

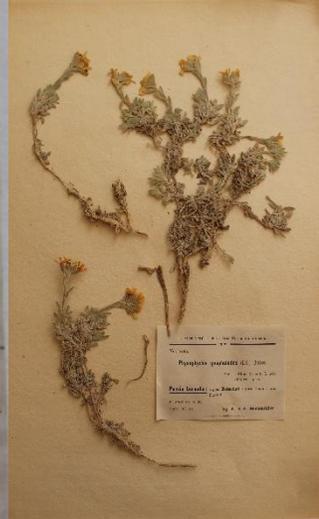


*Asperula pilosa* (Beck)

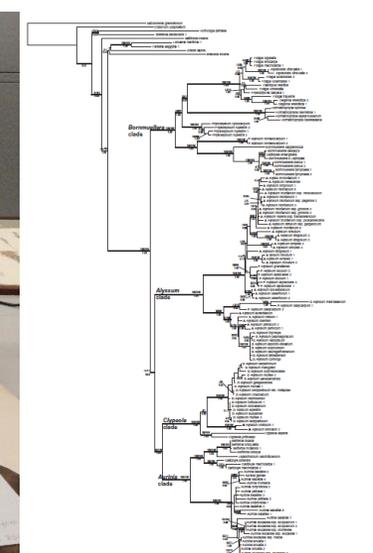
*A. pilosa* (Beck) ist durch ihren krummen Griffel von sämmtlichen anderen Vertretern der Gruppe verschieden und würde demnach in dieser Hinsicht den Übergang zu den kurzgriffeligen „*Cynanchica*“ bilden.

*A. hirta* Ram. hat doppelt breitere Blätter, welche hauptsächlich am Rückenriem u. den Rändern kurz behaart sind und die Internodien an Länge übertragen, sie hat ferner 5-7 mm lange Stielblättchen und einen doppelt längeren Griffel.

Stege



# Herbarijske zbirke – od biljke i terena, preko povijesti i kulture, do digitalizacije i molekularne biologije



**HERBARIJ, HERBARIJSKA ZBIRKA** (kolekcija) = zbirka osušenih biljnih primjeraka s odgovarajućim pratećim podacima i unutarnjom organizacijom

HERBARIJ → institucija - poseban tip prirodoslovnog muzeja: zbirka, osoblje, prostorije, knjižnica itd.

Herbarnijski primjerci mogu biti cijele biljke ili dijelovi biljaka; obično su u osušenom obliku pričvršćeni na list papira (tzv. „exsiccatae”), ali se mogu čuvati i u kutijama ili pohranjeni u alkoholu ili drugom konzervansu.



**Specimens**



**Specimen of Goodyera  
Stored in Spirit**



**Carpological Collection**



**Economic Botany  
Collection**

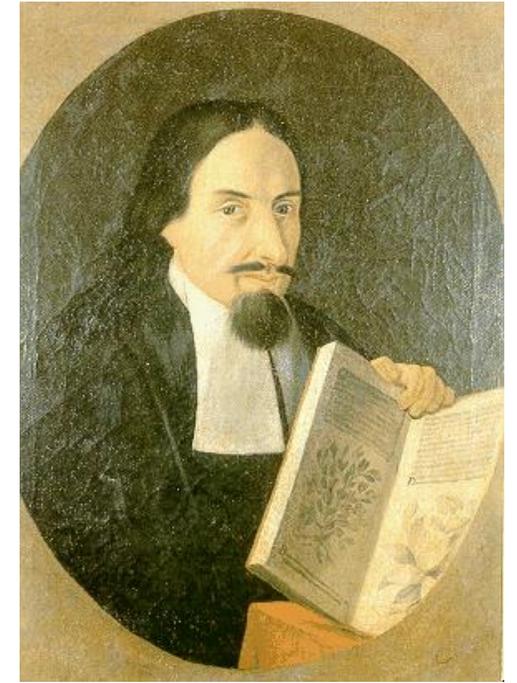


**Essential Oils**



**Wood Samples**

- **Luca Ghini** (1490?-1556; Sveuč. u Bologni) - prvi herbarizirao biljke radi dokumentiranja  
- 1544.g. u Pisi utemeljio prvi suvremeni botanički vrt
- J.P. Tournefort (1656-1708) - prvi upotrijebio izraz HERBARIJ za zbirku osušenog bilja
- C. Linneaus (1707-1778) - zaslužan za opću prihvaćenost naziva HERBARIJ



