



„FloraGREIF“

Greifswalder Digitales Informationssystem zur Flora der Mongolei

AG Kartographie und Geographische Informationssysteme
am Institut für Geographie und Geologie (R. Zölitz)

AG Allgemeine & Spezielle Botanik
am Institut für Botanik u. Landschaftsökologie (M. Schnittler)

Universitäts-Rechenzentrum (J. Formella)

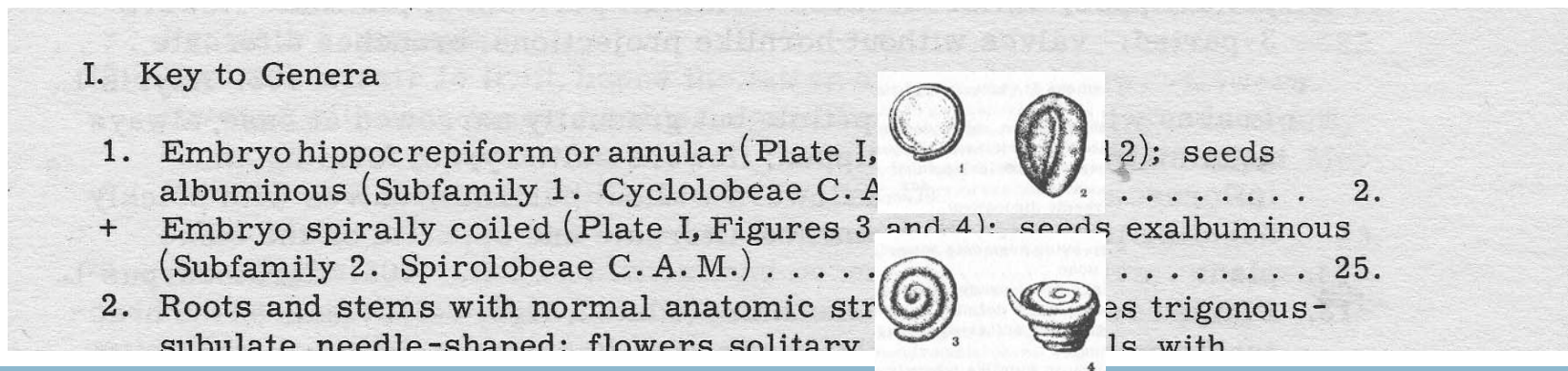
Aktueller Stand des Projekts: <http://greif.uni-greifswald.de/floragreif>

The Problem

Printed determination books

- have long dichotomous keys,
- use numerous technical terms,
- show rarely pictures of the plants,
- and are often laid out for herbarium specimens and dissecting scopes, not for field work,
- are published in limited editions and are quite expensive.

Therefore, they are often limited to specialists, and it is difficult to check if you have keyed out the right species.



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

The needs

Plant identification skills are needed

- in developing countries for applied projects
- to teach undergraduate students in universities and schools,
- for our own students working in projects in these countries (vegetation ecology, grazing loads, local economies)

Specimens collected

- have to be verified by specialists
- are a resource for taxonomic research



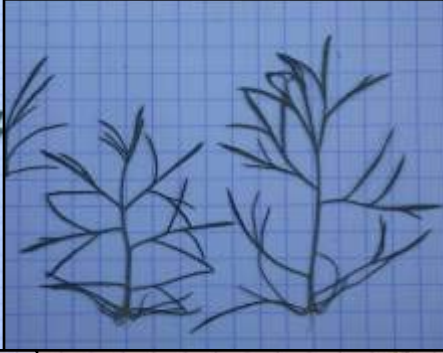
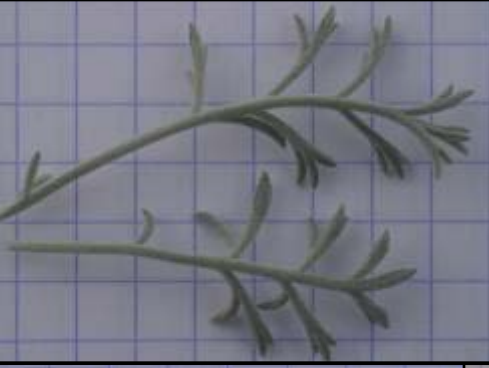
The idea

