



„Virtual Guide and Practical Approach to the Flora of Mongolia“

AG Kartographie und Geographische Informationssysteme
am Institut für Geographie und Geologie

AG Allgemeine & Spezielle Botanik
am Institut für Botanik u. Landschaftsökologie

Universitäts-Rechenzentrum

Roadmap

- Why a virtual Flora?
 - The Problem, The needs and Our Ideas
- Implementation of the Information System
- Floristic Data: Mongolia
 - Where we are: species treated
 - Handling of Taxon, Record and Image Data
- WebGIS: Distribution maps



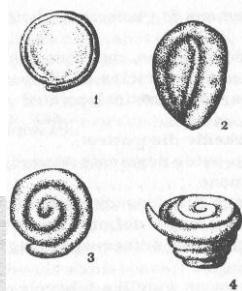
The Problem

Printed determination books:

- long dichotomous keys
- numerous technical terms
- rarely pictures of the plants
- limited editions, quite expensive

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.
2. Roots and stems with normal anatomic structure; leaves trigonous-subulate needle-shaped; flowers solitary in the leaf axils with



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



The Needs

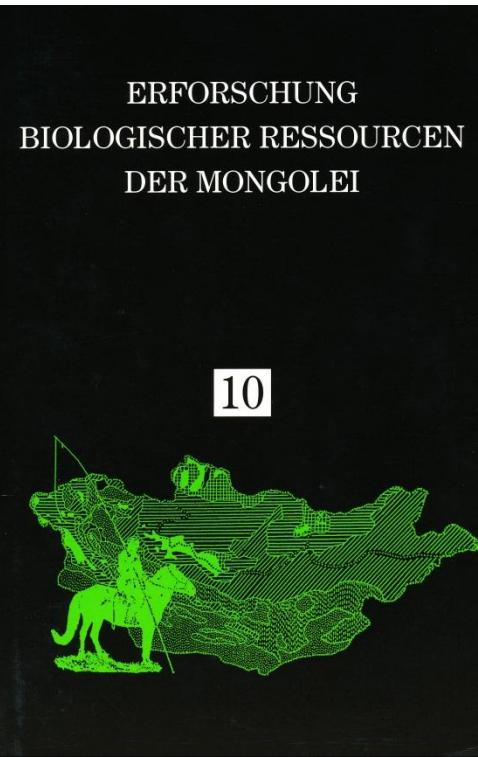
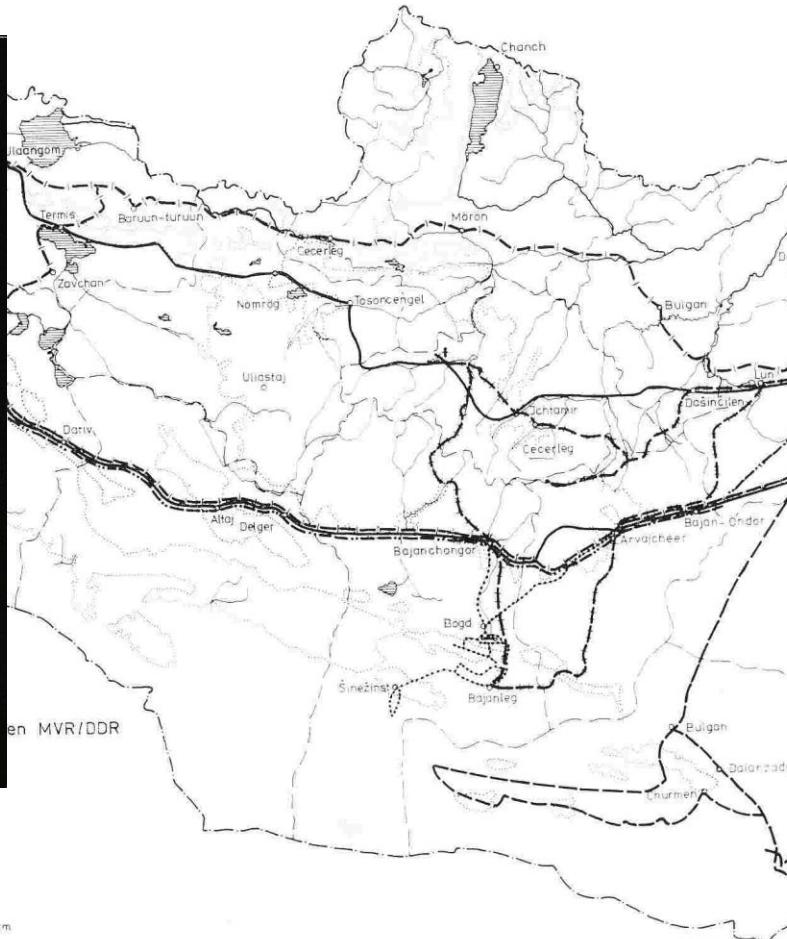
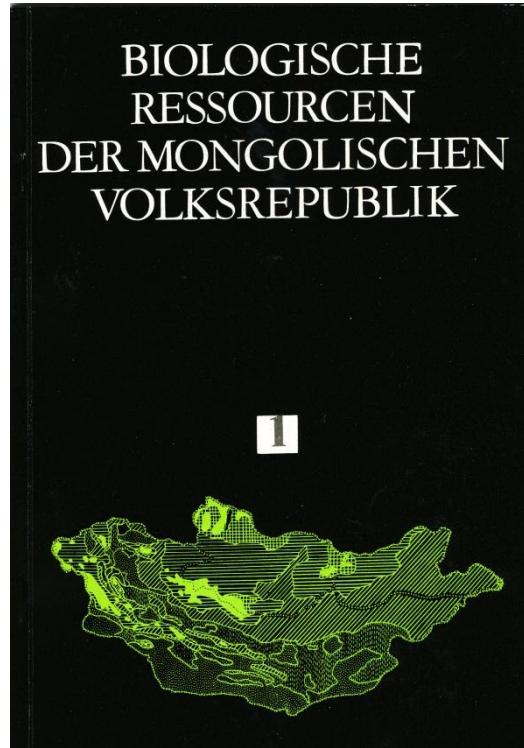
Plant identification skills:

- for applied projects, e.g. vegetation ecology, grazing loads, local economies
- to teach students in universities and schools
- to become familiar with a local flora in a short time, not only for botanists but for all interested people



The Background

Long term research experience in Mongolia since the 1960s





The Idea

Large herbaria collections from Mongolia in Germany

- Herbaria (stored dried labeled plants)
- Photo collections: living plants, macro images of details
- Taxonomical knowledge

Create a system

- to identify a plant by comparison
- to check the identifications by images and descriptive data
- to be extended with contributions of the user

Herbarium scans



Living plants



Living plants



Macro images



The Information System

Taxonomic backbone

- species description
- habitat, distribution
- determination hints

Record data

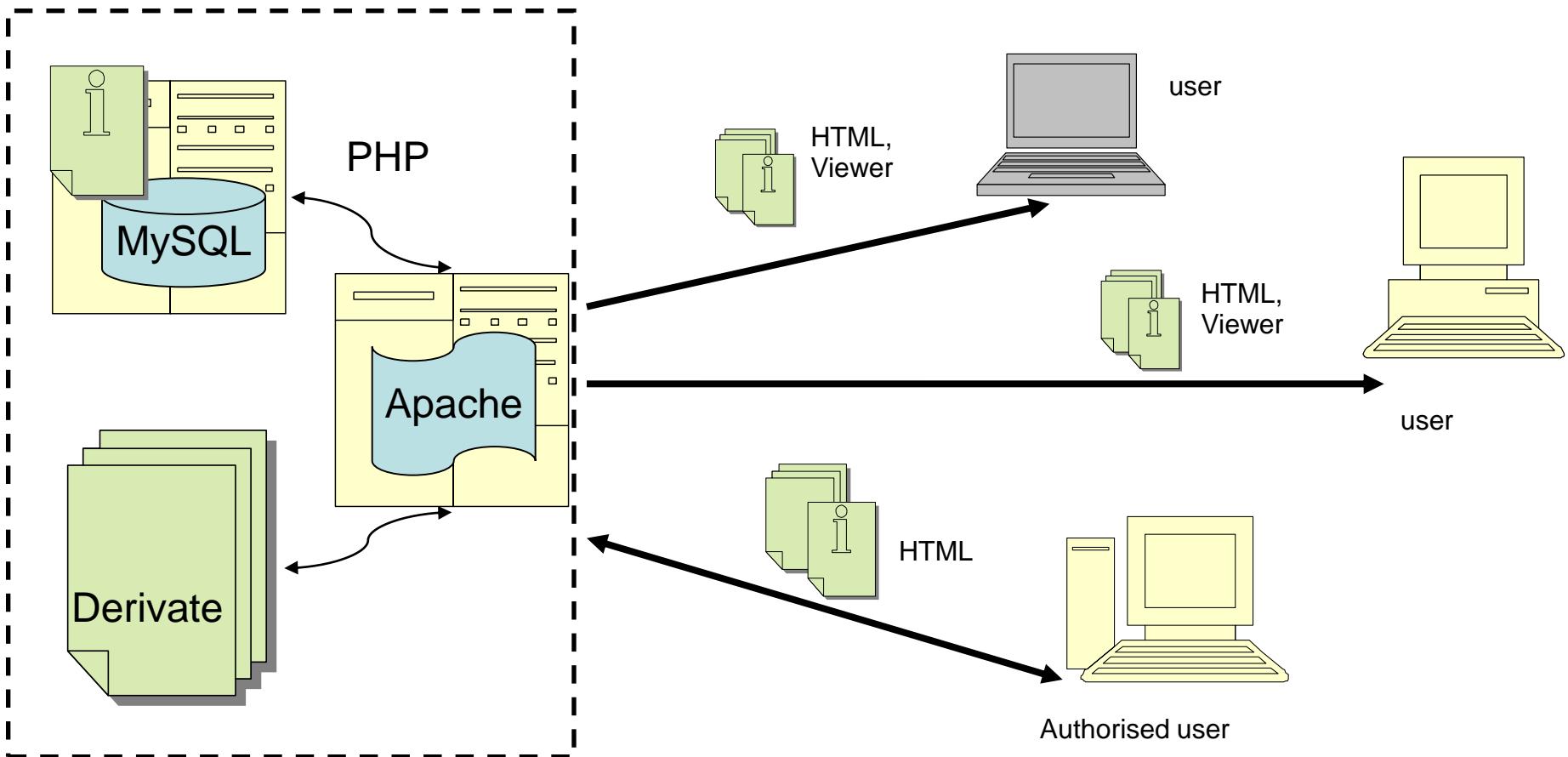
- who collected when where what?
- images of all kinds
- locality data

Search engines

- for taxa of all hierarchy levels
- for regional floras
- for collectors and specialists who have verified determinations

and as an outcome a “virtual flora”

The Technical Realisation



Floristic Data of Mongolia

2823 species in 662 genera in 128 families (Gubanov 1996)

largest families most important for vegetation ecology are:

Asteraceae

Fabaceae

Poaceae

our strategy:

- a) acquire as many images and scans as possible
- b) give detailed information for especially taxonomically difficult groups, like
Artemisia (key species for arid habitats)
Chenopodiaceae (key species on salty soils)



