How to implement a Virtual Guide to a Flora

Based on the open-source information system FloraGREIF

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Rationale

- **plant species**, communities, and their ecological interactions **are in danger of extinction, threatened** e.g. climate change, habitat loss and transformation, over-exploitation, alien invasive species, pollution, clearing for agriculture ,….
- the **knowledge**, innovations and practices of indigenous and local human communities that depend on plant diversity **needs** to be **recognized, respected, preserved and maintained**
- **access to** this **information needs to be provided** to everyone interested and therewith awareness created

CBD COP 6 (2002) adopted Global Strategy for Plant Conservation

updated targets 2011-2020

- ***Objective I: Plant diversity is well understood, documented and recognized***

- Target 1: An online flora of all known plants.

- Target 2: An assessment of the conservation status of all known plant species, as far as possible, to guide conservation action.

- Target 3: Information, research and associated outputs, and methods necessary to implement the Strategy developed and shared.

World Flora Online launched at COP 11 (2012)

- aims to be a comprehensive guide to all known species of plants
- will include information on their names, the history of their publication, descriptions, images, distributions, and conservation status

→ yet, a final data model has not been determined

Reliable determination of plants as basis of ecological research

Plant identification skills:

- for applied projects,
  e.g. in vegetation ecology,
  pasture management,
  forestry,
  medical plants….
- to teach students in universities and schools
- for interested lay persons and eco tourism
- **As well for skilled botanists**

Reliable determination of plants

From printed determination books to modern **e-floras**:

- ✓ No limited editions, available for everybody,
- ✓ number of pictures not limited, updatable

Flora of the U.S.S.R., Vol. VI, p. 7

I. Key to Genera

1. Embryo hippocrepiform or annular (Plate I, Figures 1 and 2); seeds albuminous (Subfamily 1. Cyclolobeae C. A. M.) . . . . . 2.
+ Embryo spirally coiled (Plate I, Figures 3 and 4); seeds exalbuminous (Subfamily 2. Spirolobeae C. A. M.) . . . . . 25.

Long dichotomous keys:

- important tool for botanists

But:

- hard to use for non-specialists
- often not suitable for field work

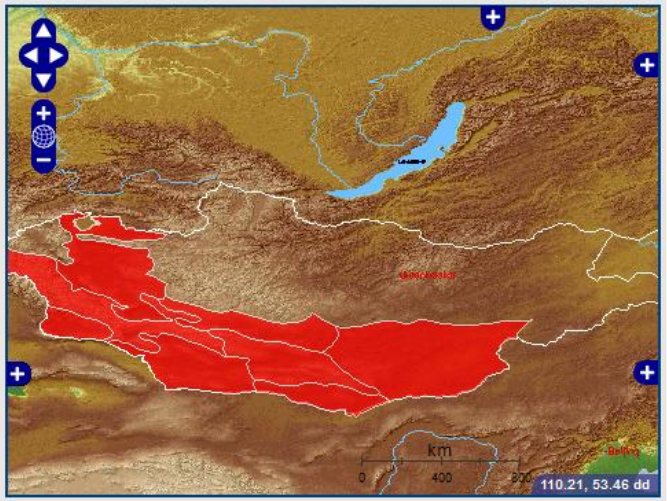
Home | Search Plant Database | WebGIS | Technical Terms | Information

Get an Overview
Targeted Search
WebGIS
Map Search

Taxon data
Records
Herbar scans
Species photos

Family: Polygonaceae

Scientific name: ***Calligonum mongolicum* Turcz.**
Name acc. to: Gubanov 1996
Description: Taxonomic caracteristic "pedicel 1-2 mm, jointed below" accord. to Flora of China, Vol. 5 (2003) is not always evident. Some specimen present pedicels jointed at middle. Pedicel 1-2 mm.
Confuse with: Calligonum gobicum Bunge ex Meissn.
Comments: C. mongolicum differs from C. gobicum by achenes up to 10 mm in diam. and 10 mm long with slender bristles.
Habitat: Sands in sandy steppes and deserts, Haloxylon woodlands, sandy bottom of sayrs and creek valleys, margins of saline depressions in desert-steppe and desert zones (Grubov 2001).
Growthform: Shrubs (Flora of China, Vol. 5 2003)
Link to Flora of China: http://www.efloras.org/browse.aspx?flora_id=2&name_str=Calligonum+mongolicum
Distribution: Mongolian Altai, Depression of Great Lakes, Valley of Lakes, East Gobi, Gobi-Altai, Dzungarian Gobi, Transaltai Gobi, Alashan Gobi (acc. to Gubanov 1996)



open map in a new window

FloraGREIF project:

presents the flora of Mongolia, combining:

- **taxa** (species descriptions, distribution and other)
- **plant images**
- **plant records**

FloraGREIF project: Record Data

7206 plant records in 1249 of a total of 2876 Mongolian plant species

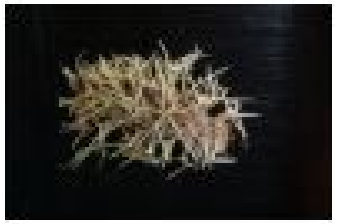
- 1520 scans of herbarium specimens of 975 species
- 10600 plant images and 775 habitat images

Collector, coll. No.

Herbarium, Scan

Location, Habitat

Flowering status



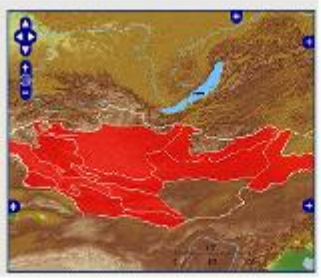
list all A B **C** D E F G H I J K L M N O P Q R S T U V W X Y Z list by Genus

Family	Occurring Taxa	Available Records	Images	Info
Chenopodiaceae	genus: 25 species: 99	1207 herbar sheets 126 photo records in 93 species		S. Rilke 2007-2010, H. Freitag 2010, A.P. Sukhorukov 2012
Convallariaceae	genus: 3 species: 7	11 herbar sheets 1 photo record in 3 species		
Cynomoriaceae	genus: 1 species: 1	1 herbar sheet 1 photo record in 1 species		S. Rilke, June 2009
Cyperaceae	genus: 12 species: 121	133 herbar sheets 40 photo records in 55 species		M. Schnittler, January 2011

Taxon Detail:

Family:	Chenopodiaceae (Tribe: Chenopodieae)
Scientific name:	***Chenopodium hybridum* L.**
Name acc. to:	Gubanov 1996
Description:	leaves palmately lobed with 2-5 teeth each side, base at least slightly cordate, petiole long: 1/3 to 2/3 of blade; inflorescence rather loose paniculate, flowers with 5 perianth segments; seeds large 1.5-2 mm in diameter, seed coat surface with craterlike pits, perianth segments not concealing seed
Confuse with:	Ch. rubrum (differentiate by smaller seeds)
Comments:	for differentiation into subsp. see *FC
Habitat:	Slopes of mountains and hills in shade of rocks and stones, screes, shrubberies, tree shade, slopes and bottom of canyons and creek valleys, deep beds of sayrs, sparsely (Grubov 2001).
Growthform:	herbs annual (acc. to Flora of China 1994-)
Link to Flora of China	http://www.efloras.org/browse.aspx?flora_id=2&name_str=Chenopodium+hybridum
Distribution:	Khentei , Khangai, Mongol-Daurian, Great Khingan, Mongolian Altai, Middle Khalka, East Mongolia, Depression of Great Lakes, Valley of Lakes, Gobi-Altai, Dzungarian Gobi, Transaltai Gobi, Alashan Gobi (acc. to Gubanov 1996)
Distribution in Khangay:	eastern district, southern district (acc. to Byazrov et al. 1989)

open map in a new window



Record Detail:

Chenopodiaceae	***Chenopodium hybridum* L.**
Collected by:	K.-F. Günther et M. Schnittler 02.09.2007, Coll.No. 27888
Determined by:	K.-F. Günther et M. Schnittler
Confirmed by:	Rilke, Sabrina, 3.9.08
Flowering status:	adult, fruiting
Comments for presentation :	seeds 2 mm in diameter
Herbarium:	**Herbar K.-F. Günther** Privat herbarium K.-F. Günther, Buchaer Str. 6 b, D-07745 Jena, Germany
herbar scan	

2 seeds and 4 fruits

leaf

Country:	Mongolia Province: Khovd District: Dorgon
Locality:	Seer, canyon of the Chono-Kharaykhyn Gol river, Mongolei, Khovd-Aimak, Senke der Großen Seen, Kara ussu-See (Khar Us Nuur), 12,5_km südöstl. Durgun (Seer)
Coordinates:	Geogr. Coord. 92.794700 (lon) 48.314400 (lat) decimal Prec: 500 m
Altitude:	1155 ± 25 m

