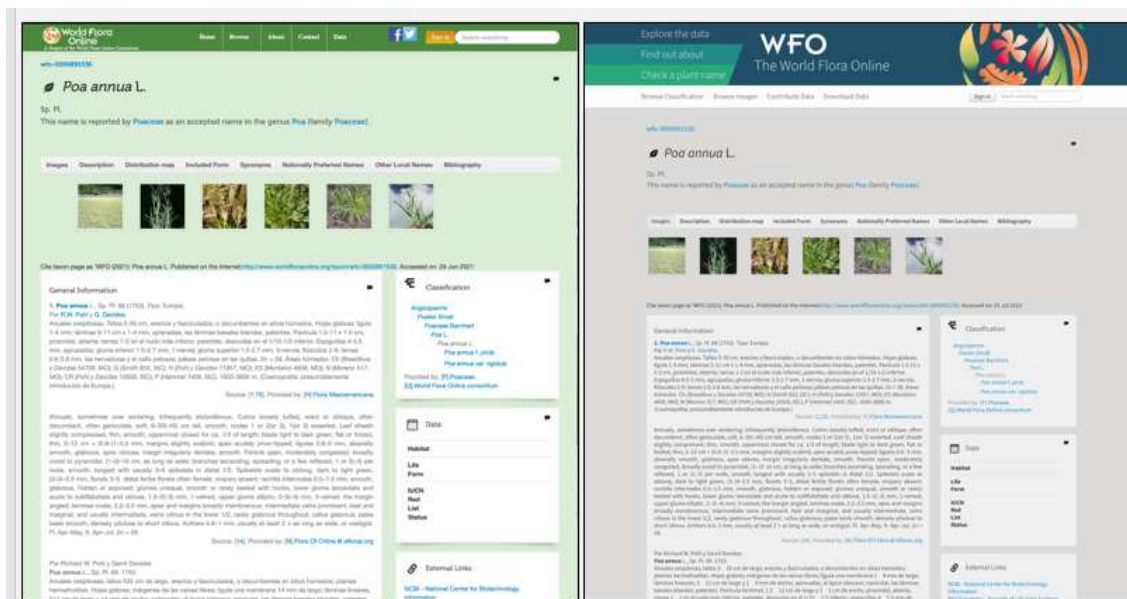
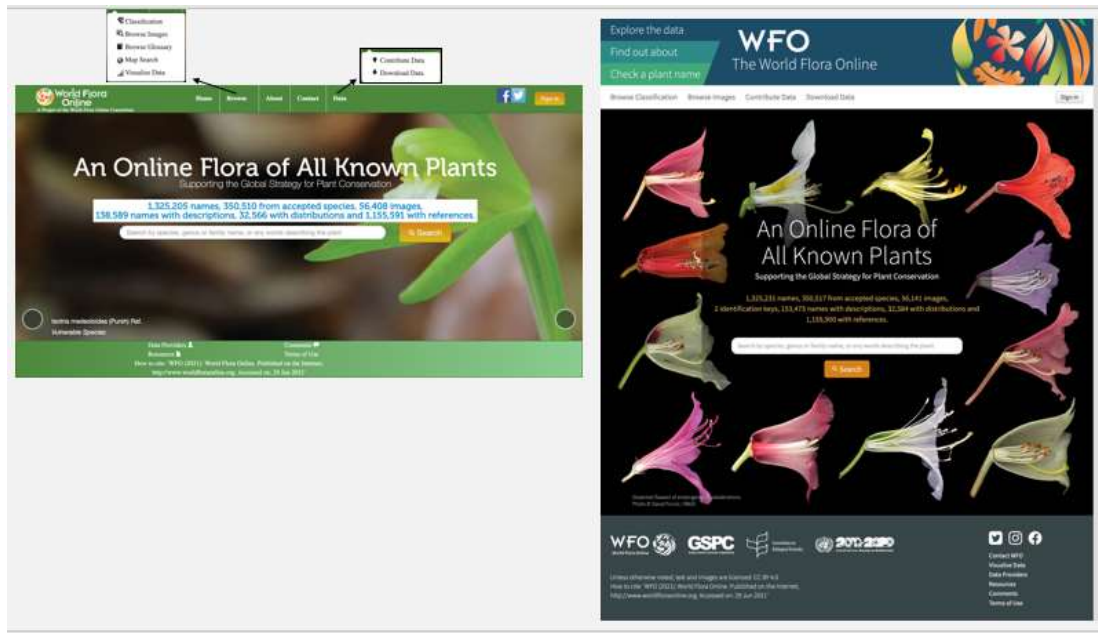


Mark then outlined the main changes that were being implemented for the WFO data portal homepage:

- New header matching 'About Pages' and WFO Plant List
- Old header repurposed as navbar – menus rationalized, Sign In maintained

- New footer including functions of old footer + social media, contact, visualized data
- Main image and delivery changes:
 - Current image gallery slow to load on low bandwidth, replaced by a more efficient alternative
 - New sizing to match other areas of WFO website
 - Black background compresses to small file size, one image loaded

Comparison of the 'old' (left) and proposed new WFO homepage and data pages (right) are illustrated below:



In conclusion, Mark stressed that this update and improvement of the design of the portal would “buy us time” to secure the resources to develop a replacement for the back-end database with a fully

functional API and develop a new User Interface to enable us to fulfil all the requirements defined in the Use Case analysis – and more.