Use rapidly evolving technologies available in developing countries as well:

- digital photography to document plants
cheaper and smaller cameras, larger zoom lenses for details,
high resolution CMOS sensors, high capacity storage media
- GPS systems to record exact coordinates for localities
cheaper than ever, already as a component in mobile phones and cameras
easy to use, reliable
- internet to disseminate information accessible for everybody
more mobile than ever, accessible at low cost,
able to transfer more information at high speed







The solution

Create a system

- to identify by comparison
- and to check your identifications by combining:

Use the rapidly developing opportunities of digital photography

Scans of herbarium specimens



Comparison material from large herbaria: well determined but dead

Living plants
- growth form
- habitat



New material: determination may be uncertain

Macro images of plant parts crucial for identification



New material: living plants showing all details

Herbarium scans



HERBARIUM HAUSSKNECHT, JENA

Sammlung M. Schnittler No.20327

Artemisia macrocephala Jacq. ex Bess.

Mongolia, Khovd Aimag, Buyant Sum,
Depression of Great Lakes;
Khovd: small depression with finer soil,
fixed, loamy sand ca. 10 km W Lake Khar-
Us-Nuur (western shore), near a TV pole
at the hill Ucha-Obo, 1647 ± 25 m N
48°53'5"N 91°52'50" E ± 50m

leg. M. Schnittler
det. M. Schnittler & K.-I

D60



Living plants



Macro images




The advantages

- a system accessible for free by people in the countries
(often without access to printed determination books)
external specialists
(which can use the digital records as resources for monographic works)
teaching students and project personnel
(to become familiar with a local flora in a short time)
- time-consuming and extensive loans from herbaria can be avoided
high-resolution scans of herbarium specimens combined with detailed photographs of living specimens show all details
- "Digital" specimens can be collected without permits!
- accompanying information can be used for synthesis
(example: a Web GIS application to compile distribution maps)

The obstacles

- the system must reflect changes in taxonomy
allow to search for species and places

But 

- the system has to be user-friendly
self-sustainable
should allow to be extended with contributions of the user without involvement of computer specialists
- the user wants to see details of images as fast as possible
(transfer online that bit of information what is needed...)

Floristic data: Mongolia

- 2823 species in 662 genera (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 important and taxonomically difficult groups, like
Artemisia (key species for arid habitats)
Chenopodiaceae (key species on salty soils)



Where we are: species treated

Field trips with living plant images - collections and images

Field trip	collections ¹	deposited in	collector	images ²	photographer	records ³	species ⁴
Mo03	224	HFW	M. Schnittler	988	M. Schnittler	378	245
Mo07	353	JE	K.-F. Günther	1711	M. Schnittler	475	334
Rs08	307	BGBM	L. Martins	2130	M. Schnittler	637	469
Total	884			4829		1490	ca. 780 ⁵

¹ specimens collected (usually only one specimen per plant species and field trip, with exceptions for taxonomically difficult groups)

² images of living plants in the field, general view and details, without habitat images

³ plant specimens collected and/or photographed, one species treated at one locality constitutes one record

⁴ approximate number of species treated (collected and/or photographed)

⁵ due to species treated at more than one field trip, the app. total number of species treated is less than the sum from all field trips

The components

Taxonomic backbone	taxon-related information: <ul style="list-style-type: none">- ecological data- literature- determination hints, synoptic keys...
Record data base	record-related information <ul style="list-style-type: none">- locality, collector...- images of all kinds- description. WebGIS
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"

Search Engine

Home

Search Plants

Project & Schedule

Methods & Standards

Team

Links

FloraGREIF

targeted search
get an overview

Need help?

What are looking for?

Enter the taxon name:

family

genus

species

Chenopodiaceae (612 rec) *

Atriplex (42 rec) *

—

taxon

record

image

Enter additional information and refine your search:

Taxon Information [Herbar Records](#) [Images](#)

distribution:

Choose distribution

distribution khangay: I II III IV V VI

habitat:

Choose habitat

advanced search

Search Engine

Home	Search Plants	Project & Schedule	Methods & Standards	Team	Links
FloraGREIF		Brassicaceae	58 genus 135 species		
		Butomaceae	1 genus 2 species		
targeted search		Callitrichaceae	1 genus 2 species		
get an overview		Campanulaceae	4 genus 16 species		
Need help?		Cannabaceae	1 genus 1 species		
		Capparidaceae	1 genus 1 species		
		Caprifoliaceae	4 genus 11 species		
		Caryophyllaceae	22 genus 83 species		
		Celastraceae	1 genus 1 species		
		Ceratophyllaceae	1 genus 1 species		
		Chenopodiaceae	25 genus 90 species	612 records in 64 species	 
		Convallariaceae	3 genus 7 species		
		Convolvulaceae	3 genus 11 species		
		Cornaceae	1 genus 1 species		
		Crassulaceae	5 genus 17 species		

Search Engine

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targeted search
get an overview

Need help?

name: **Chenopodiaceae Atriplex fera (L.) Bunge** (acc. to Gubanov)

description: leaves oblong-ovate to ovate lanceolate, entire; flowers in glomerules in leaf axils and end of spicate; fruiting bracts entirely connate, 2-6 mm long, highly convex, ovate, glabrous or infrequent with few appendages in middle portion

confuse with: *A. laevis* C.A.Mey.

comments: plants with spiny appendages on fruits are described as var. *cornuta* Hand.-Mazz. (see ** & Schnittler 2463)

habitat: Moist clayey and puffy solonchaks, saline bottom and coasts of intermittent lakes, subsaline chee-grass communities, alkaline steppe depressions. (acc. to Grubov 2001)

growthform: herbs annual (acc. to flora of china (1994 -) and grubov (2001))

herbar:

5 records



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get an overview

Need help?

Chenopodiaceae Atriplex

leg: K. Pist
det: Sanch
teste: Rilke, :

Herbar sheet

Index.Herb. GAT, I
Corren
Acc. No. 6099
herbar scan

[view](#)

Locality

country: Mongol
region as written Solong
on label: Talbul

Habitat

habitat as
written on label: Solong



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FloraGREIF

targeted search
get an overview

Need help?

images for family **Chenopodiaceae** genus **Atriplex** species **all**

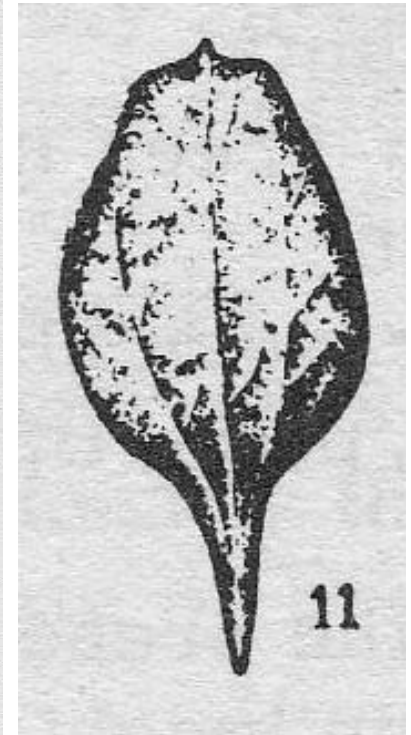


A retrospective

33. *A. fera* (L.) Bge. in Mém. Acad. Sc. Pétersb. VII sér., XXVII, 8 (1880) 6. — *Spinacia fera* L. Sp. pl. ed. 2 (1763) 1456. — *S. divaricata* Turcz. ex Moq. in DC. Prodr. XIII, 2 (1849) 118. — *Obione fera* Moq. in DC. Prodr. XIII, 2 (1849) 107; Fenzl in Ldb. Fl. Ross. III, 733; Turcz. Fl. baic. -dah. II, 2, 26. — *O. lenticularis*, Moq. Chenop. (1840) 70. — *Atriplex lenticularis* C. A. M. in Turcz. cat. baic. -dah. no. 958 (1838) 15. — Ic.: Gmel., Fl. Sib. III, p. 86, t. 16.

