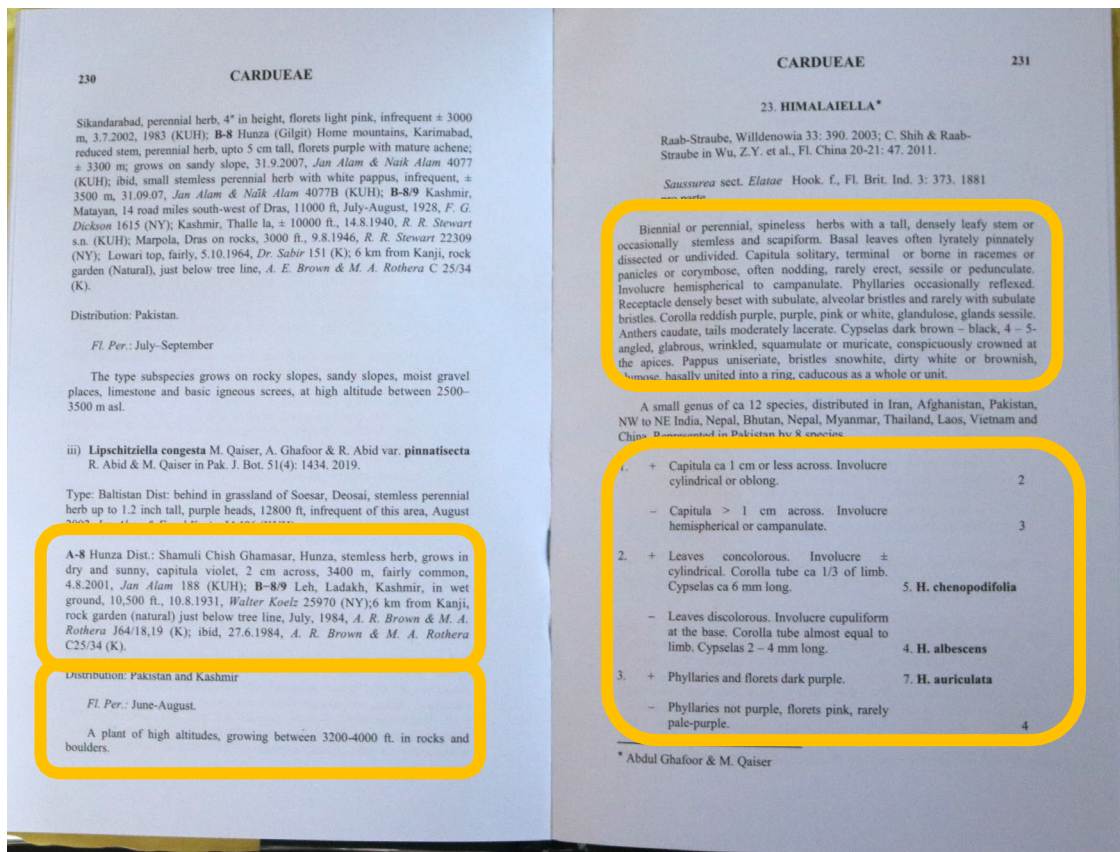




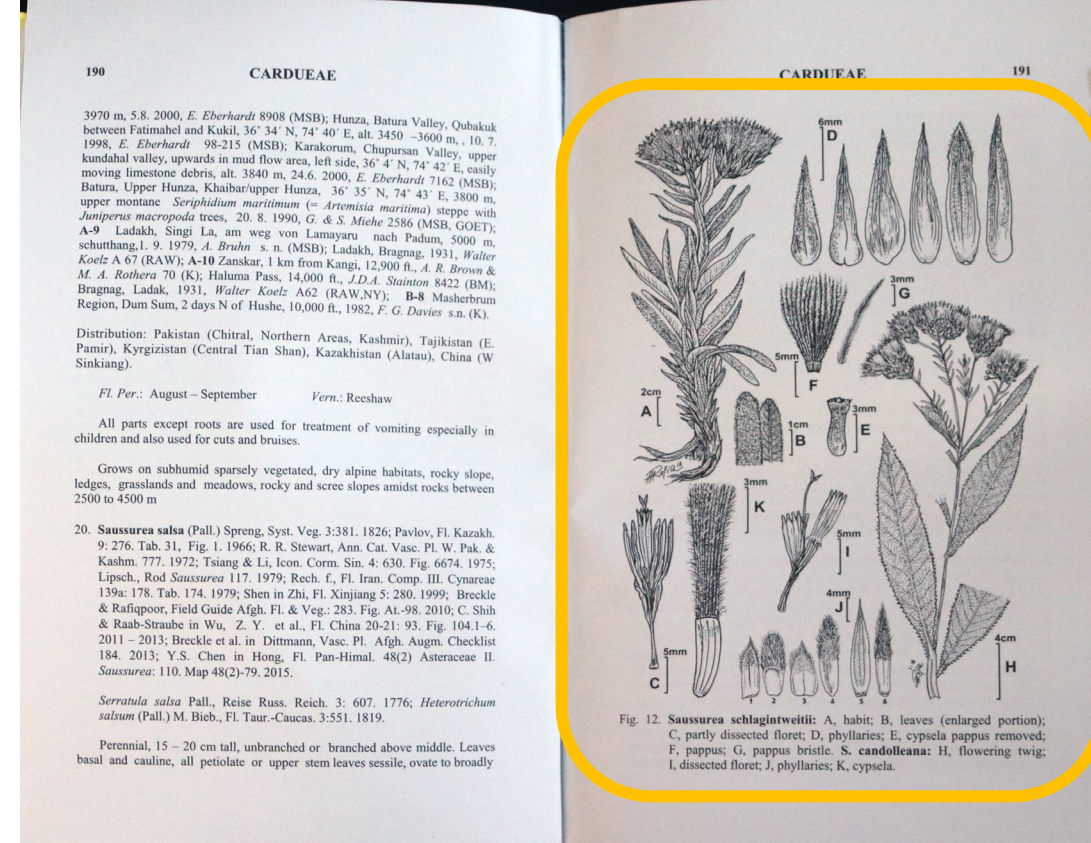
Using the *Flora of Pakistan* to strengthen and widen Pakistan's botanical infrastructure

Mary E. Barkworth

Utah State University and OpenHerbarium



Floras –
rich resources



Distribution information
Descriptions
Nomenclatural information
Identification keys
Illustrations



- Time consuming
- One user group
- Expensive
- Not portable
- Quickly outdated

Problems

The challenge

- Increase access
 - Number of people
 - Different kinds of people
- Enable rapid updating

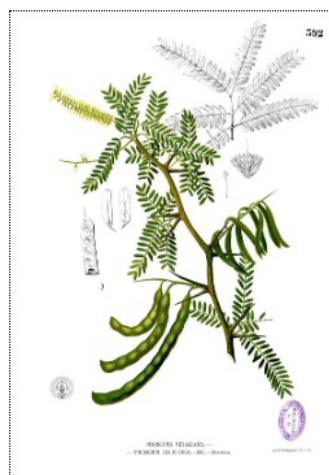
An answer

- Digital technology
 - The web
 - Informatics
- Share, collaborate
- Build on what exists
- Strengthen botany
- Enable rapid updating

***Prosopis juliflora* (Sw.) DC.** ↗

Go to Encyclopedia of Life...

Family: Fabaceae



Francisco Manuel Blanco

Flora of Somalia

English short

Somali short

Awale & Jama (2018). Hordhaca dhirta badhtamaha Soomaalilaand.

Geed yar baahsan oo goor-walba-cagaarane ah oo illaa 10 m gaadha. Laamaha wuxu kasoo bilaabaa gunta. Jirridiisu waa bunni khafiif ah, oo qodxo leh. Caleemo talantaalli ah, oo kakan, oo kasii kooban 22 lammaane oo iska soo horjeed u baxay, oo cagaar dhalaalaya ah. Ubax yar, huruud iyo caddaan ah, oo hoos u soo laadlaada. Midho ku jira qolof dheer oo cagaar widhwidhaya ah, oo aad mooddo in ay yara maroorto, oo si kooxo ah u soo laadlaada.