Recommendations from the Taxonomic Working Group and Council Decisions

The following recommendations from the Taxonomic Working Group were proposed and adopted by the Council.

- Adoption of the Proposal for the launch of the new updated portal and its content.
- Approval of the following new Taxonomic Expert Groups (TENs):
 - Haloragaceae+ 3 small related Families
 - Commelinales
 - Mayacaceae and Cabombaceae, and
 - Fabaceae

7. Report on ‘Use the major upgrade to promote WFO’ [Task 100]

At the last Council meeting the Taxonomic Working Group was encouraged to form a task group from amongst its members and other WFO participants to prepare a response paper to the ‘Leipzig Catalogue of Vascular Plants’ and use this opportunity to maximize scientific and other awareness of the WFO around the launch of the new ‘WFO Plant List’ in May 2021. Thomas Haevermans chairs this task group and reported to the Council.

He pointed out that various WFO ‘products’ would provide useful resources to promote wider awareness of the WFO and its role. These ‘products’ include the WFO Plant List - yearly, with DOI; the WFO Tree - Short-Term, yearly, with DOI, which acts as a useful megaphylogeny as a tool for other communities. He also suggested that in the more longterm, the WFO could be used to extract traits from natural language descriptions. The promotion of the WFO could be enhanced with the use of social media short texts, a promotional video, a press release (based on an upcoming news item due to be published in Taxon, a data paper and further scientific papers. The WFO science papers could explore such questions as ‘how much do we know about the world’s plant diversity?’, ‘whether it is important to increase our knowledge of plants and to better understand diversity?’ and ‘how can the WFO inform the post-2020 targets for conservation?’. The WFO can produce some useful metrics for monitoring the achievement of conservation targets. He highlighted the promotional value of the upcoming piece in Taxon and suggested that perhaps an Opinion piece might be submitted for consideration of publication in the journal Perspectives in Plant Ecology, Evolution and Systematics.

8. Report from the Technical Working Group

Chuck Miller presented the Report of the Technical Working Group, on behalf of its co-chairs, Chuck Miller and Walter Berendsohn. He listed the current members of the Group and highlighted that the Group had held one virtual meeting since the last Council meeting. He mentioned that much of the progress made on technical matters had been included in the reports given by William Ulate, Alan Elliott and Mark Watson (above). He specified what progress had been made with Action Items assigned to the Technical Working group, as follows:

- 6. Add descriptive data – As reported by William

- 9. Botalista – As reported by Raoul.
- 29. New Names – As reported by William
- 48. Portal Modifications – New Portals as reported by Mark
- 59. Update Protologue information for matched names using IPNI data – Done
- 68. Create a data paper of the WFO Backbone data with a DOI – Done, with WPL. Data paper to be added to Thomas Haeverman's Taxon Paper.

Chuck highlighted a series of ongoing or pending Action Items, as follows:

- 7. Create a Harvester/Admin Guide - Ongoing
- 15. Develop Markup Tools for Toolkit – Deferred at St Louis
- 30. WFO Darwin Core Extensions – Deferred at St Louis
- 31. Request WFO tailored IPT from GBIF – Deferred at St Louis
- 39. DOIs for datasets and downloads - Ongoing. Lauren Raz leading.
- 58. Assess adding the BGCI Threat Search and Global Tree Search Databases - Pending
- 69. Explore use of Frictionless Data for backbone data ingestion – Pending more community adoption
- 81. Give percentages of what data have been uploaded from what is published for each source of Content – Pending
- 82. Investigate repurposing the WFO Plant List software developed by RBG Edinburgh to replace the Portal Browse/Classification submenu – Pending
- 96. Investigate modification of TPL and WFO Portals to lower Google Search result standings for TPL below WFO – Pending
- 99. Evaluate needs for pre-harvesting process tools. – Pending

The following next steps were outlined: i) Load More Content Data; ii) Complete Taxonomic Backbone Data Reload; iii) Convert Production servers to new Portal, About and WFO Plant List pages, and iv) Continue to evaluate the addition of DOIs, in collaboration with GBIF – Lauren

Recommendation from the Technical Working Group and Council Decision.

One recommendation was proposed to Council from the Technical Working Group: to 'Relook at Catalogue of Life's COLDP data exchange format vis a vis Darwin Core Archive'. This recommendation was approved and adopted by the Council.

9. Review and adoption of draft post-2020 WFO Memorandum of Understanding

Peter Wyse Jackson presented a draft new Memorandum of Understanding (MOU) to update and replace the MOU opened for signature in 2012 whereby organisations worldwide agreed to collaborate in the development of a World Flora Online (WFO) and to become members of the WFO Consortium. This draft had been circulated for comment to all members of the WFO Council. Under the provisions of the new MOU, signatories of the previous MOU remain members of the WFO Consortium. The text of this MOU, with no additional changes, was adopted by the WFO Council and will be the basis for membership of new members of the WFO Consortium for the coming period.