Habitat:	rocky, S-exp. side canyon in granite rocks, near the camp-place, auf Felsgeröll

FloraGREIF project: Floristic Data

2876 species in 662 genera in 128 families (Based on Gubanov 1996)

Asteracae

Fabaceae

Poaceae

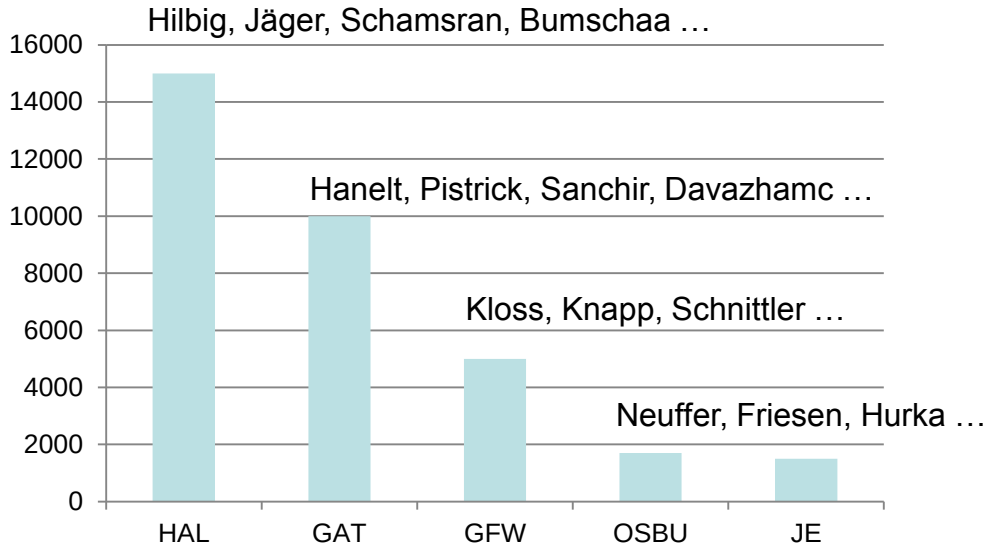
Our goal:

- aquirement of images and scans for as many species as possible
- providing of detailed information for taxonomically difficult groups, as:
  - *Artemisia* (key species for arid habitats)
  - Chenopodiaceae (key species on salty soils)

Why Mongolia?

- Long term research experience in Mongolia since 1962 at different Institutions in (former Eastern) Germany
- Large herbarium collections from Mongolia in Germany