407



312



Apiaceae

The family is easy to recognize by their inflorescence which is particularly a double amble.

Even though studying inflorescences is a difficult field in botany the double amble is very easy to recognize because morphologically it is constructed like two umbrellas

Carrots and celery belong to this family and also occur together as soup base



***Angelica sylvestris* L.**

Lamiaceae

Thyme



Oregano



Basil



Sage:

When you get a cold you enjoy sage as tea. You decide yourself to call it medicine or spice.



Sage

Alliaceae



Same thing with garlic: You can use it in all kinds of food as a spice.
Medically it is applied against arteriosclerosis and for better blood circulation

Endangered Plants

86 plant species were registered as endangered and threatened in the first edition of the Mongolian Red Book, in the second edition (1997), the number was already 128.



***Nitraria sibirica* Pall.**

Locality: Mongolia, Province: Khovd, District: Myangad, Great Lake Basin, N of lake Khar-Us-Nuur

Habitat: dominant plant on sand dunes

Photo by: S. Rilke 07.08.2003

http://greif.uni-greifswald.de/floragreif/?flora_search=Image&record_id=15469

Endemic Plants

There are about 150 endemic vascular and lower plants

such as: *Stipa mongolorum*, *Adonis mongolica*, *Betula mongolica*, *Atraphaxis bracteata*, ***Calligonum gobicum***, *Nanophyton mongolicum*, *Gymnocarpus przewalskii*, *Silene mongolica*, *Potaninia mongolica*, *Chesneya mongolica*, *Astragalus gobicus*, *Oxytropis ulzii-chutagii* and *Armisia gobica*.