The text of the MOU as adopted by the Council is provided in Annex 2.

10. Botalista Developments

Pierre-André Loizeau outlined the latest developments in relation to the development of the Botalista software, in particular the ways in which it provides a tool for TENs to update and manage taxonomic backbone data for the WFO.

He informed the meeting that the specific Botalista nomenclature module available to TENs was now online, at wfo.botalista.community. He reminded colleagues who wanted to test the software that they could do so by logging into the test instance at sandbox.botalista.community with the user cjb and the password cjb.

Regarding the TENs application, he pointed out that in addition to a Names entry, the menu has Field collections and Accessions entries (see below). This is because these entries also use modules belonging to Names. This is just a display problem.

After giving indications on the next loading of Musaceae, he recalled the principles that guide the use of this software by TENs. These principles are shown in the slide below.

Operating principles

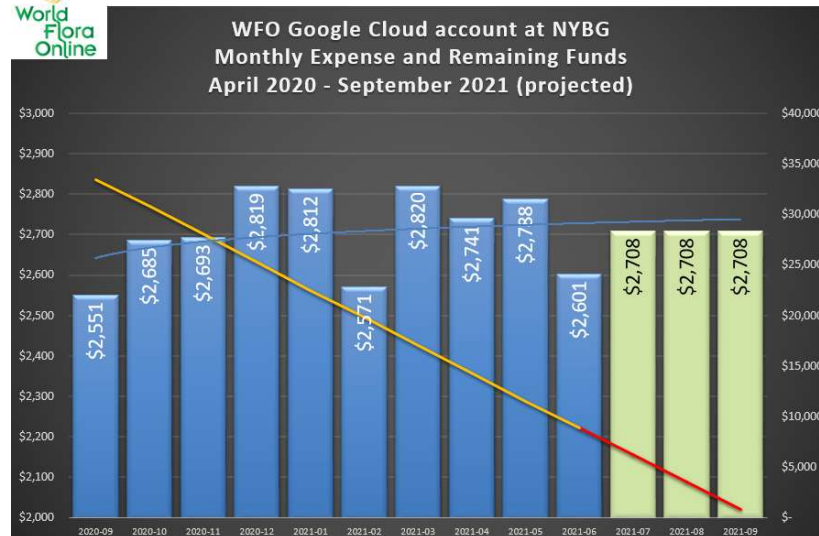
- Access to all the backbone in consultation
- Modification possible only inside the TEN's family
- Ask the TEN of another family for further modifications
- Synchronisation on a regular basis of the Botalista backbone with the WFO backbone
- TEN notified by the system if a change has been made on the WFO backbone
- Extraction of the family for ingestion in the backbone in the Missouri when ready

Conservatoire et Jardin botaniques de Genève

4

11. Google Cloud resources review

Chuck Miller reported on the status of the Google Cloud grant funds originally awarded to New York Botanical Garden for the WFO. The following chart of expenses and account balance was presented:



The projection indicates the Google grant will be fully expended around September, 2021. Chuck suggested several options for continuing to operate the WFO's servers after the funds run out.

- Continue to pay the Google fees using volunteered WFO member funds
- Move the WFO virtual servers and disk space to one or more WFO members' server room(s)
- Move the WFO virtual servers and disk space to an alternative hosting service (like AWS or Microsoft) funded by one or more WFO members
- Obtain grants to cover the WFO systems costs

Dr Wyse Jackson generously offered to temporarily provide funds from Missouri Botanical Garden to continue paying the Google Cloud fees until an alternative approach is implemented. He set a target to have the alternative in place by December 2021.

Eduardo Dalcin requested that the specifications for the WFO virtual servers and disk space be shared with everyone. William provided the following specifications for the WFO's 16 servers and disk space following the meeting:

Servers used by the World Flora Online as of July 2021

#	Name	Group	Machine	Machine-type	vCPU	Mem (GB)	CPU Platform	Boot-disk Image	Disk Size (GB)	Disk Type	Disk2-size	Disk2-type
1	wfo-prod-portal	production	portal	custom	1	5.00	Intel Haswell	ubuntu-1404-trusty-v20161010	160	Standard Persistent		
2	wfo-prod-harvester	production	harvester	n1-standard-4	4	15.00	Intel Haswell	ubuntu-1404-trusty-v20161010	40	Standard Persistent		
3	wfo-prod-database	production	database	custom	6	30.00	Intel Haswell	ubuntu-1404-trusty-v20161010	300	Standard Persistent		
4	wfo-prod-images	production	images	custom	1	2.50	Intel Haswell	ubuntu-1404-trusty-v20171101	100	SSD Persistent		
5	wfo-stage-portal	stage	portal	n1-standard-4	4	15.00	Intel Haswell		160	Standard Persistent		
6	wfo-stage-harvest	stage	harvest	n1-standard-4	4	15.00	Intel Haswell		40	Balanced Persistent		
7	wfo-stage-database	stage	database	n1-standard-8	8	30.00	Intel Haswell		300	Standard Persistent		
8	wfo-stage-images	stage	images	n1-standard-1	1	3.75	Intel Haswell		100	Standard Persistent		
9	wfo-test-portal	test	portal	custom	1	5.00	Intel Haswell	ubuntu-1404-trusty-v20161010	160	Standard Persistent		
10	test-wfo-harvester	test	harvester	n1-standard-4	4	15.00	Intel Skylake	ubuntu-1404-trusty-v20170619	40	Standard Persistent		
11	test-wfo-database	test	database	n1-standard-8	8	30.00	Intel Haswell	ubuntu-1404-trusty-v20170619	300	Standard Persistent		
12	test-wfo-image	test	image	custom	1	2.50	Intel Haswell	ubuntu-1404-trusty-v20171010	100	SSD Persistent		
13	wfo-demo-win2012svr	admin	fileserver	n1-standard-2	2	7.50	Intel Haswell	windows-server-2012-r2-dc-v20	50	Standard Persistent	300	SSD Persistent
14	wfo-owncloud-2019-vm	admin	owncloud	n1-standard-1	1	3.75	Intel Haswell	bitnami-owncloud-10-2-1-2-linu	500	Standard Persistent		
15	wfo-about-pages	admin	about	n1-highmem-2	2	13.00	Intel Haswell	ubuntu-1804-bionic-v20201111	250	Standard Persistent		
16	redmine-wfo-vm	admin	redmine	g1-small	1	1.70	Unknown	bitnami-redmine-3-2-2-0-linux-c	50	Standard Persistent		

12. 18th Council meeting

It was agreed that the next WFO Council would be held virtually on a date to be determined.

13. Plans for in-person WFO Council meeting in Meise, Belgium in 2022

Marc Sosef outlined plans to hold the next in-person meeting of the WFO Council, hosted by the Meise Botanic Garden, Belgium. A tentative date was proposed at the meeting of Tuesday 19th April to Friday 22nd April, 2022. **However, since the Council meeting that has been changed, and instead it is now planned to go forward on the following dates: Tuesday 26th April to Saturday 30th April.**

Council members are asked to mark their calendars with those dates. Instead of the usual two days of meetings of the Taxonomic and Technical Working Groups, it is proposed that the first days will be spent in developing a Strategic Plan for the World Flora Online for the period up to 2030.

14. Any Other Business

There being no further business the co-chairs thanked all of the presenters and participants and closed the meeting.

Annex 1

DRAFT WORLD FLORA ONLINE –ACTION ITEMS FROM COUNCIL MEETING - ZOOM July 2021

(fully completed or merged tasks are shaded grey pending deletion at next meeting of Council)

#	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: None
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	New signatories since last meeting of Council: None
3	Update Facebook page. Keep updating FB page with news and current information.	Comms Working Group	Ongoing	Richelle Wiehe (MBG) will update FB, send images and news items to her.
5	Videos. Links to videos by partner institutions to be included on WFO Website.	All	Ongoing	Anyone with videos relevant to WFO, please send to the William Ulate & 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.	William	Ongoing When ready, William Ulate 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 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). <ul style="list-style-type: none">• 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: <ul style="list-style-type: none">• Solanaceae Source – Contacted back to coordinate an updated dataset• NYBG – Harvested all descriptions in Test: NorthEastern US,

#	TASKS	WHO?	WHEN?	COMMENTS
				<p>Neotropica, Brittonia & NYBG Memoirs</p> <ul style="list-style-type: none"> • Catalogo de las Plantas de Colombia –26K names - Waiting for content. • Australian Floras – First dataset of descriptive data harvested in Test. • 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	<p>Create a Harvester administration/operations guide.</p> <p>The development of a Harvester administration/operation guide should be carried out immediately through testing and collaboration.</p>	William	Ongoing	<p>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)</p>
10	<p>Implement Botalista software.</p> <p>Work together to further develop Botalista as collaborative tool for expert networks to contribute backbone data. (Related to Item 99)</p>	Pierre-André and Raoul	July 2021	<p>WFO Instance of Botalista created and ready for testing by TENS. wfo.botalista.community</p>
13	<p>Taxonomic Expert Networks (TENS).</p>	TEN Manager	Standing Item	<p>1) 1 TEN approved by Council July 2021:</p>