Sabo: Meelaha burciidda iyo quruuruxa leh, ee inta badan dhulka qashinka leh, joog ah illaa 1500 m. Filiqsanaanta: Asal ahaan Megsiko, imika se aad ugu faafay kulaaleyaasha qallalan iyo dhulalka saxare-xigeenka ah.

Fiiro: Waa geed u adkaysta abaaraha iyo milixda, oo si halis ah u faafaya, oo aad ula wareegay inta badan Berbera iyo dhulka xeebta ku teedsan.

Multiple tabs permitted



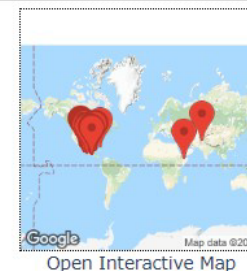
Vilaiti Keekar



Alia Ahmed

SHARING: Images & specimen data
(see map) AUTOMATICALLY shared

Easy to send message if errors



Open Interactive Map



KeyBase

Teaching old keys new tricks...

[Barkworth](#) | [Manage account](#) | [Log out](#)

Modifying keys is simple

Mujahid, I. & A. Shabbir. 2017. Pakistan Journal of Botany 49(4):1327-1333.

- 51 Achenes with myxogenic cells (mucilage-slime producing cells); pappuses of several scales; receptacles flat
- 51: Achenes without myxogenic cells; pappuses coronas of small scales or an auricle; receptacles usually convex or hemispherical
- 52 Heads ligulate, outer flowers pistillate and disc flowers bisexual
- 52: Heads disciform with the outer flowers pistillate or discoid with all flowers bisexual
- 53 Heads disciform with the outer flowers pistillate
- 53: Heads discoid, all flowers bisexual
- 54 Heads solitary, sessile
- 54: Heads in paniculate clusters, pedunculate
- 55 Heads in corymbose panicles; anthers with more or less triangular apical appendages; achenes faintly 4-6-ribbed
- 55: Heads usually in ordinary panicles; anthers with lanceolate-linear to subulate apical appendages; achenes not ribbed
- 56 Achenes slender and somewhat arcuate, obtusely tuberculate; heads in dense corymbose panicles
- 56: Achenes obovoid-oblong, straight or somewhat oblique, smooth or ribbed but not tuberculate
- 58 Heads small, in small or large panicles
- 58: Heads medium-sized to moderately large, solitary or aggregated in dense or open panicles
- 59 Receptacles conical, with bracts; anthers tailed; pappuses composed of short coronas
- 59: Receptacles flat to convex, glabrous; anthers not tailed; pappuses not present

[Xylanthemum](#)

[Tanacetum](#)

[Dendranthema](#)

53

54

56

[Soliva](#) ▶

55

[Ajania](#)

[Artemisia](#)

[Pseudohandelia: Pseudohandelia umbellifera](#)

58

[Seriphidium](#)

59

[Handelia: Handelia trichophylla](#)

61



Flora of Pakistan: Soliva species

By: Mary E. Barkworth and Iram Mujahid

[Interactive](#)

[Bracketed](#)

[Indented](#)

[About](#)

Current node

- Disc florets 3-merous; achenes longer than wide, tops conspicuously hairy, margins thick, corky
- Disc florets 4-merous; achenes wider than long, glabrous, margins with thin papery wings

Remaining items (2)

- [Soliva anthemifolia](#)
- [Soliva sessilis](#)

- Display in 3 formats
- Link taxa to taxon pages
- Download existing key
- Write as spreadsheet
- Modify leads
 - Convert to csv for upload
- Modify metadata

openherbarium.org/taxa/index.php?taxon=275420



[Home](#) [Search](#) [Flora Projects](#) [Agents](#) [Interactive Tools](#) [Images](#) [Other Networks](#) [Symbiota](#)

Welcome Mary! [My Profile](#) [Logout](#) [Sitemap](#)