Herbarium	No. Specimen
HAL	15000
GAT	10000
GFW	5000
OSBU	1700
JE	1500



VEGETATION ZONES OF MONGOLIA

1:10.000.000

90°0'0"E 100°0'0"E 110°0'0"E

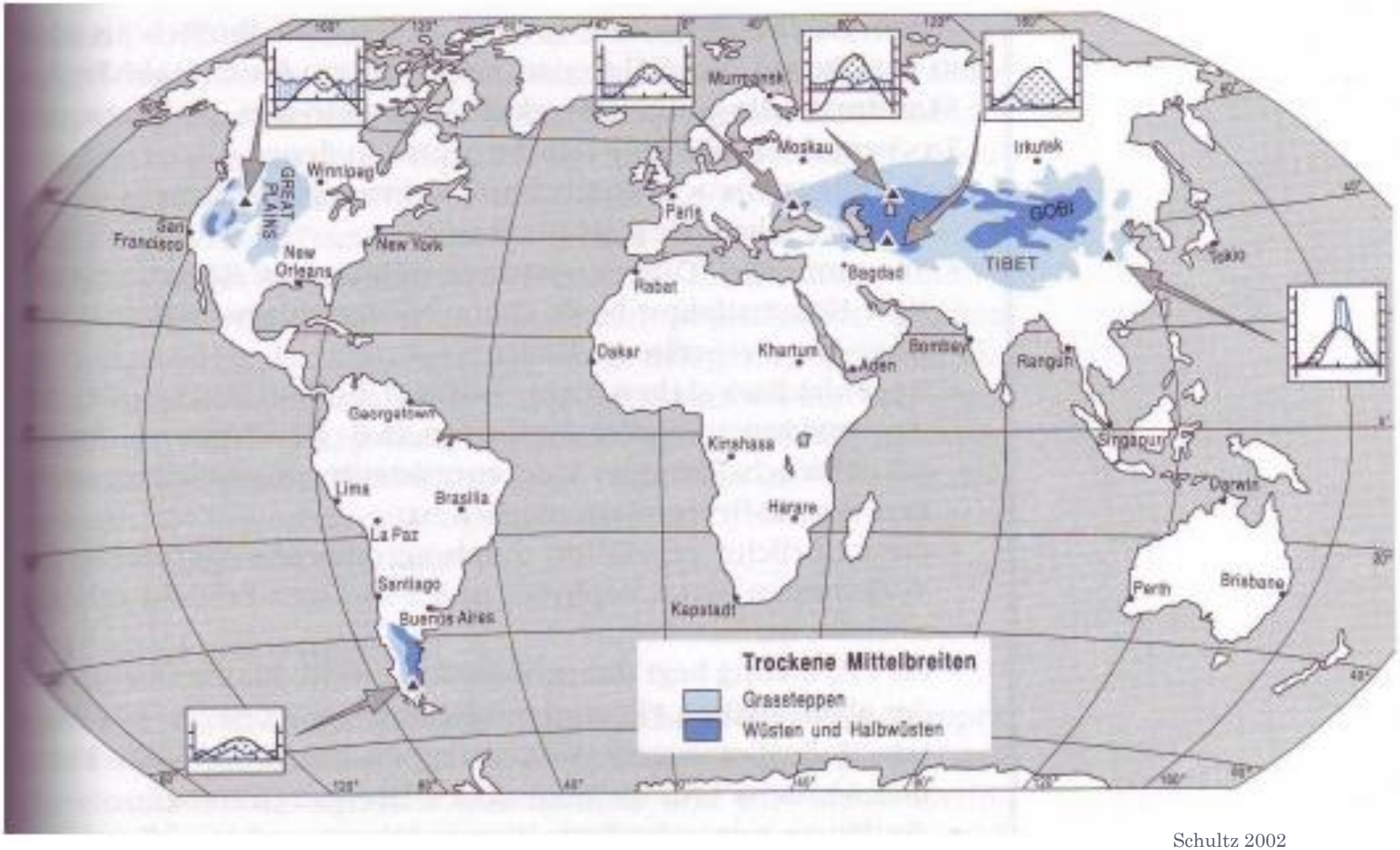
50°0'0"N 45°0'0"N 40°0'0"N

Legend

- Alpine Vegetation
- Mountain Taiga
- Mountain Forest Steppe and Mountain Steppe
- Dry Steppe
- Desert Steppe
- Desert