Annual, 15–50 cm high; stem erect or ascending, simple or branched; leaves in lower part of the plant opposite, in upper part alternate, oblong-ovate to ovate-lanceolate, obtuse, entire, rounded-cuneate at base, more rarely subhastate, narrowed to a petiole, green on both sides, the upper ones narrower and covered, like the inflorescence, with a subsequently exfoliating farinaceous film; flowers glomerate in the leaf axils and in a terminal spiciform inflorescence interrupted in fruit; staminate 4-merous; pistillate mostly in glomerules of 3–10, rarely solitary, bracteolate; bracteoles ovate, oval, or oblong-oval, distinctly stipitate in fruit, convex, united throughout, entire or at summit with 3 small teeth (of these the middle one acute, the lateral ones obtuse) or rarely 1-toothed, reticulate-nerved, in upper part sometimes muricate, mealy-scruffy; seeds round, flat, brown, smooth, 1.5–2 mm in diameter, with prominent radicle. July–August. (Plate IV, Figure 11).

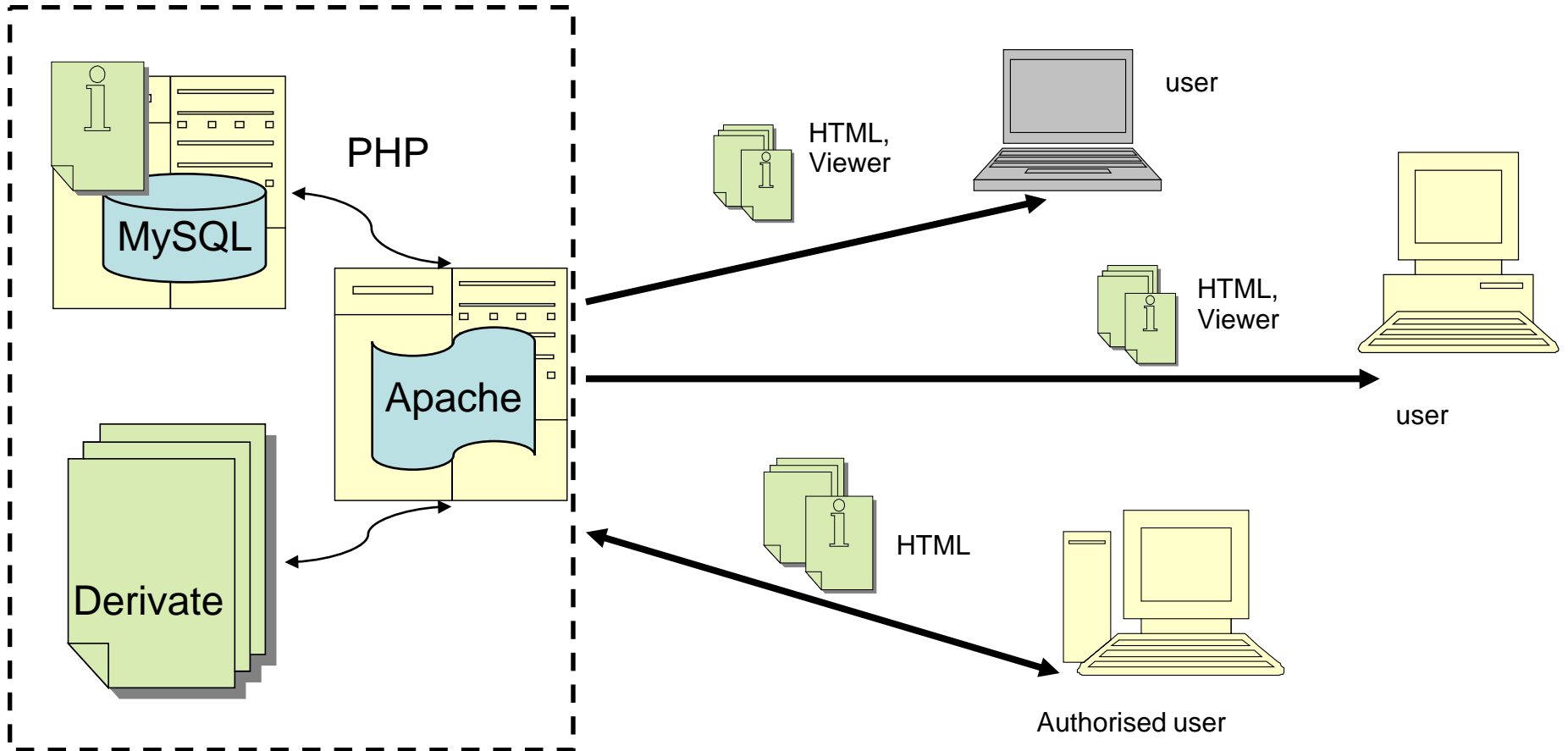
Solonetzes. — E. Siberia: Ang. -Say., Dau. Gen. distr.: Mong. Described from Siberia, from the vicinity of Krasnoyarsk, according to Gmelin's collection. Type in London.