Calligonum gobicum



Calligonum gobicum

Endemic of the Gobi: distributed in the area of the gobi only

Status Quo

currently the system includes:

2869 Mongolian plant species (name, distribution, habitat)
including about 845 species of **medicinal plants**

173 species of **food plants**

64 species of **technical plants**

1/3 edited plant species (description, comments)

- 10.600 photos of 9 photographers
- 5.862 records
- 854 scans of herbarium specimens



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FloraGREIF project is in progress.
Let us know what we can do better.

Family	Occuring Taxa	Available Records	Images	Info
Adoxaceae	genus: 1 species: 1	1 herbar sheet in 1 species		S. Rilke, July 2009
Alismataceae	genus: 2 species: 4	1 herbar sheet 1 photo record in 1 species		
Alliaceae	genus: 1 species: 52	139 herbar sheets 29 photo records in 33 species		A. Zemmrich supported by N. Friesen (Osnabrück)
Amaranthaceae	genus: 1 species: 4	1 herbar sheet 2 photo records in 2 species		
Apiaceae	genus: 34 species: 66	102 herbar sheets 29 photo records in 36 species		K.F. Günther in preparation
Apocynaceae	genus: 2 species: 2	2 herbar sheets in 1 species		S. Rilke, August 2010 (tax. info to this family)

list all A B C D E F G H I J K L M N O P Q R S T V W X Y Z [Get an Overview](#) [Targeted Search](#) [WebGIS](#) [Map Search](#)

[FloraGREIF project is in progress.](#) [Let us know what we can do better.](#)

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Taxon data Records Herbar scans Species photos


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Family: Alliaceae
For Mongolia the key of N. Friesen (1995) and for former Soviet Central Asia the use of the "Flora of Siberia / 4 / Araceae - Orchidaceae" (1987/2001) is highly recommended. 

Scientific name: **Allium malyschevii N. Friesen**
Source: Gubanov 1996, not in Grubov 1982/2001
Synonym: A. amphibolum auct. non Ledeb.: Grubov 1982/2001: 65/127 p.p. (acc. to Friesen 1995)
Description: Bulbs several on distinct rhizome, cylindrical- conical, 5-9 cm long, with grayish-brown reticulate-fibrous tunic; scape 15-30 cm tall, covered at very base with erubescent leave sheaths; 2 leaves, linear, flat, narrowed towards base and tip, falcate, obtuse, slightly shorter than or as long as scape; umbel subhemispherical, compact, capitate; perianth; perianth lobes bright purple; filaments with 1, often undulate tooth at each side. A. amphibolum & A. pumilum: scape covered 1/3 - 1/2 with leave sheaths; inner filament side or undentate.
Confuse with: Allium amphibolum Ledeb., A. pumilum V
Comments: A. malyshevii: scape covered at very base with red sheaths (difficult to separate mentioned property, cf. herbar scans); inner filaments with 1, often undulate tooth at each side. A. amphibolum & A. pumilum: scape covered 1/3 - 1/2 with leave sheaths; inner filament side or undentate.
Distribution: Khubsugul, Khentei, Khangai (acc. to Gubanov 1996)
[open map in a new window!](#)

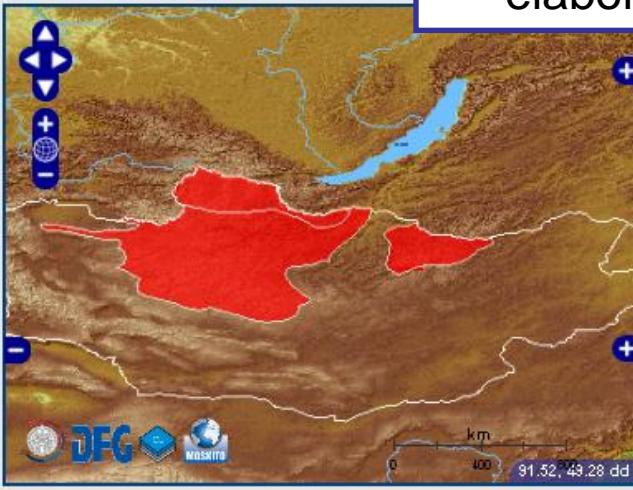
Habitat: In alpine meadows, in grassy stony slopes, in alpine belts (Friesen 1995).