SOURCE:
LAVRENKO 1979

0 125 250 500 750 1.000 Kilometers



Schultz 2002

Gurbanguly
Berdimuhamedow

Türkmenistanyň dermanlyk ösümlikleri

V

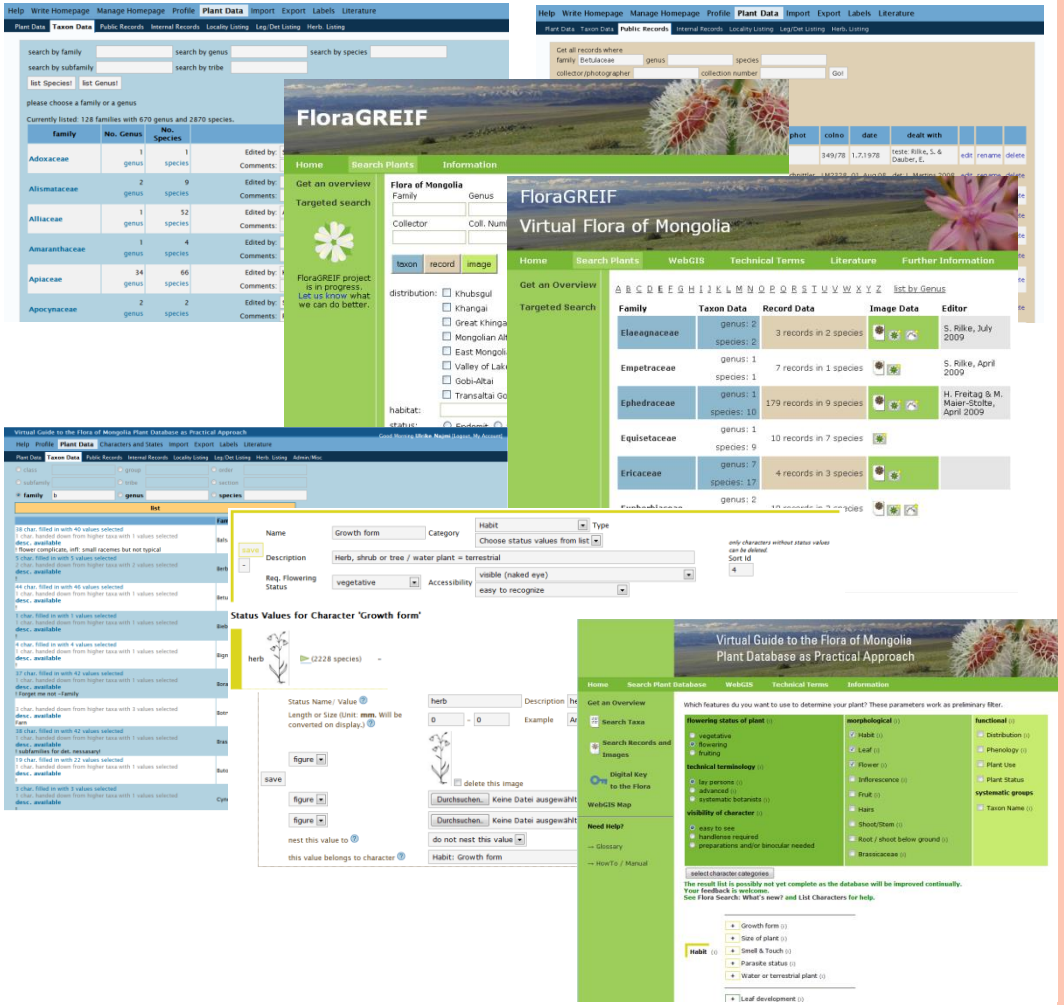
How to implement a Virtual Guide to a Flora

2007 – 2010

- Basic Taxonomic Backbone
- Record and Image Database
- Search Plant Database

2011 – 2014

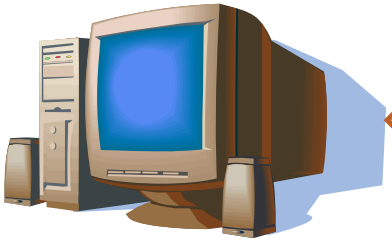
- Advanced Taxonomic Backbone
- Character Database
- Digital Multi Access Key



Taxonomic Backbone

- Is there a compiled plant list?

Grubov 1982/2001,
Gubanov 1996,
add. literature



information system

Files (Excel, CSV)

- Add synonyms, short descriptions …
- Hierarchical listing of taxa: class – group – order – family – subfamily – tribe – genus – section – species

Taxonomic Backbone – internal Screenshot

Virtual Guide to the Flora of Mongolia Plant Database as Practical Approach

Good Morning **admin** [Logout, My Account]

Help | Write Homepage | Manage Homepage | Links | Presentation | Plugins | Users | Options | Import | **Plant Data** | Characters and States | Import | Export | Labels | Literature

Plant Data | **Taxon Data** | Public Records | Internal Records | Locality Listing | Leg/Det Listing | Herb. Listing | Admin/Misc

○ class ○ group ○ order

○ subfamily ○ tribe ○ section

◉ **family** f ○ **genus** ○ **species**

list

	Family	Author	Editor	Synonym	
39 char. filled in with 42 values selected 1 char. handed down from higher taxa with 1 values selected **desc. available** ! schwer für Laien zugängliche Gruppe Sonderschlüssel Limb and unguis	Fabaceae g [26] S [318]		S. Rilke, S. Starke, A. Weitkunat: Mai–November 2013; D. Podlech (Astragalus without fotos), Juli 20	Papilionaceae; Leguminosae	edit
30 char. filled in with 37 values selected 1 char. handed down from higher taxa with 1 values selected **desc. available** ! colour?	Frankeniaceae g [1] S [2]		S. Rilke, March 2009		edit
38 char. filled in with 41 values selected 2 char. handed down from higher taxa with 2 values selected **desc. available** ! carpell number?	Fumariaceae g [2] S [9]		S. Rilke & S. Starke, March 2012	Papaveraceae p.p. , Papaveraceae subfam. FUMARIOIDEAE	edit