## SVRHA HERBARIJA

1. Čuvanje herbariziranih biljaka (često povijesno važan materijal)
2. Nadzor i pohrana tipskog materijala
3. Određivanje biljaka (specijalistička determinacija)
4. Istraživačka djelatnost (nomenklatura, sistematika, taksonomija)
5. Izvor informacija za pisanje flora, priručnika i monografija
6. Podučavanje i obrazovanje
7. Izvor informacija o geografskoj rasprostranjenosti
8. Čuvanje "voucher" ("jamstvenih") primjeraka
9. Izvor podataka za "nebotaničare" (npr. ekonomska i medicinska botanika, biljna imena)



Herbarij – Andrea Cesalpino (1519-1603)

## Tri najstarija herbarija na svijetu:

- Naturkundemuseum, Kassel, Njemačka, iz 1569. godine (KASSEL) s približno 30 000 primjeraka
- Università di Bologna, Bologna, Italija, iz 1570 godine (BOLO) s oko 130 000 primjeraka
- Universität Basel, Basel, Švicarska, iz 1588 godine (BAS) s oko 220 000 primjeraka

## Index Herbariorum

There are approximately 3,000 herbaria in the world today, with approximately 12,000 associated curators and biodiversity specialists. Collectively the world's herbaria contain an estimated 350,000,000 specimens that document the earth's vegetation for the past 400 years.

## Najveći herbariji svijeta:

- Muséum National d'Histoire Naturelle, Paris (P) s 10 500 000 primjeraka
- Royal Botanical Garden, Kew (K) s oko 7 000 000 primjeraka
- Komarov Botanical Institute, Sant Petersburg (LE) s više od 7 000 000 primjeraka
- Conservatoire et Jardin Botanique, Geneve (G) s oko 6 000 000 primjeraka

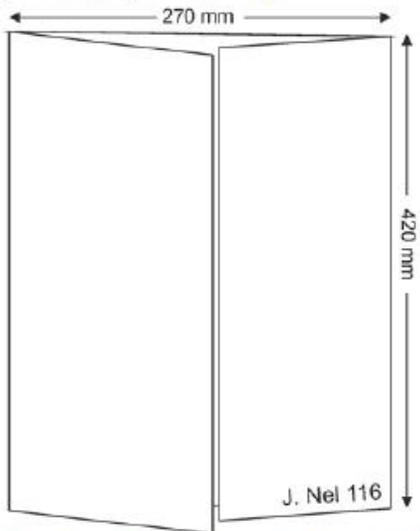




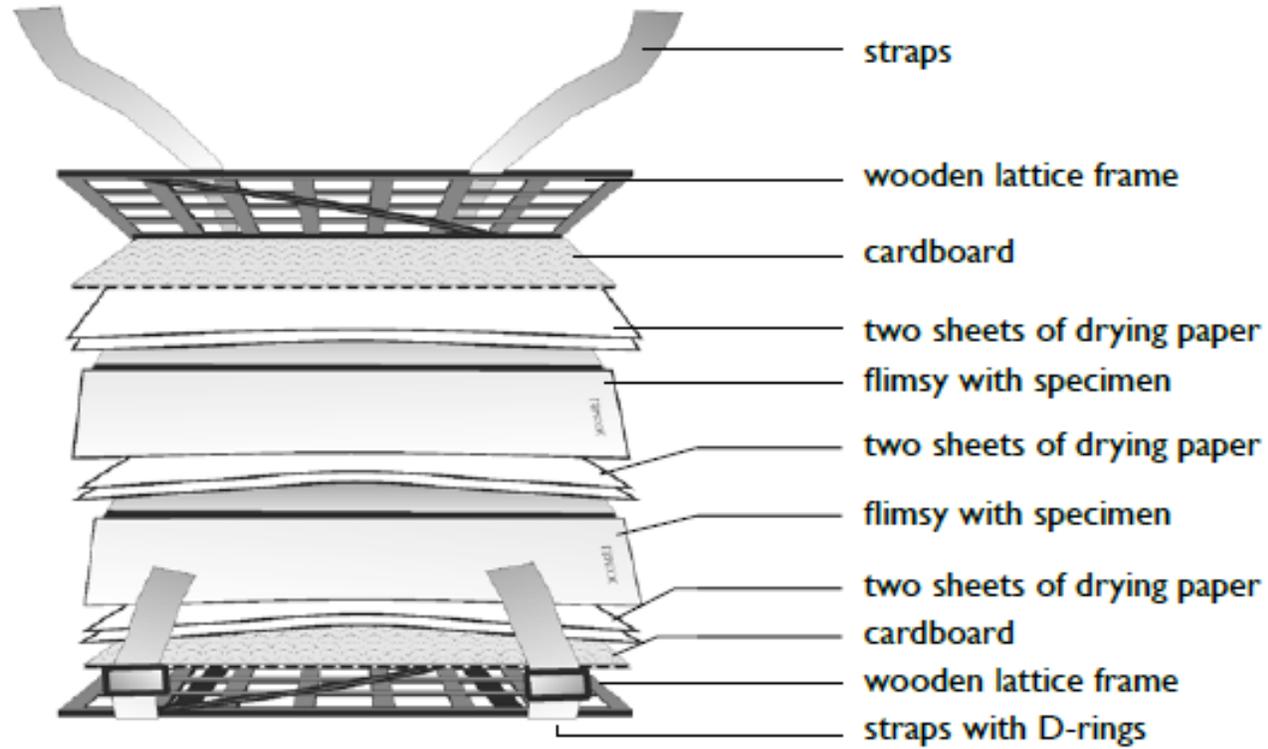
A packed plant press, with straps tightened.