#	TASKS	WHO?	WHEN?	COMMENTS
	<p>1) Identify specialists to review parts of the taxonomic backbone. When no networks exist, identify specialists to review parts of the taxonomic backbone and/or assess the quality of the treatment in the current WFO backbone.</p> <p>2) Make a survey of existing global taxonomic networks and the systems used and ask if they are willing to participate in WFO</p> <p>3) Update and publish the Order/Family coverage/gap analysis on About Pages of WFO website</p> <p>4) Engage with WCSP Reviewers for potential TENS</p> <p>5) Explore links with Yuri Roskov and COL GSDs as potential WFO TENS</p> <p>6) Build on the offer of a Fern TEN to involve wider community opinions</p>			<p>Haloragaceae (+ Aphanopetalaceae, Penthoraceae, Tetracarpaeaceae); Commelinales (all families); Mayacaceae; Cabombaceae; Fabaceae (Leguminosae)</p> <p>2) Ongoing</p> <p>3) Gap analysis for plant families to be updated for higher classifications after backbone update. Ongoing.</p> <p>4) Ongoing.</p> <p>5) Ongoing.</p> <p>6) Ongoing. PPG Interested in developing an inclusive Fern TEN</p>
15	<p>Develop markup Tools for a Toolkit. Consolidate the Markup Tools being used; develop them to integrate them into a toolkit.</p> <p>- SANBI has developed Markup tools and are available for others to use. Available from GitHub: github.com/rudivs/SpeciesMarkupAddIn</p>	Technical Working Group	Deferred at St Louis	No current update, not priority for 2020, but continue for future
16	<p>Communicate document on web strategy based on CBD CHM work. Create a document on web strategy for the next meeting based on the work being done by the CBD CHM. Suggest ideas on materials like meetings where WFO should present a keynote or at least a Symposium on WFO.</p> <p>- Communications Committee will define Communication plan as a bigger topic.</p> <p>- Put someone in charge of the Social Media</p> <p>- Separate production of content from the website administration, tailor-make the strategy for each group in order to facilitate the prioritization.</p> <p>- Launch of our communications strategy to raise awareness when we have a portal that people could</p>	Comms WG. (Eduardo Dalcin, Barbara Thiers, John Parnell)	Pending	<p>We need to have a clear strategy on how the WFO is integrated into all of the outcomes of CBD, which requires an understanding on how the CBD works and a lot of promotion of the WFO within the CBD Mechanisms. For the Communication Strategy, define what WFO is doing in the next 6 months to be able to know what to communicate. We need to define what audience we want to attend first and use appropriate platforms to reach them. Peter Wyse Jackson may send a message to the Council asking for names of specialists who could collaborate on a Communication Plan, once</p>

#	TASKS	WHO?	WHEN?	COMMENTS
	<p>use. Communicate key advances and specific strategy.</p> <ul style="list-style-type: none"> - Demonstrate a joint Consortium web site to promote fundraising. - For a Strategy define Who they are? What to tell them? How to tell them? Who's going to tell them? And when are they going to be told? - Create a list of institutions relevant to promote WFO and interact with (previously #19) 			<p>we know what we want to communicate.</p> <ul style="list-style-type: none"> • Draft Web Strategy created. – Istanbul • ResearchGate WFO project has been set up
18	Save the Dates. Save the date for the 17 th meeting	Peter Wyse Jackson	18 th Meeting – Online, T.B.C. Oct-Dec 2021; 19 th Meeting – Meise, 19-22 April 2022	Post the report of the previous Council Meeting on the WFO website Physical meetings at Meise and Canberra deferred
29	DOIs for datasets and downloads. Evaluate using GBIF-generated DOIs for WFO contributed datasets and downloads (related to #68 and #75)	Technical Working Group DOI Process Subgroup Lauren Raz, lead	Ongoing	Requires code change Creation of metadata for downloads for DOI. Evaluate the adding DOIs to uploaded datasets and downloaded reports. Tech WG recommended in Sep 2020 formation of a DOI subgroup to assess the GBIF DOI process. Adopted by Council.
30	<p>WFO Darwin Core extensions. WFO Terms not included in Darwin Core standard:</p> <ol style="list-style-type: none"> 1. localID: Record identifier used by the data contributor. E.g. Tropicos ID, Flora of S Africa ID, EDIT ID 2. Alternate Taxon/Name IDs: E.g. Catalogue of Life ID 3. taxonomicStatusReference: Accepted or Synonym status by/according to publication. E.g. Accepted according to GrassBase 4. sourceCitation (of the name record): Not namePublishedIn or bibliographicCitation. E.g. Solanaceae Source is source of the Backbone name record. 5. VerbatimSpecimenList: Currently using Specimens extension. 	Technical Working Group	Deferred at St Louis	Write a white paper on Darwin Core extensions needed for WFO Formally request Darwin Core extensions from TDWG for WFO

#	TASKS	WHO?	WHEN?	COMMENTS
	6. VerbatimDistribution: Using "Distribution" Description Type in Descriptions.txt file 7. Protologue: Using Description Type of Original Publication in Descriptions.txt file 8. nomenclaturalNote			
31	Send formal request to GBIF for WFO-tailored versions of IPT and DwCA Validator, involving SANBI and Flora do Brasil	Technical Working Group	Deferred at July 2020	Botalista replaces tailored version of DwCA Validator. Tailored IPT still needed for taxonomic and descriptive data.
33	Resolve insufficient resources to support: a) Software development staffing. b) Institution to maintain OwnCloud	WFO Council	Deferred to next meeting	a) Missouri is committed to providing William's role, but we have an issue with software development staffing b) Defer decision to next meeting.
39	Catalogue of Life/GBIF	Pierre-André Loizeau	Ongoing	Pierre-André Loizeau is the WFO representative on CoL Advisory Board, Lauren Raz and Ann Fuchs are members of CoL Global Team CoL+ project nearing completion, CoL has been restructured GBIF will conduct a comparison between WFO taxonomy and CoL (see #85). Ongoing – delayed due to delays in CoL+ project
42	New Names. Implement a mechanism to deal with new names coming from Content Providers or IPNI and updating the Taxonomic Backbone, as recommended by the Taxonomic Working Group. A 'new name' is an Effectively Published name not already in the Taxonomic Backbone. Content Providers only provide one name, their accepted name of the taxon for which they are providing content	Technical Working Group	<ul style="list-style-type: none"> IPNI IDs awaiting reharvesting of Taxonomic Backbone. New IPNI names were loaded with Status of Unchecked. New TEN names will be loaded with Status of Accepted, Synonym or Ambiguous 	Create a feedback mechanism as needed to alert TENs when a new name is incorporated in the pre-harvesting Taxonomic Backbone (eventually in Botalista). Make an agreement with IPNI to receive their annual updates of new names and new combinations. Treat new names from IPNI as if coming from a non-TEN Content Provider