Soliva sessilis Ruiz & Pav. [Go to Encyclopedia of Life...](#)
Family: Asteraceae



Harry Rose

Flora of North America

Linda E. Watson

Plants (1-12-5(-25+) cm (high or across), more or less villous, glabrescent (not stoloniferous, stems purplish, prostrate to ascending, often rooting at nodes). **Leaves** basal and cauline; blades ± oblanceolate, 1-2(-3)+ cm, 2(-3)-pinnately palmately lobed. **Heads** mostly scattered along stems. **Invlores** 2-4(-5) mm diam. **Florets** without pappuses; **pistillate florets** 5-8(-17+) in 1-2+ series; **disc florets** 4-8+, corollas 1.5-2.5 mm. **Achenes** bodies more or less obovate to lanceolate, (1.5-12.5-3+ mm, usually winged, wings entire or ± sinuate to incised, each shoulder usually distally projecting as spinelike tooth, faces glabrous or more or less scabrelous to hirtellous; persistent stylar sheaths indurate, spinelike, 1-2+ mm, erect or slightly inflexed. 2n = ca. 92 (as S. pterosperma), 110+ (from Portugal), 118-120.

Soliva sessilis is native to South America but is now found in tropical and semi-tropical regions in many parts of the world, including North America, Pakistan, and China. As treated here, it includes 3 variants that are sometimes treated as species. They differ in their achene morphology and may grow together. Their treatment as a single species was recommended by Webb (1986) based on examination of plants growing in lawns in New Zealand.

Mujahid, I. & A. Shabbir. 2017. A new generic record of Asteraceae (*Soliva anthemifolia* from S. Quercus & *Soliva oblongifolia* from S. Quercus) to the flora of Pakistan.



Richard Spellenberg



Bert and Susan Eisenberg



Richard Spellenberg



Richard Spellenberg



Open Interactive Map


[/image/details.php?imgid=90871](#)

Checklists in OpenHerbarium

- Metadata names authors and sources
- Show documentation
- Include notes on habitat, value
- Tools for checking quality
- Link to taxon pages
- For any group
- Parent-child relationships
- CAN HIDE

OpenHerbarium Taxonomy Displ x OpenHerbarium Research Checkl x +

openherbarium.org/checklists/checklist.php?cl=139&proj=7&dynclid=0



Home Search Flora Projects Agents Interactive Tools Images Other Networks Symbiota Welcome Mary! My Profile Logout Sitemap

Home > Pakistan: Regional Checklists > **Pakistan, Sindh Checklist** Games

Pakistan, Sindh Checklist A V Spp

Authors: Rabia Memon and Mary E. Barkworth
Citation: Memon, R. and M.E. Barkworth. Checklist of the vascular plants of Sindh, Pakistan.
[More Details](#)

Families: 104
Genera: 557
Species: 1191 (species rank)
Total Taxa: 1261 (including subsp. and var.)

Page 1 of 3: 1 | 2 | 3

ACANTHACEAE

Asystasia gangetica
Avicennia marina
source: Jafri, S.M.H. 1966. The flora of Karachi. The Book Corporation, Karachi, Pakistan.
Avicennia officinalis
source: Jafri, S.M.H. 1966. The flora of Karachi. The Book Corporation, Karachi, Pakistan.; Zaid bin 1962-01-12 [SINDH]
Barleria acanthoides
A.karim [SINDH]
Barleria cristata
Barleria hochstetteri
A.M Khan 1955-11-15 [SINDH] , Hadi 1963-10-10 [SINDH]
Barleria prionitis
Afzal 2999 [SINDH]
Blepharis linariifolia
Blepharis scindica
source: Jafri, S.M.H. 1966. The flora of Karachi. The Book Corporation, Karachi, Pakistan.
Blepharis sindica
Crossandra infundibuliformis
Dicliptera bupleuroides
Dicliptera verticillata
Dipteracanthus longifolius




Options

Search:

☐ Common Names
☒ Synonyms

Filter:
Original Checklist ▾

☐ Common Names
☐ Display as Images
☒ Notes & Vouchers
☐ Taxon Authors
☐ Show Taxa Alphabetically

[Rebuild List](#)   

Checklists: research checklists need vouchers

OpenHerbarium can list with vouchers, help locate vouchers, and list missing taxa with vouchers

SHARING: Changes in child checklist **AUTOMATICALLY** applied to parent checklist.