A close-up of the straps and D-rings.



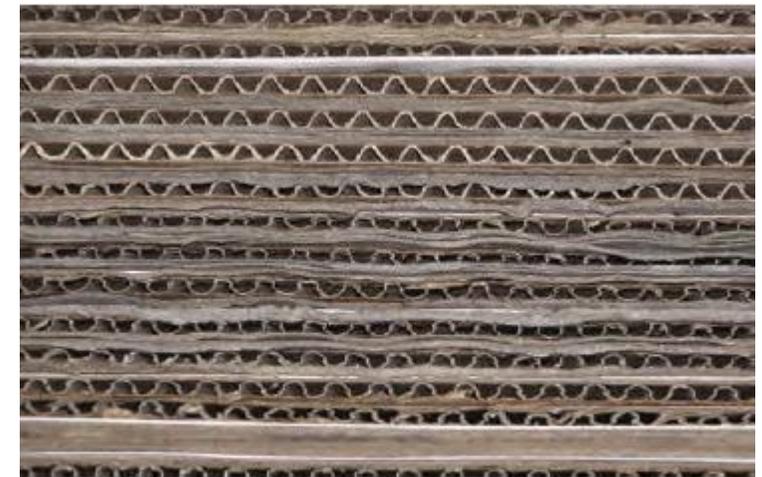
Flimsies correctly folded to show collector's name and number.



The sequence in which a plant press is packed.



Specimens being dried in plant dryers.



Cardboard ventilators are most effective when the corrugations run parallel to the short sides.



## preparing a succulent flower for pressing



1. Remove a flower.



2. Cut longitudinally through centre.



3. Separate halves.



4. Place onto moistened gummed paper, cut surface uppermost.



5. Cover with wax paper.



6. Write collectors number and name onto gummed paper.



7. Press mounted flower with the rest of the specimen.

## preparation of submerged aquatic plants



1. Place a sheet of white paper on a rigid board into a shallow dish, then add the plants.



2. Gently move the floating plants onto the sheet.



3. Lay out to show all characters.



4. Start lifting the board while holding the board and specimen in position.



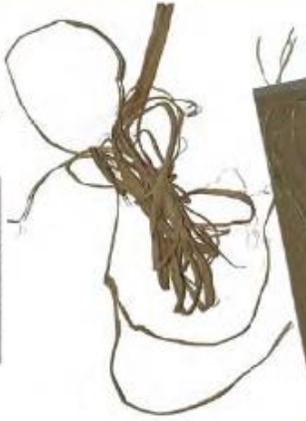
5. Tilt the board while lifting it out of the water to remove excess water.