#	TASKS	WHO?	WHEN?	COMMENTS
				Export new names in the backbone in a data format appropriate for the TENS to incorporate into their own system.
44	Duplicates. There were 17.7k name duplications in the Taxonomic Backbone due to TPL artifacts	Taxonomic Working Group	In progress	Significant de-duplication has been done. Remaining duplicate names will be reviewed in August 2021
47	Nomenclatural Registration.	Pierre-André Loizeau	Ongoing	Expression of interest to become a Registration Centre made. Further work pending future developments in other Registration Centres
48	Make modifications to the Portal 17. Assess if order of Descriptions can be prioritized (for display). 18. Assess how to provide page hit statistics by data provider. 28. Reveal hidden fields (e.g. Basionym) 29. Enable alternate classifications 30. Advise on display options to have descriptive data on the Taxon Page with alternate views: order by content provider vs by description type.	Technical Working Group	Ongoing	NB Code changes required 17. Pending 18. Pending 28. Deferred at St. Louis 29. Deferred at St. Louis 30. Pending
58	Assess adding the BGCI Threat Search database as this includes national level and non-standard conservation assessments BGCI Global Tree Search country-level distribution data into mapping in WFO when this functionality is developed (merged from #83).	William	Pending	
59	Re-run IPNI-WFO Name Matching after the WCSP/IPNI Update to improve the number of matching names from 68% and analyse the results.	William	WFO/IPNI matching done after WCV update. Ongoing.	

#	TASKS	WHO?	WHEN?	COMMENTS
	Update Protologue information for matched names using IPNI data (Related to #44)			
66	Negotiate with Kew to add a WFO link to IPNI name pages.	WFO Council	Ongoing	Discussed in March 2021 Council. Alan Paton to follow up
68	Create a data paper of the WFO Backbone data with a DOI. Use this DOI for backbone download. (related to #29)	Technical Working Group	In progress	WPL backbone datasets enable creation of a data paper. Data paper to be added to Thomas Haeverman's Taxon Paper.
69	Explore use of Frictionless Data for backbone data ingestion	Technical Working Group	Pending more community adoption	Walter is interested.
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
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 William.
84	Contact Consortium Members to solicit additional Content datasets	WFO Council Co-chairs	Ongoing	
85	Review results of the comparison of WFO Taxonomic Backbone with CoL (Related to #39)	Taxonomic Working Group	Pending the completion of the comparison of the two datasets by GBIF/CoL	
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	
87	Investigate repurposing the WFO Plant List software developed by RBG Edinburgh as the Taxonomic Browser for viewing the current Public Portal Backbone, replacing	Technical Working Group	Ongoing	Roger Hyam has joined the Tech WG. The software is being reimplemented as a JSON

#	TASKS	WHO?	WHEN?	COMMENTS
	the Browse/Classification submenu.			Web Service to facilitate use as the Taxonomy Browser
91	Google Cloud servers Credit for use of the Google Cloud will run out in 2021. Investigate options for additional sponsorship by Google and other options for hosting WFO servers	Council	December 2021	Awaiting outcomes of various contacts. At July 2021 Council Dr Wyse Jackson offered to pay the Google monthly bill until December 2021, if needed while alternatives are explored.
92	WFO post 2020 strategic review and forward planning	Council to lead	2022 (when physical meetings possible)	Consider Garnett et al. (2020) ' <i>Principles for creating a single authoritative list of the world's species</i> ' 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 Page and adding them to Taxon Pages (previously #77) – Tax WG
93	Conduct stock take of Content and approved providers	WFO Gatekeeper and TEN Manager	For next Council	To be done after July/August relaunch
94	Request Naturalis to authorize the Flora Malesiana text content now in the EDIT platform to be ingested into the WFO Portal until the full Linneaus NG-based dataset becomes available in 2022 and will then replace the EDIT text.	WFO Council	2021	Using the available EDIT text enables WFO to include the available 10,500 Flora Malesiana descriptions while awaiting the new more complete version in 2022.
96	Investigate modification of TPL and WFO Portals to lower Google Search result standings for TPL below WFO.	Technical Working Group	2021	Requires portal code changes
97	Explore replacing WFO Portal header and footer to match About Pages and WFO Plant List	RBG Edinburgh with William	Done	Nye Hughes completed the header and footer changes to match About and Plant List pages. To be launched together with About pages