Home Search Flora Projects Agents Interactive Tool

Home >> Return to Checklist >> Checklist Administration

Pakistan, Sindh Checklist

Pakistan; Sindh

New Vouchers Missing Taxa Voucher Conflict

Taxa without Vouchers: 845 (excludes taxa from)

Listed below are species from the checklist that c for possible voucher occurrences. Use the pulldo

ACANTHACEAE

Asystasia gangetica
Barleria cristata
Blepharis linariifolia
Blepharis sindica
Crossandra infundibuliformis
Dicliptera bupleuroides
Dicliptera verticillata
Eranthemum pulchellum
Justicia adhatoda
Justicia gendarussa
Justicia heterocarpa
Justicia spicigera
Justicia vahlii
Lepidagathis cuspidata
Lepidagathis lutea
Lepidagathis trinervis



Home Search Flora Projects Agents Interactive Tools Images Other

Home >> Return to Checklist >> Checklist Administration

Pakistan, Sindh Checklist

Pakistan; Sindh

New Vouchers Missing Taxa Voucher Conflicts Reports

Possible Missing Taxa: 24

Listed below are species name not found in the checklist but are

Alysicarpus bupleurifolius
Avena sativa
Capparis himalayensis
Cenchrus setaceus
Crotalaria mysorensis
Crotalaria trichotoma
Dianthus caryophyllus
Eleusine compressa
Indigofera hebeptala
Indigofera paniculata
Lathyrus odoratus
Lotus corniculatus
Luffa acutangula
Najas graminea
Phaseolus vulgaris
Pistacia khinjuk
Rhynchosia albissima
Scrophularia striata
Sesbania pachycarpa

Home Search Flora Projects Agents Interactive Tools Images Other Networks Symbiota

Home >> Return to Checklist >> Checklist Administration

Pakistan, Sindh Checklist

Pakistan; Sindh

Write keys!

New Vouchers Missing Taxa Voucher Conflicts Reports

- Full species list (CSV)
- Full species list (Print Friendly)
- Full species list with vouchers (CSV)
- Full species list with vouchers (Print Friendly)
- Pensoft Excel Export
- Occurrence vouchers only (DwC-A, CSV, Tab-delimited)
- Possible species additions based on occurrence vouchers
 - Specimens of taxa missing from checklist (CSV)
 - Specimens with misspelled, illegal, and problematic scientific names (CSV)

Checklists: teaching

enherbarium.org/checklists/checklist.php?cl=139&proj=7&dynclid=0

Pakistan, Sindh Checklist

Authors: Rabia Memon and Mary E. Barkworth
Citation: Memon, R. and M.E. Barkworth. Checklist of the vascular plants of Sindh, Pakistan.
[Less Details](#)

Locality: Pakistan, Sindh Province

Abstract: This checklist is being developed from a combination of records in OpenHerbarium, including several from the Flora of Pakistan, Jafri's Flora of Karachi. Data in records in from the Global Biodiversity Information Facility will be added. Tools in OpenHerbarium will be used to locate voucher specimens.

Notes: Started with names from grid squares in the Flora of Pakistan. There are some names derived from parts of Islamabad Capital Territory, as well as neighboring provinces that are included in grid squares that include a part of Sindh Province.

Families: 104
Genera: 557
Species: 1191 (species rank)
Total Taxa: 1260 (including subsp. and var.)