Based on:

- Gubanov (1996)
- Grubov (1982)
- add. literature

Next Steps:

- elaborate synoptic keys



Home	Search Plants	WebGIS	Technical Terms	Information
Get an Overview	Polygonaceae	<i>Aconogonon angustifolium</i> (Pall.) Hara		
Targeted Search	Collected by:	Exkursion, S. Rilke, 02.08.2003, Coll.No. 128		
WebGIS	Determined by:	Schmidt, S.; Gahlert, F.		
Map Search	Confirmed by:	Zemmrich, Anne, 2008		
	Flowering status:	adult, flowering and fruiting		
	Herbarium:	GFW Acc. No.: 38675		
	herbar scan			
	Images			
		achenes included perianth photo by: FloraGREIF: D.Pietzsch		
 FloraGREIF project is in progress. Let us know what we can do better.	Country:	Mongolia		
	Province:	Arkhangay		
	District:	Bulgan		
	Geogr. Region:	Khangay		
	Locality:	Mountain steppe west of Tsetserleg, Waldsteppe westlich Tsetserleg		
	Coordinates:	Geogr. Coord. 101.152300 (lon) 47.290500 (lat) decimal WGS 84 show map		
	Altitude:	1872 m asl		
	Habitat:	Mountain steppe, Larix sibirica forest, Geranio pseudosibirico Laricetum, Aconitum barbatum subassoziation , Waldsteppe, Larix sibirica Wald, Geranio pseudosibirico Laricetum-Gesellschaft, Subassoziation Aconitum barbatum		

Images: linked to Record

Viewer: Zoomify Express:
• Split Large Image Files (200 MB)
• Transmit Tiles instead of complete File



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Family

Genus

Species

Additional search terms for: [Taxon](#) | [Record](#) | [Image](#)

Growth form:

(data not yet complete)

annual perennial shrub tree

Status:

endemic subendemic

Red list:

rare relict extinct

Special Features: (in preparation)

medical plant

Local Name: (in preparation)

Distributed:

Khubsgul

Khentei

Khangai

Mongol-Daurian

Great Khingan

Khobdo

Mongolian Altai

Middle Khalkha

East Mongolia

Depression of Great Lakes

Valley of Lakes

East Gobi

Gobi-Altai

Dzungarian Gobi

Transaltai Gobi

Alashan Gobi

Habitat:

[List frequent habitat terms](#)

Search for

Taxon

Record

Image

matching the above search terms.



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Family Genus Species

Additional search terms for: [Taxon](#) | [Record](#) | [Image](#)

Collected:

Determined:

Tested/Revised:

Coll. Number:

Herbarium:

Flowering Status:

Habitat:

[List frequent habitat terms](#)

Search for [Taxon](#) [Record](#) [Image](#) matching the above search terms.



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Family

Genus

Species

Additional search terms for: [Taxon](#) | [Record](#) | [Image](#)

Type:

all scans species photos habitat photos

Collected:

Determined:

Tested/Revised:

Habitat:

[List frequent habitat terms](#)

Search for

[Taxon](#)

[Record](#)

[Image](#)

matching the above search terms.

The Advantages

Information System:

- free access worldwide, up-to-date dataset
- advance cooperation, complement determination books

Floristical Data:

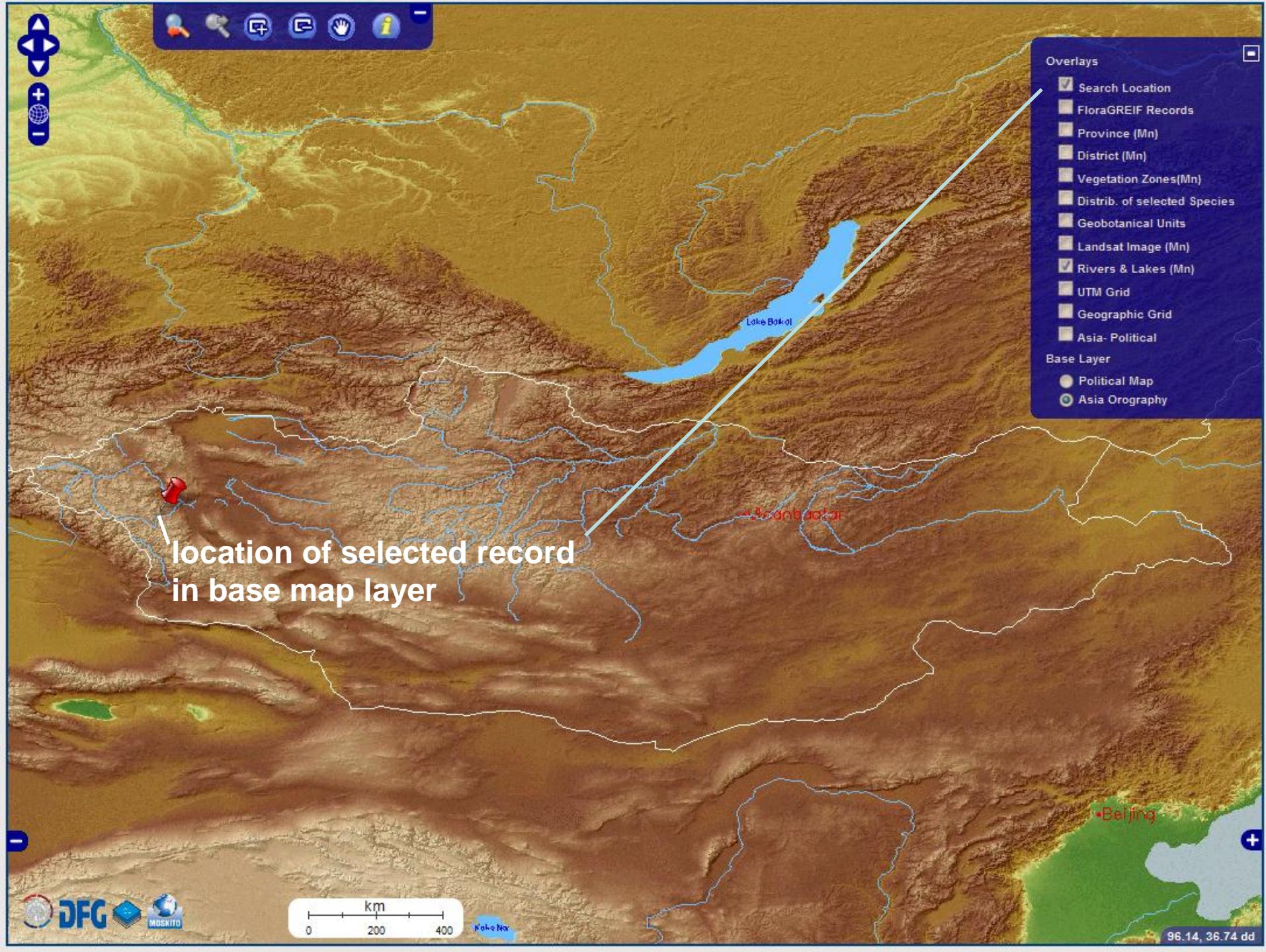
- online high-resolution scans of herbarium
- take photos of plants instead of collecting