#	TASKS	WHO?	WHEN?	COMMENTS
				and WFO Plant List in Aug/Sep.
99	Evaluate needs for pre-harvesting process tools.	Technical Working Group	2021	Without the planned Botalista system, the pre-harvesting process lacks automation. Earlier Botalista designs need to be re-evaluated to document gaps to be filled.
100	Use the major upgrade to promote WFO, especially in response to Leipzig List	Taxonomic Working Group	In line with the major update to the WFO website	Form a task group from amongst its members and other WFO participants to prepare a response paper to the 'Leipzig Catalogue of Vascular Plants' and use this opportunity to maximise scientific and other awareness of the WFO around the launch of the new 'WFO Plant List' in May 2021
101	Review the periodicity of the WFO Plant List	Taxonomic Working Group	Before next Council	Link with use of DOIs for versions
102	Relook at Catalogue of Life's COLDP data exchange format vis a vis Darwin Core Archive	Technical Working Group	2021	Conduct an analysis of pros and cons of COLDP for WFO.

Annex 2

Memorandum of Understanding - The World Flora Online

This Memorandum of Understanding (MOU) updates and replaces an MOU opened for signature in 2012 whereby organisations worldwide agreed to collaborate in the development of a World Flora Online (WFO) and to become members of the WFO Consortium. Under the provisions of the MOU, signatories of the previous MOU remain members of the WFO Consortium and are not required to sign this MOU. The text of this MOU was adopted by the WFO Council at its 17th meeting on 6th July, 2021.

1.0 Background

1.1 Through decision X/17 of the Conference of the Parties of the United Nations Convention on Biological Diversity a consolidated update of the Global Strategy for Plant Conservation (“GSPC”) 2011–2020 was adopted. In the same decision the Conference of the Parties requested the Executive Secretary to the Convention, in collaboration with the Global Partnership for Plant Conservation (“GPPC”) and other partners and relevant organizations, to undertake activities to support implementation of the Strategy.

1.2 The GPPC brings together international, regional and national organisations in order to contribute to the implementation of the GSPC.

1.3 Target 1 of the GSPC called for the achievement of ‘An online Flora of all known plants’ by 2020.

1.4 A widely accessible Flora of all known plant species is a fundamental requirement for plant conservation. The terms and technical rationale for Target 1 of the GSPC proposed that a World Flora be developed as a framework capable of accommodating regional floristic information (at national or lower level) that can provide answers in both regional and global contexts. The terms and technical rationale for Target 1 suggested that the Flora should include accepted names and a comprehensive synonymy, building on the results of the previous objectives for Target 1 (dated 2002–2010), aimed to develop “a widely accessible working list of known plant species as a step towards a complete world flora.” It was also pointed out that new knowledge should also be incorporated as it becomes available. Target 1 of the first phase of the GSPC was achieved at the end of 2010, through The Plant List (www.theplantlist.org). Target 1 of the 2011–2020 GSPC was achieved at the end of 2020 with the development of the World Flora Online (“WFO”, www.worldfloraonline.org).

1.5 For the purposes of this MoU, ‘widely accessible’ is interpreted to mean that the WFO will be available in an electronic format, online, with open access and freely accessible. Furthermore, it is accepted that Creative Commons or equivalent licensing are foundation principles of the WFO and of its organisation.

1.6 The terms and technical rationale of Target 1 of the GSPC suggested that a World Flora should include geographic distributions to at least country level, drawing on national floras, checklists, and monographs; habitat data; identification tools (e.g., interactive keys, images, and descriptions); conservation status (with links to assessments being carried out under GSPC Target 2); and other enhancements as practicable, e.g., vernacular names. Much of these data already exist in digital or printed format, and they can be used to populate the Flora. The WFO is a community resource built on the work of a great many individuals throughout the world, and their contributions to the Flora and its influence on GSPC is documented and attributed in the WFO portal (e.g. through appropriate citation of

original work) and the WFO about pages (e.g. including partner organizations and Taxonomic Expert Networks).

1.7 It is acknowledged that when complete, the WFO will be expected to include comprehensive information on approximately 400,000 plant species, and comprise vascular plants and bryophytes.

2.0 Purpose

2.1 To support the implementation of the GSPC.

2.2 To establish an informal international consortium ("Consortium") to continue to develop and maintain the WFO.

2.3 To establish and acknowledge the link between the international Consortium and the GPPC, whereby the Consortium is formally recognised as a working group of the GPPC.

2.4 To provide an expression of interest for organisations to become involved in the WFO and elaborate a framework for cooperation and coordination between the parties to this MoU to contribute to the WFO.

3.0 Agreement

3.1 The parties to this MoU agree to be members and cooperate as part of the international Consortium of relevant organizations and institutions to contribute to the development and maintenance of the WFO.

3.2 Membership of the Consortium shall be open (see 5.1) to all organisations and institutions who sign the MoU and that have substantial programmes relevant to plant systematics at the national and/or international levels and wish to play a part in the achievement of the WFO.