Prerequisites

- **CMS GREIF**
 - project „Digitales Archiv zur Schwedischen Landesaufnahme von Vorpommern 1692 - 1709“, funded by DFG from 11/2004 till 11/2006
 - <http://greif.uni-greifswald.de/geogreif>
- **specifications**
 - Apache web server
 - MySQL, Option: Oracle
 - data access via PHP
 - html templates

CMS GREIF



Implementation

- extend CMS GREIF to FloraGREIF
 - Add subject-specific components: taxon, record, search engine
 - Organise scan of herbar sheets, organise existing photo collections, additional macro photos
 - Choose an adequate viewer (ca. 200 MB)
 - Integrate WebGIS functionality

Implementation: Taxon Data

search by family

search by genus

please choose a family or a genus *acc. to Gubanov 1996*

Currently listed: 128 families with 666 genus and 2810 species.

family	No. Genus	No. Species	Editor
Adoxaceae	1 genus	1 species	
Alismataceae	2 genus	4 species	
Alliaceae	2 genus	49 species	
Amaranthaceae	1 genus	4 species	
Apiaceae	34 genus	66 species	
Apocynaceae	2 genus	2 species	
Araceae	1 genus	1 species	
Asclepiadaceae	4 genus	6 species	
Asparagaceae	1 genus	9 species	
Asphodelaceae	1 genus	1 species	
Aspidiaceae	1 genus	2 species	

Based on:

- Gubanov (1996)
- Grubov (1982)

Widely used determination books
about Mongolian flora

Next Steps:

- manage own listings
- elaborate synoptic keys

Implementation: Taxon Data



family	genus	species	author
<input type="text" value="Chenopodiaceae"/>	<input type="text" value="Kochia"/>	<input type="text" value="densiflora"/>	<input type="text" value="Turcz. ex Moq."/>
subfamily	tribe	subspecies	author subspecies
<input type="text" value="Chenopodioideae"/>	<input type="text" value="Camphorosmeae"/>	<input type="text"/>	<input type="text"/>

+ new in Gubanov (1996)

description

confuse with

comments

distribution (1, ..., 16)

status ---> firstly described from geogr. region

distribution khangay

I II III IV V VI

Implementation: Record Data

Get all records where

family genus species

collector collection number

Listing all records for family: **Chenopodiaceae** genus: **Atriplex**

[enter new record: Chenopodiaceae Atriplex](#)

			Sorted by Taxon Name					
	int. remarks	presentation remarks	record	leg	colno or date			
scan	üs	two branches with last fruits	Atriplex cana	H. Freitag & S. Rilke	26408b	edit	rename	delete
scan	üs fr	fruits completely connate	Atriplex fera	*W. Hilbig, Bumschaa u.a.	19.8.1977	edit	rename	delete
	Aimak Töv Sum Bajansogt?	fruits completely connate	Atriplex fera	Hilbig, Werner	45/81	edit	rename	delete
scan	üs fl	young flowering plant	Atriplex fera	K. Pistrick et Ch. Sanchir	106	edit	rename	delete
		completely connate	Atriplex fera	K. Pistrick et Ch. Sanchir	312	edit	rename	delete
			Atriplex fera	Hilbig, Werner	30.7.1977	edit	rename	delete

Implementation: Record Data

Kochia densiflora Turcz. ex Moq. (Chenopodiaceae) **date:** 23.06.08

leg.: K.-F. Günther et M. Schnittler **Date:** 08.09.2007 **No.:** 28071

det.: K.-F. Günther et M. Schnittler **Date:**

formerly det. as:

teste: Rilke, Sabrina **Date:** 23.6.08

rev.: **Date:**

flowering status: flowering to fruiting plant

comments for presentation: dense long hairs around flowers and fruits, mature fruits with 5 equa

locality

geogr. data acc. to herbar label

Mongolei, Zentral-Aimak, Tal des Tola-Flusses (Tuul gol), Ulan-Bator (Ulaanbaatar),
13,5_km südwestl. vom Stadtzentrum, ca._4_km südwestl. Jarmag, direkt vor dem
Flughafengebäude