Page 1 of 13: [1](#) | [2](#) | [3](#) | [4](#) | [5](#) | [6](#) | [7](#) | [8](#) | [9](#) | [10](#) | [11](#) | [12](#) | [13](#)



Options






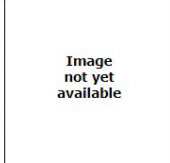


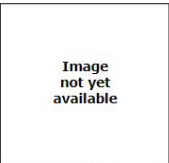
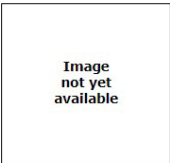



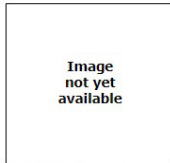
Search:

☐ Common Names
☒ Synonyms


Filter:
Original Checklist ▾

☐ Common Names
☒ Display as Images
☐ Show Taxa Alphabetically

[Rebuild List](#)  

 <i>Asystasia gangetica</i> [ACANTHACEAE]	 Image not yet available	 Image not yet available	 <i>Barleria acanthoides</i>	 <i>Barleria cristata</i>	 Image not yet available	 <i>Barleria prionitis</i>
 Image not yet available	 Image not yet available	 Image not yet available	 Image not yet available	 Image not yet available	 Image not yet available	 Image not yet available

© Ori Fragman-Sapir



[Skip This One](#) Image 1 of 4 [Next Images](#) ➔

1 out of 385 Species Identified
0 Identified Correctly on First Try

Tell Me What It Is!

Options

Filter Quiz by Taxonomic Group ▾


☐ Display Common Names

[Reset Game](#)

Ask WHY?
WHY that family?
WHY that genus?

Global resources: benefit from, help build

GBIF – Global Biodiversity Information Facility

[Get data](#)[How-to](#)[Tools](#)[Community](#)[About](#)

GBIF | Global Biodiversity Information Facility

Free and open access to biodiversity data

OCCURRENCES

SPECIES

DATASETS

PUBLISHERS

RESOURCES

Search

Q

WHAT IS GBIF?

ABOUT GBIF PAKISTAN

Candle sponge (*Aplysina fistularis*) observed off the coast of Fitts Village, Barbados by Julian Walcott. Photo via iNaturalist (CC BY-NC 4.0)