3.3 The parties to this MoU further agree that in undertaking this work that they shall be contributing to the common good, by making information on the world's plants freely available to all.

3.4 Furthermore, they agree that this work shall be carried out within the context of the provisions of the Convention on Biological Diversity, namely conservation of, sustainable use of, and the fair and equitable sharing of benefits arising out of use of biodiversity, as well as to relevant international, regional and national laws and regulations concerning biodiversity including laws relating to access to plant genetic resources, associated benefit sharing and traditional knowledge.

4.0 Activities

4.1 Areas of co-operation under this MoU will be subject to available resources. Activities may include, but will not be limited to:

4.1.1 Collaboration and support of actions that contribute to the development and maintenance of the WFO, including, as appropriate, the provision of data, technical and other services, resources and participation in collaborative projects;

4.1.2 The designation of one or more representative(s) from each organization to be members of the Council of the Consortium (see 5.1.1);

4.1.3 The development of shared activities, including publicity and fund-raising activities;

4.1.4 Subject to available resources, participation in a shared Secretariat (see 5.1.3).

5.0 Structures

5.1 As part of the implementation of this MoU, the following structure for the WFO Consortium is established:

5.1.1 Council. This will include one primary designated representative of each of the parties to this MoU. The Council shall be the decision making body of the Consortium. Decisions made by the Council shall be by consensus. Decisions made by the Council shall relate to the activities of the Consortium only, rather than to individual activities of its members. It is anticipated that the Council will meet in-person annually and other virtual meetings may be held at other times as required by the Council. The chair(s) of the Council shall be decided by its members.

5.1.2 Working Groups. These will take forward technical and other work of the Consortium. In their respective area of expertise, working groups will also develop specific work plans as needed for implementing the WFO, thereby supporting decisions of the Council. The following Working Groups are recognised:

- a) Technical Working Group;
- b) Taxonomic Working Group;
- c) Communications Working Group.

Working Groups may be created, reorganised or disbanded by a decision of the Council. The chair(s) of each working group will be appointed by the Council. The terms of office of the chair(s) and members of each Working Group shall be from one in-person Council meeting to the next. Membership of the Working Groups shall be renewable. Terms of reference for each Working Group will be approved by the Council.

5.1.3 Secretariat. A Secretariat is established to support the day-to-day work of the Consortium, including:

- a) helping to develop and maintain the WFO;
- b) facilitating communications between members of the Consortium;
- c) assistance in managing the activities and operations of the bodies outlined above, (viz. Council, Working Groups and organising meetings of the Council;
- d) keeping minutes and a record of decisions adopted at Council meetings, organizing documents of the Consortium and making them available to all Members.

Parties to the MoU may, on a voluntary basis, provide support and assistance in the provision of the Secretariat, which shall be shared between a number of institutions and organisations. The Secretariat shall also keep a record of signatories of this and the previous pre-2020 MoU.

5.2 The structure of the Consortium outlined above may be amended by the Council as and when required, including, should it become necessary, its superseding by a formal constitution and operating rules.

6.0 Duration, Renewal, Amendment and Termination

6.1 This MoU came into force on the 6th July 2021 when it was adopted by the Council. Its duration will be determined subsequently by the Consortium.

6.2 This MoU can be amended at any time through mutual agreement expressed in writing. Such amendments, once approved by the parties, will become part of this MoU.

6.3 Any party to this agreement may terminate their participation in this MoU by providing the Secretariat to the Consortium with 60 days notice in writing.

6.4 This MoU shall replace the previous MoU between any parties related to the WFO. Any party to the pre-2020 MoU on the WFO will automatically be included as a signatories to this MoU, unless they specifically decline to sign it and withdraw from the Consortium.

7.0 General

7.1 As a result of this MoU, none of the parties shall be prevented or hindered from participating in similar activities with other public or private agencies, organizations, or individuals.

7.2 Parties to this MoU will agree on the text of any press releases or other public statements relating to this MoU or the relationships established under the terms of this MoU.

7.3 The parties acknowledge that any party may be subject to obligations relating to freedom of information, for example, under the Freedom of Information Act 2000 in the United Kingdom. The parties will make reasonable efforts to inform the Consortium of any proposed disclosure under freedom of information obligations in relation to this MoU or the relationship established under this MoU but shall not be bound to obtain the prior consent of the Consortium members to any such disclosure.

7.4 This MoU does not commit any of the parties to this agreement to provide any fiscal, personnel, or other support, whether real or in-kind outside the agreed voluntary commitment outlined above.

7.5 Any endeavour or transfer involving reimbursement or transfer of funds between the parties to this MoU shall be handled in accordance with applicable laws, regulations, and procedures of each of the signatories. Such matters shall be outlined in separate agreements that shall be made in writing by representatives of each organization and shall be independently authorized by appropriate statutory authority for each member. This MoU does not provide such authority.

7.6 This MoU is not intended to be a legally binding document.

8.0 Parties to the Memorandum of Understanding

The parties hereto have executed this Memorandum of Understanding:

Agreed to by:

(name of institution/organisation) _____

Signature: _____

Name: _____

Title: _____

Date: _____