Enter new family:

Choose group1

fill group2

fill order

family

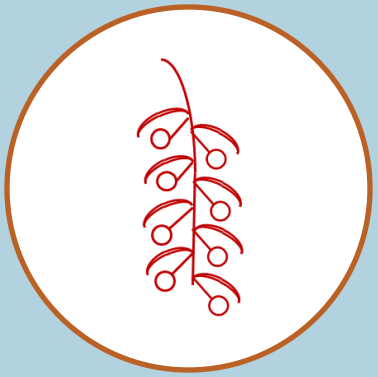
family

author

author

editor

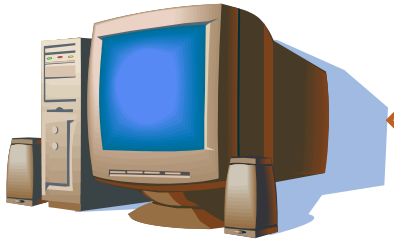
save **save and continue**



Record Database = Virtual Herbarium

- Is there a compiled list of herbarium specimen?

Enter one by one

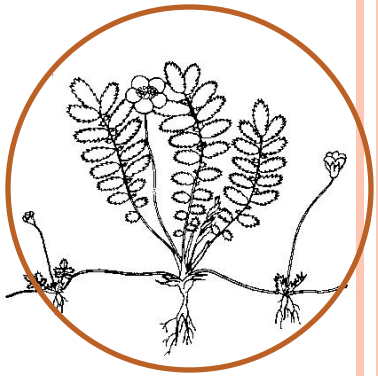


information system

Import lists

Files (Excel, CSV)

- Add revision/confirmation remarks
- Add images/macros/scans …



Record Database - Screenshot

Plant Data | Taxon Data | **Public Records** | Internal Records | Locality Listing | Leg/Det Listing | Herb. Listing | Admin/Misc

family | genus | species

coll./phot. by: Jäger | coll. no.

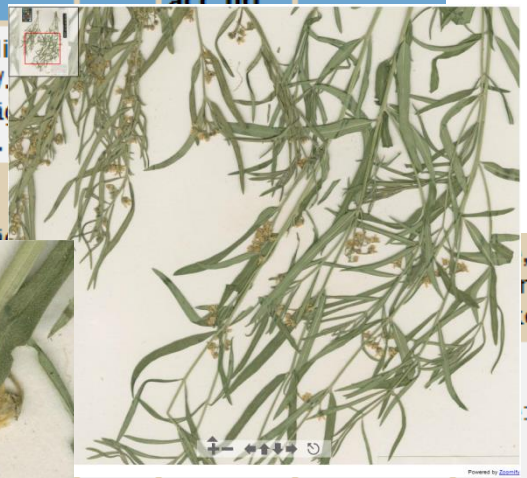
acc. no. | herbar | ☑ show records with scans only

int. remark | *edited by* | Go!

collector: **Jäger**

enter new record:

currently displayed: 1 – 100 show next records >> (for undetermined records: see below)



	int. remarks	presentation remarks	record	leg	phot	coll.no. acc.no	date				
scan ★			Allium altaicum	Hi W. Jä E.							
scan ☆ *								, nne e	edit	rename	move ->	delete x
scan ★ *						58070		: Rilke,	edit	rename	move ->	delete x
scan ☆						Aufn. 34 HAL acc.no. 57103	26.06.1982		edit	rename	move ->	delete x

Character Database

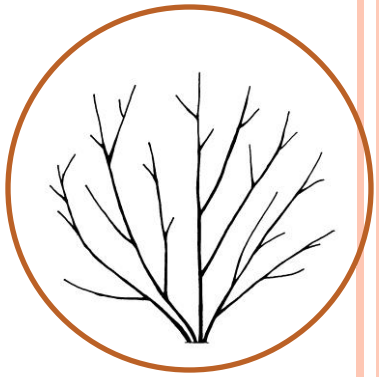
- What are the characteristics of plants?