Occurrence records

1,387,490,017

Datasets

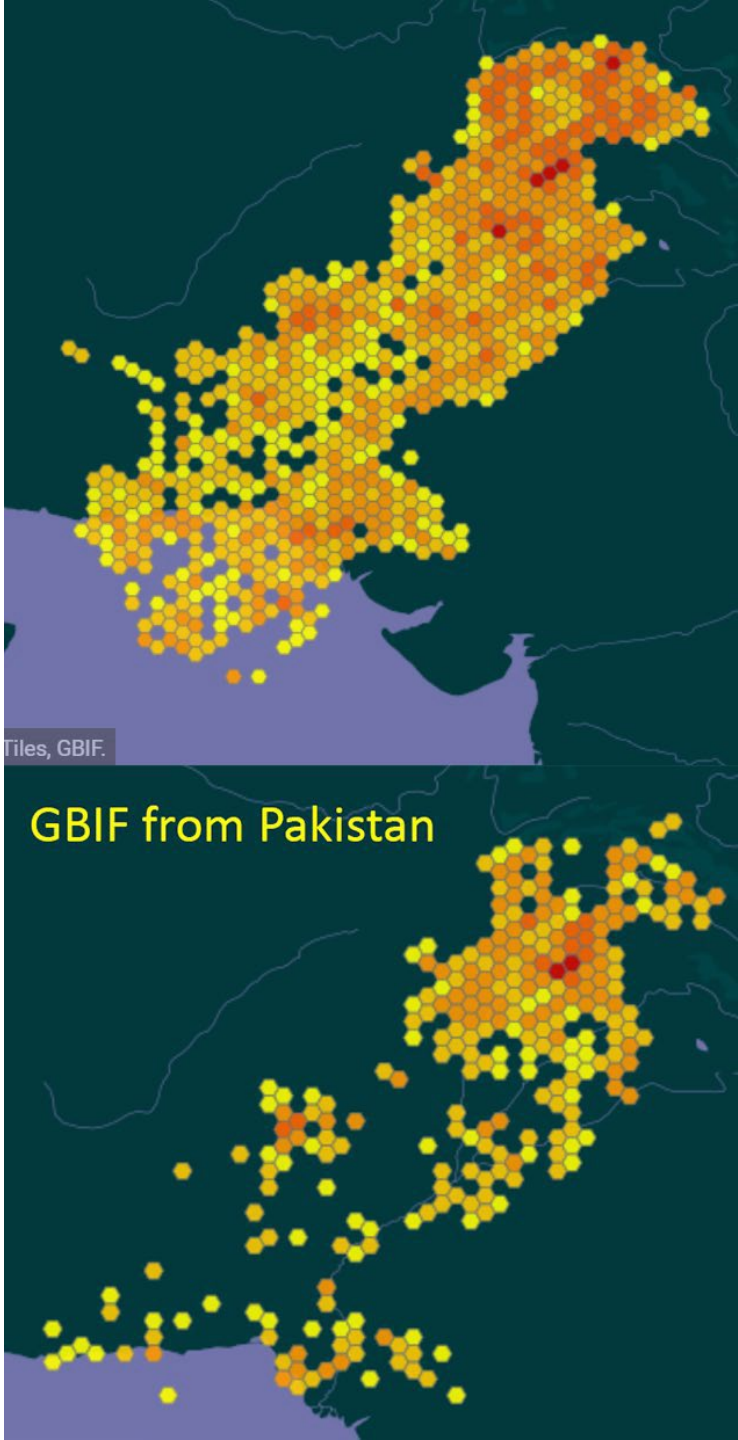
50,717

Publishing institutions

1,569

Peer-reviewed papers using data

4,277



GBIF – occurrence data and more

Checklists Sampling event datasets

How to choose a dataset class on GBIF?

Marie Grosjean

2019-12-04 · GBIF · Publishing

If you are a (first time) publisher on GBIF and you are trying to decide which type of dataset would best fit your data, this blogpost is for you.

All the records shared on GBIF are organized into datasets. Each dataset is associated with some metadata describing its content (the classic “what, where, when, why, how”). The dataset’s content depends strongly on the dataset’s class. GBIF currently support four types of dataset:

- Resource datasets (e.g. metadata-only datasets)
- Checklists
- Occurrence datasets
- Sampling-event datasets

These classes are described in detail on our [Dataset classes page](#) along with links to examples and documentation. As mentioned on this page:

The four classes of datasets supported by GBIF start simply and become progressively richer, more structured and more complex.

In other words, the distinction between the different classes is not always very obvious. This is why I tried to put together a quick guide to help you choose the class that fits best your data.

Five questions to help you decide

Names & nomenclature

- IPNI (International Plant Names Index)
 - Vascular plants
 - If valid and legitimate, *not taxonomy*.
 - Rarely infraspecific taxa
 - Not linked to protologues
- WFO (World Flora Online)
 - Successor to The Plant List
 - Taxonomy, no sources
- **Tropicos** – Developed by and for Missouri Botanical Garden
 - Shows usage in floras
 - Links to Biodiversity Heritage Library
 - Includes bryophytes
- **Taxonomic Names Resolution**
 - Use as spell check

No database is perfect, nor up to the minute

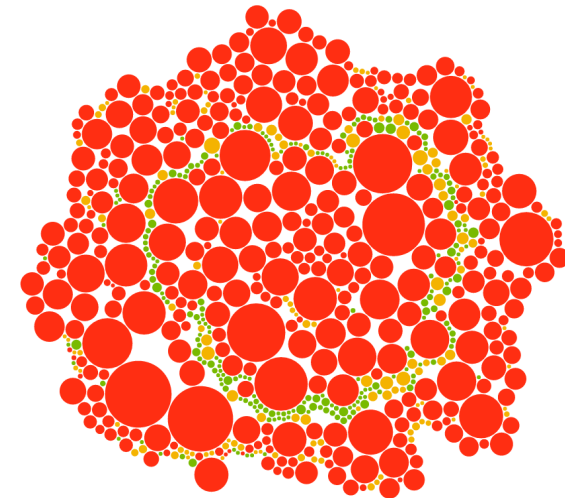
- They are very useful
- Help them be better
- **Encourage Pakistan and Provincial Governments**
 - Generate and make Open Access Geographic files for administrative areas
 - Divisions, Tehsils, Parks, Reserves, etc.
- Encourage students to gain skills in programming, GIS