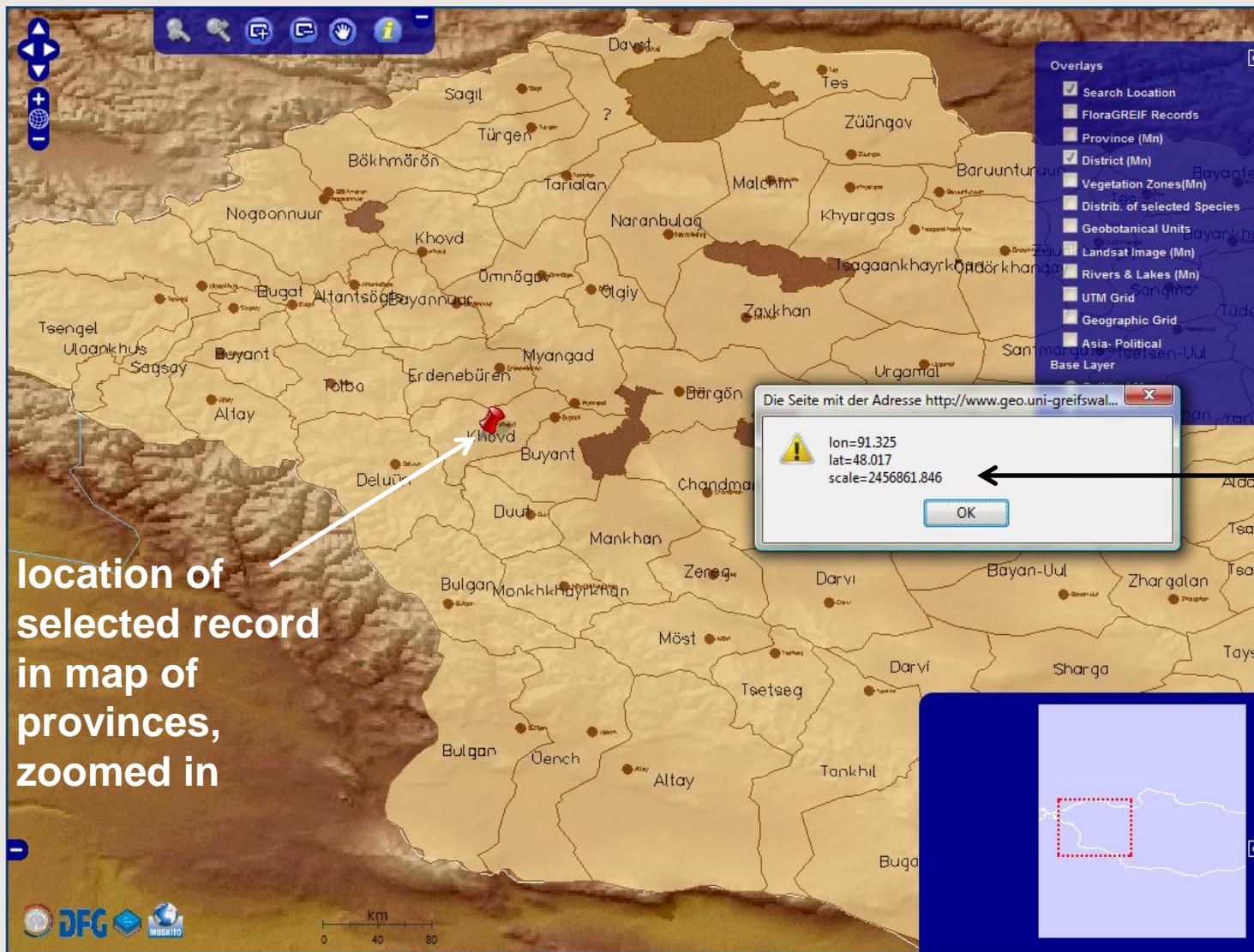
WebGIS

- Synthesis with other information, e.g. locality data

WebGIS

- Data input: check given coordinates, add coordinates for a given locality
- Data analysis: visualize distribution of taxon, compare distribution of taxon and record location
- Map base layers, e.g.: topographic map, orthophoto, administrative division





Unbekannt (1)



Name	Khovd
Centre	Dund-Us
Province	Khovd

Show coordinates of location where clicked, use it for data input when needed

We are grateful to...

- Botanischer Garten und Botanisches Museum (W. G. Berendsohn)
- Herbaria: Halle (U. Braun), Gatersleben (K. Pistrick), Jena (A. Zündorf), Halle (E. Jäger) with comprehensive collections on Mongolian Flora
- Mongolian Academy of Sciences, Ulaanbaatar (M. Urgamal, I. Tuvshintogtokh), University Kovd (D. Oyuunchimeg)
- Taxonomists: H. Freitag (Ephedra, Suaeda, Kassel), N. Kilian (Liguliflorae, Berlin), M. Maier Stolte (Ephedra, Kassel), R. Wisskirchen (Polygonaceae), N. Friesen (Allium, Osnabrück), E. Raab-Straube (Saussurea), D. Podlech (Fabaceae, München), P. Hanelt (Papaveraceae, Gatersleben), H. Scholz (Eragrostis, Berlin)
- DFG Funding: Förderbereich Themenorientierte Informationsnetze; 01/07/2007 – 05/11/2010

Towards a virtual research environment

- Cooperation with MAS, data available via internet, next field trip in October 2011
- Networking to enlarge the set of images, e.g. G. Stubbe, M. Vesper, W. Lobin, R. Purdie and other: Herbar Custodians and Botanists
- Follow Up Use: Flora Aserbaidschana: M. Schnittler
- Recording Local Plant Names: O. Streiter
- Including special information features: medical plant, invasive plant

A close-up photograph of a plant stem, likely from a legume family, showing several green, pointed, and fuzzy structures. These structures appear to be young flowers or seed pods. The surface of the stem and these structures is covered in fine, light-colored hairs and some larger, reddish-brown, spiny projections. The background is dark and out of focus.

Thank you very much for your attention!