6. A mounted specimen.

# materials and equipment for mounting

raffia and needle



typical label

instruments



paint brushes



A sandbag placed on top of a stack of mounted specimens ensures that the specimens remain flat while the glue is drying.

rubber stamps and ink pad

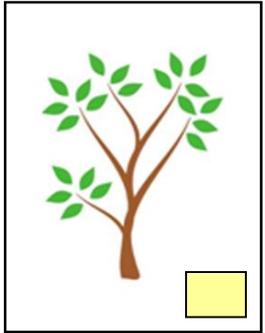


specimens interleaved with wax paper while glue is drying

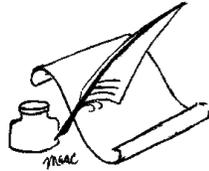


## NOMENKLATURA -tipski primjerci

### Holotip



+



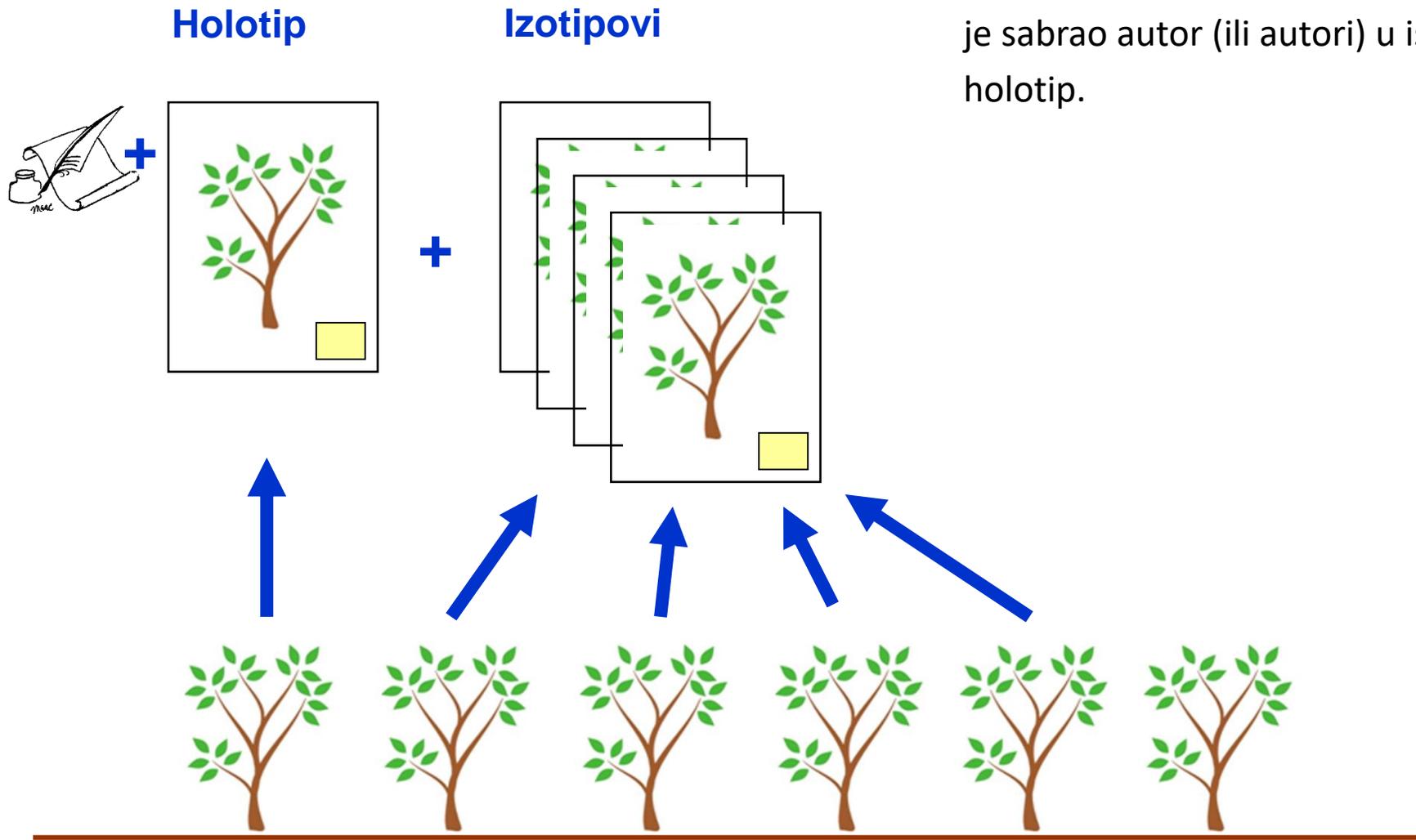
Dijagnoza ili  
protolog



*Locus classicus*

**Tipska metoda** – ime se ne veže uz moguće nepotpuni opis taksona, nego na primjerak biljke → nomenklaturi tip

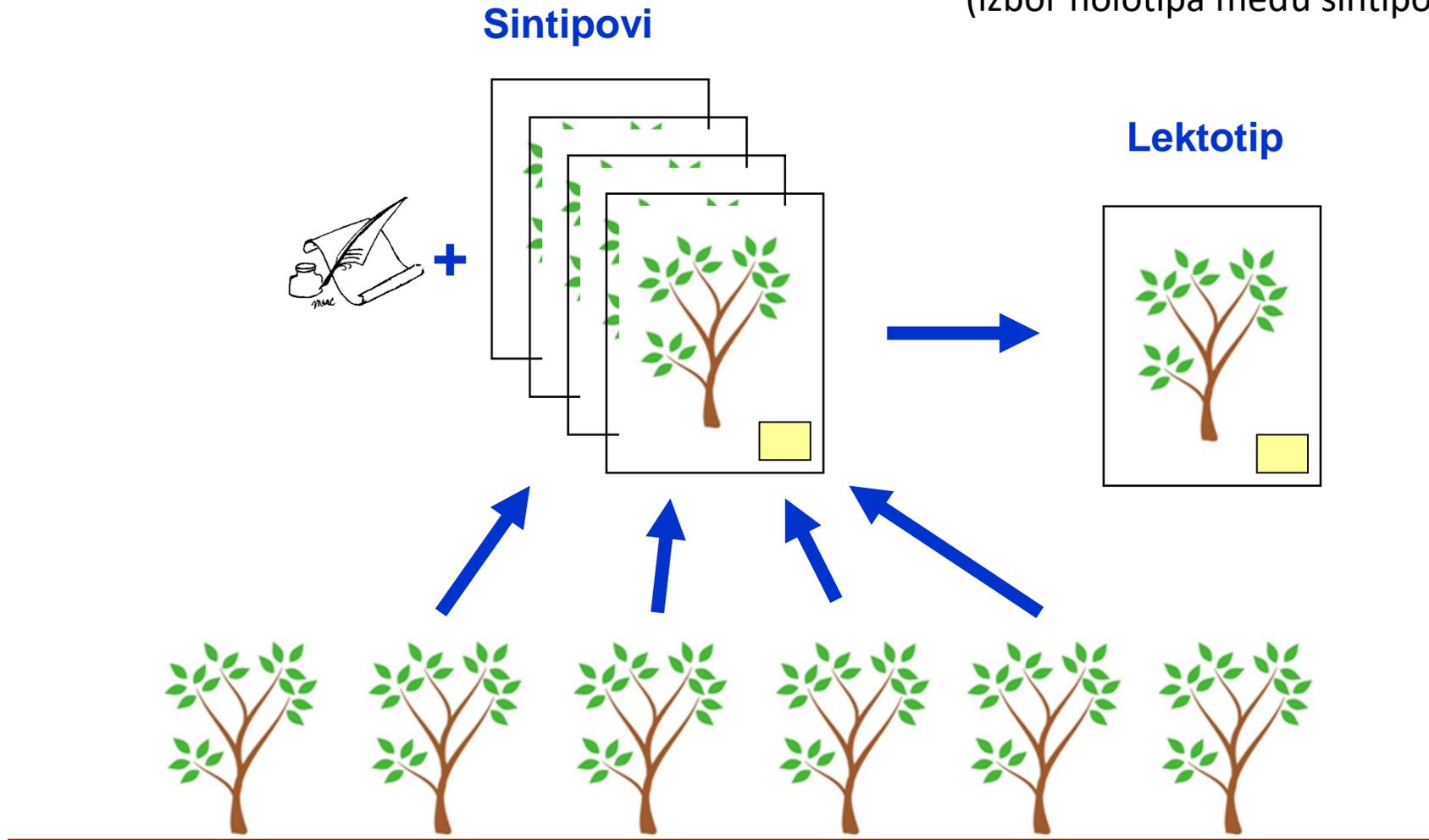
**Holotip** (lat. *holotypus*) je primjerak (ili bilo koji drugi element, npr. crtež) koji je autor upotrijebio ili naznačio kao nomenklaturi tip. Dok postoji, on automatski definira upotrebu odgovarajućeg imena.