Open Herbarium

An Open Vascular Plant Herbarium Network

- Run by Symbiota, open source software
 - Over the years, increasingly complex
- Symbiota2 beta release fall
 - Reduce complexity
 - Make development easier
 - Some new tools as demos



Symbiota1
large & red bad
small and green good

Topics



Skills



Plant taxonomy



Herbarium specimens



Documenting biodiversity



OpenHerbarium

Less Geel	Less Geel Rock Art Reserve, inside the fenced area	9.780317	44.445217	
Less Geel	Less Geel Rock Art Reserve, inside the fenced area	9.780317	44.445133	
Less Geel	Less Geel Rock Art Reserve, inside the fenced area	9.780317	44.4452	
Less Geel	Less Geel Rock Art Reserve, inside the fenced area	9.780563	44.44485	
Less Geel	Less Geel Rock Art Reserve, inside the fenced area	9.78155	44.442433	
Less Geel	Less Geel Rock Art Reserve, inside the fenced area	9.78155	44.442433	
Less Geel	Less Geel Rock Art Reserve, inside the fenced area	9.78025	44.444483	
Less Geel	Less Geel Rock Art Reserve, inside the fenced area	9.78025	44.44116	m
Less Geel	Less Geel Rock Art Reserve, inside the fenced area	9.78155	44.442433	
Less Geel	Less Geel Rock Art Reserve, inside the fenced area	9.78155	44.442433	
Less Geel	Less Geel Rock Art Reserve, inside the fenced area	9.780317	44.445183	
Less Geel	Less Geel Rock Art Reserve, inside the fenced area	9.780563	44.444833	95.46.035m 445.26.09m
Less Geel	Less Geel Rock Art Reserve, inside the fenced area	9.780317	44.44525	95.46.015m 445.26.115m
Less Geel	Less Geel Rock Art Reserve, inside the fenced area	9.780317	44.44525	95.46.015m 445.26.125m
Less Geel	Less Geel Rock Art Reserve, inside the fenced area	9.780317	44.44525	95.46.015m 445.26.125m
Less Geel	Less Geel Rock Art Reserve, inside the fenced area	9.780317	44.44525	95.46.015m 445.26.125m
Less Geel	Less Geel Rock Art Reserve, inside the fenced area	9.780317	44.44525	95.46.015m 445.26.125m
Less Geel	Less Geel Rock Art Reserve, inside the fenced area	9.780317	44.44525	95.46.015m 445.26.125m
Less Geel	Less Geel Rock Art Reserve, inside the fenced area	9.780317	44.44525	95.46.015m 445.26.125m

Data cleaning
Making data fit for use and reuse

Data cleaning



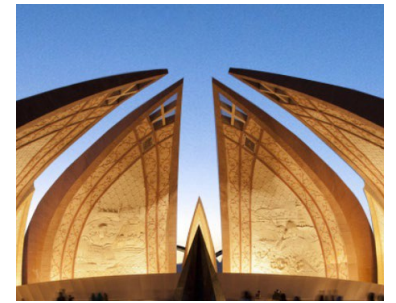
Digitizing a herbarium



Glossary

Thank you
Mary Barkworth
mary.barkworth@usu.edu

February 29, 2019



- GBIF Contributors
 - Quaid-i-Azam herbarium
 - Bannu Post Graduate College
 - University of Balochistan
 - University of Azad Jammu & Kashmir
 - University of Sindh Jamshoro
- [OpenHerbarium](#)
 - Contributing herbaria: 14

- Records available: 32,220
 - With species: 38,798
 - With lat/lon: 24,983
- Flora of Pakistan online
 - Keys: 400, a few updated
 - Citations: 32,190
- Regional Checklists: 13