coordinates

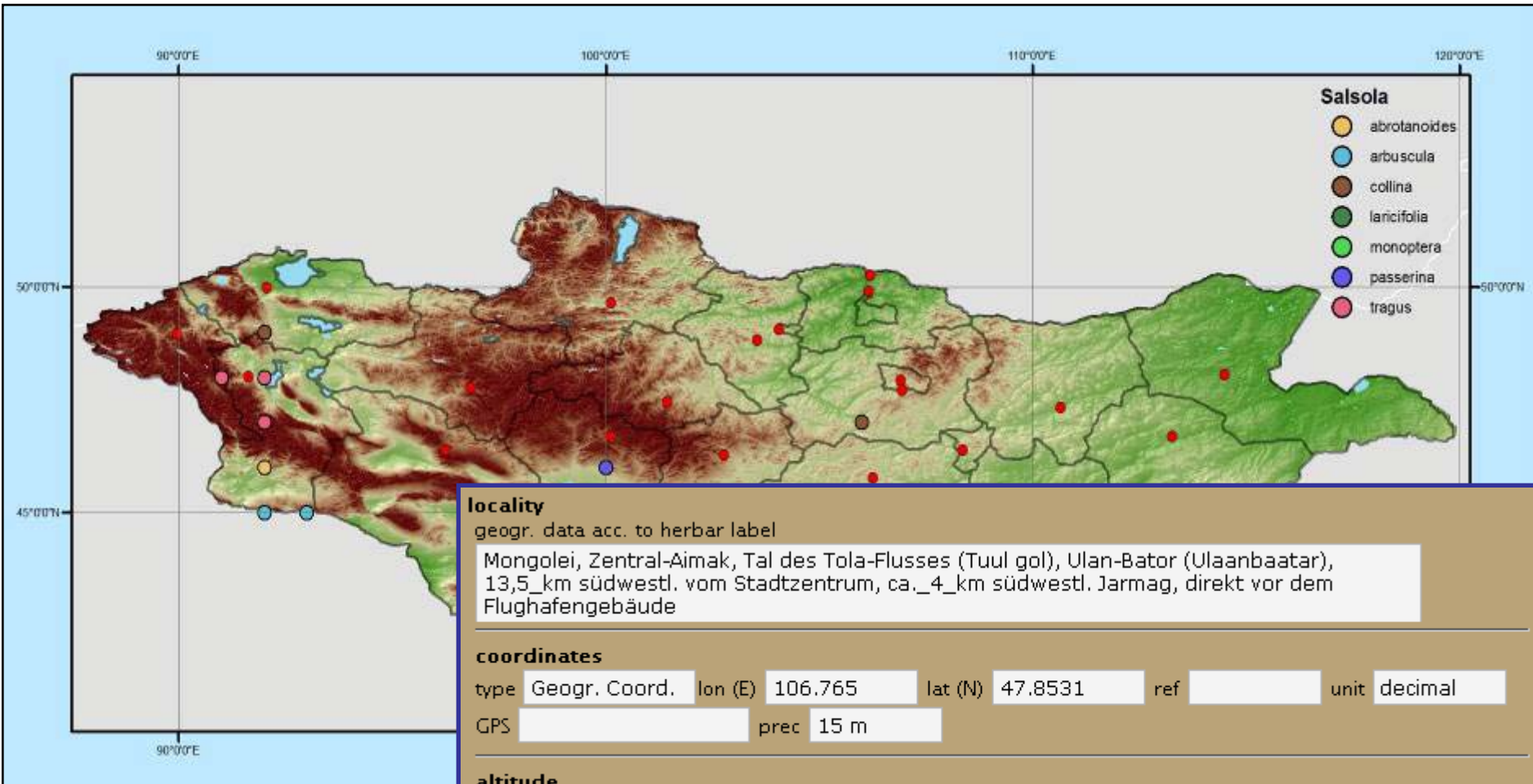
type Geogr. Coord. lon (E) 106.765 lat (N) 47.8531 ref unit decimal