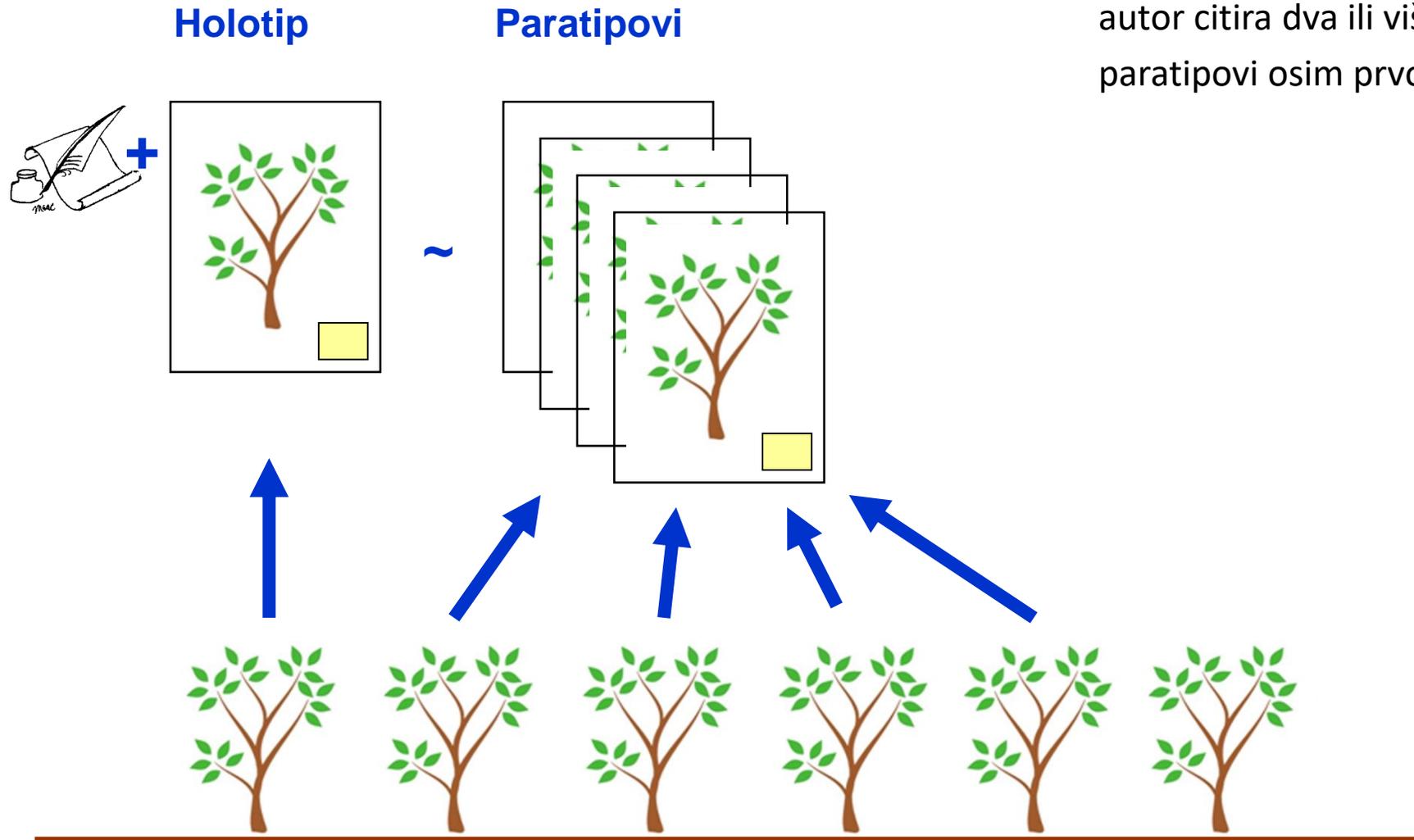
**Izotip** (lat. *isotypus*) jest bilo koji dvostruki primjerak holotipa koji pripada izvornoj zbirci. To je uvijek određeni primjerak, koji je sabrao autor (ili autori) u isto vrijeme i na istom mjestu kada i holotip.