Morphological Characters

- Habit (#5)
- Leaf (#16)
- Flower (#21)
- Inflorescence (#3)
- **Fruit** (#7)
- Hairs (#2)
- Shoot/Stem (#2)
- Root / shoot below ground (#3)

Functional Characters

- Distribution (#2)
- Phenology (#2)
- Plant Use (#2)
- Plant Status (#3)



Character Database - Screenshot

Name: Inflorescence Type Category: Inflorescence Type: Choose status values from list

save

Description: Types of inflorescence. Attention: We here ask for the botanical nomenclature of inflorescences,

Req. Flowering Status: flowering Accessibility: easy to see / advanced

only characters without status values can be deleted.

Sort Id: 3

Status Values for Character 'Inflorescence Type'

spike (233 species) –

Status Name/ Value: spike Description: all flowers sessile and crowded along a main a

Length or Size (Unit: **mm**. Will be converted on display.): 0 – 0 Example: Plantago, Carex vesicaria, Vicia, Typha (spad

figure delete status

save delete this image Sort Id: 1

figure Durchsuchen... Keine Datei ausgewählt.

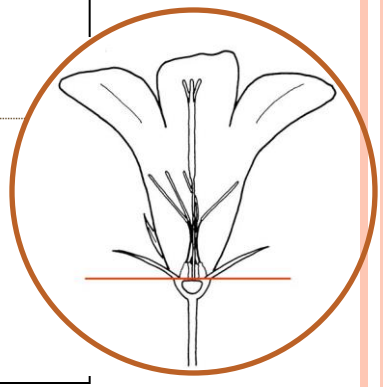
figure Durchsuchen... Keine Datei ausgewählt.

nest this value to: do not nest this value

this value belongs to character: Inflorescence: Inflorescence Type

raceme (519 species) edit

umbel (156 species) edit



Digital Multi Access Key

- What are plants like within this family, genus, species?

+ **Habit**, general appearance of a plant [3: 3]

+ **Fruit**, the seed bearing organ, with or without adnate parts; a ripened ovary and any other structures which are attached and ripen with it. Aggregate fruits are handled like simple fruits for determination. [6: 8]

+ **Flower**, reproductive portion of the plant, consisting of sepals, petals, stamens, and pistils [20: 1 24]

- **Inflorescence**, flowering part of a plant, describes the arrangement of the flowers on the flowering axis [3: 2 2]

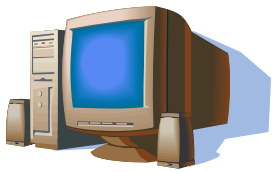
Character	Available Status Values	Current Status Values inherited by
Inflorescence +		Flowers in inflorescence → family value acc. to:
Appearance +		terminal → family value acc. to:
Inflorescence Type +		umbel double umbel value acc. to:

+ **Leaf**, expanded, usually photosynthetic organ of a plant (including phylloclades) [8: 3 10]

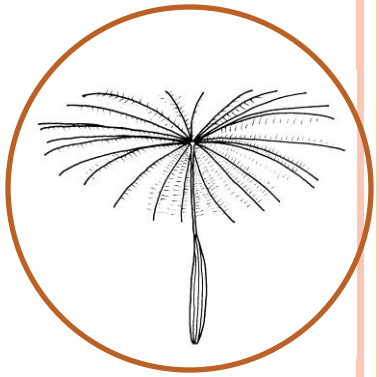
+ **Shoot/Stem**, a young stem or branch

+ **Root / shoot below ground**, plant part below ground (in most cases), including below ground shoots, without leaves [3: 4]

Taxonomists



information system



Digital Key- Screenshot

Virtual Guide to the Flora of Mongolia
Plant Database as Practical Approach

Home | Search Plant Database | WebGIS | Technical Terms | Information

Get an Overview

Search Taxa

Search Records and Images

Digital Key to the Flora

WebGIS Map

Need Help?

→ Glossary

→ HowTo / Manual

The result list is possibly not yet complete as the database will be improved continually.
Your feedback is welcome.
See Flora Search: What's new? and List Characters for help.

Current Search Parameter:

- Growth form: **herb**
- Flower Form: **papilionaceous**
- Distribution (Veg. Zones): **Khangai**

☑ **Edit search parameter** **Reset search parameter**

108 taxa matched search parameter: 1 - 100 >>

Fabaceae

Astragalus

Astragalus bifidus

Astragalus brachybotrys

Astragalus brevifolius