GPS prec 15 m

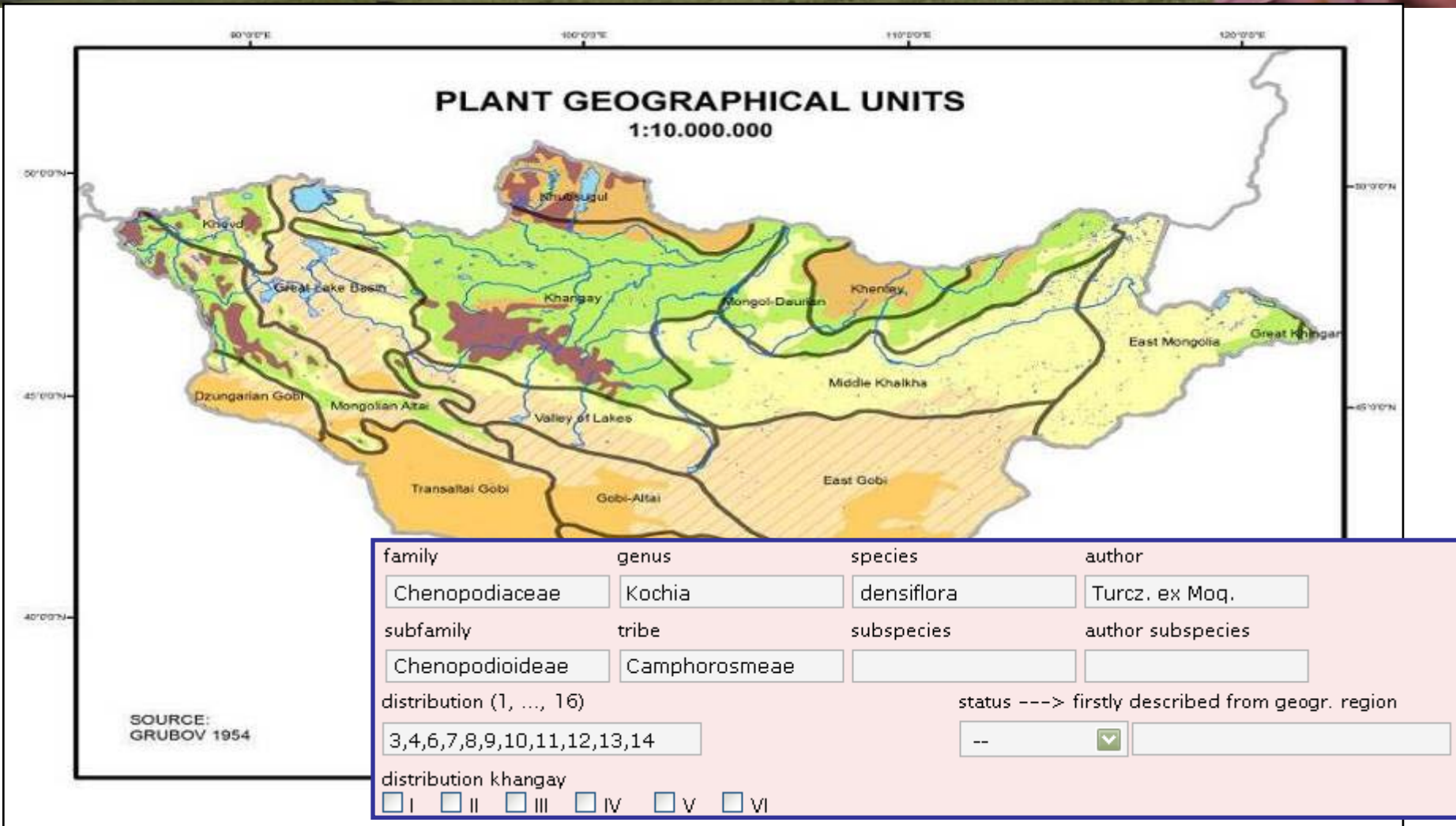
altitude

approx. 1200 (m asl) alt. (lower) 1150 alt. (upper) 1250 exp inc

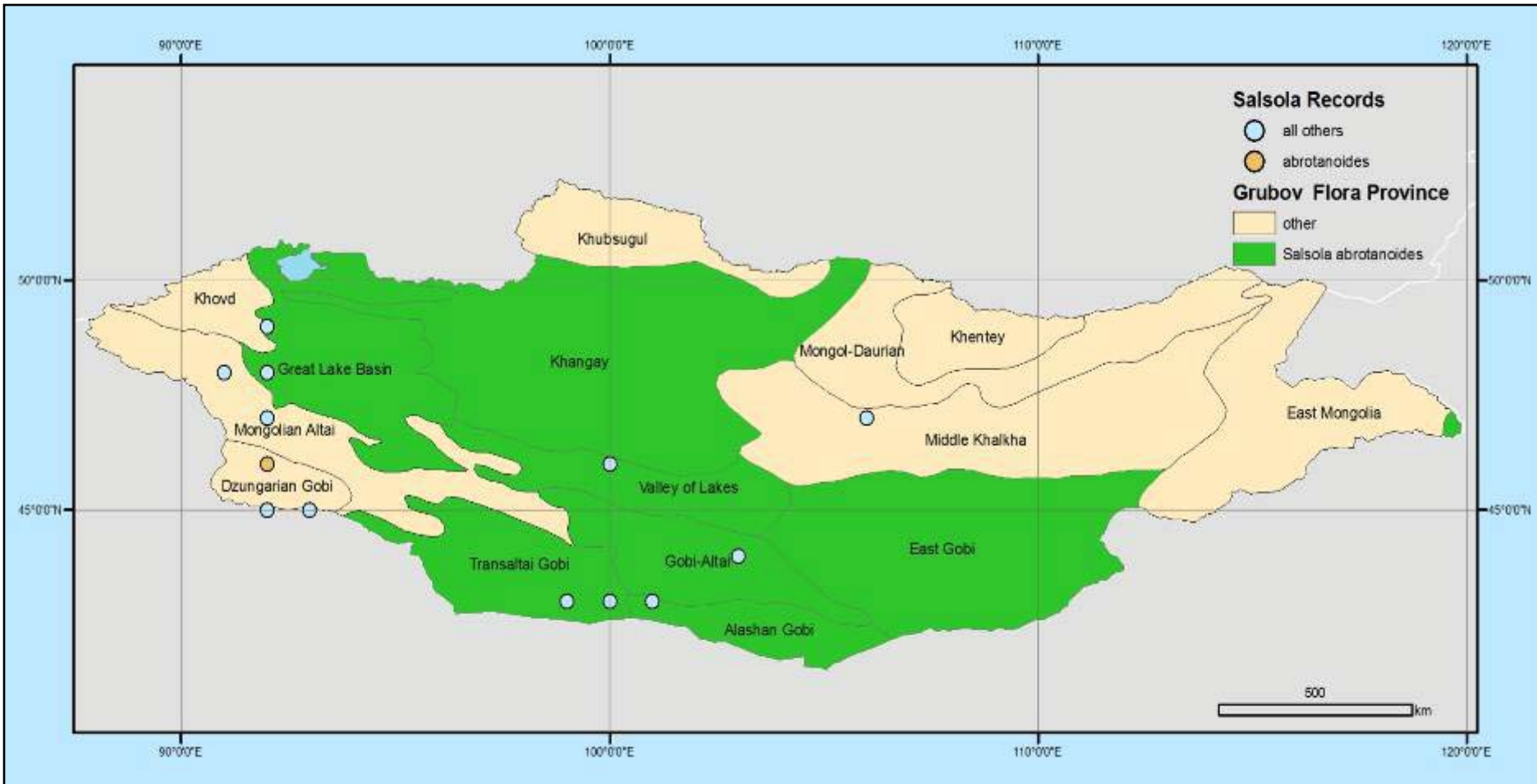
WebGIS



WebGIS



WebGIS



We are grateful to...

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- Dr. Anne Zemmrich: Landschaftsökologie und Vegetationskunde der Mongolei, Weideökologie
- Dr. Sabrina Rilke: Systematik, Taxonomie, Nomenklatur, Chenopodiaceae (Salsola)
- Ulrike Najmi: Informatik
- Susanne Starke: Herbarfachkraft, Poaceae
- Jörg Hartleib: GIS

Cooperation partners

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DFG: Funding

- Förderbereich Themenorientierte Informationsnetze; Laufzeit: vom 01.07.2007 bis zum 30.09.2010; Das Projekt soll nach Einführung in die Praxis ohne zeitliche Begrenzung weiterlaufen

Thanks
for your
attention!