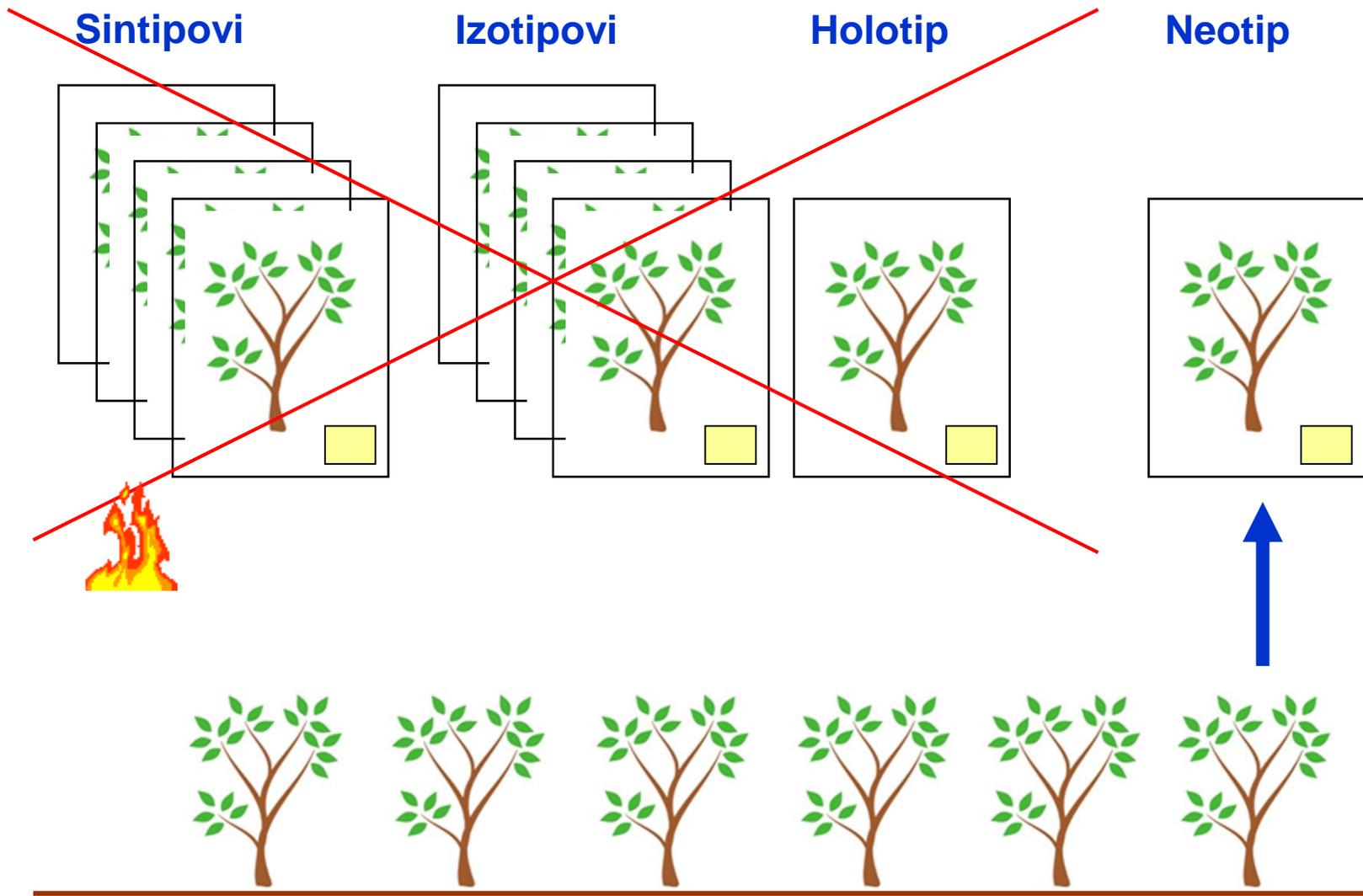
**Sintip** (lat. *syntypus*) je primjerak ili više njih koje je autor sabrao za opisivanje vrste, ali nije naznačio holotip ili je istodobno veći broj primjeraka označio kao holotip.

**Lektotip** (lat. *lectotypus*) je primjerak (ili bilo koji drugi element) uzet iz izvornog materijala kao nomenklaturi tip ako prilikom objavljivanja nove vrste nije nijedan primjerak označen kao holotip (izbor holotipa među sintipovima).

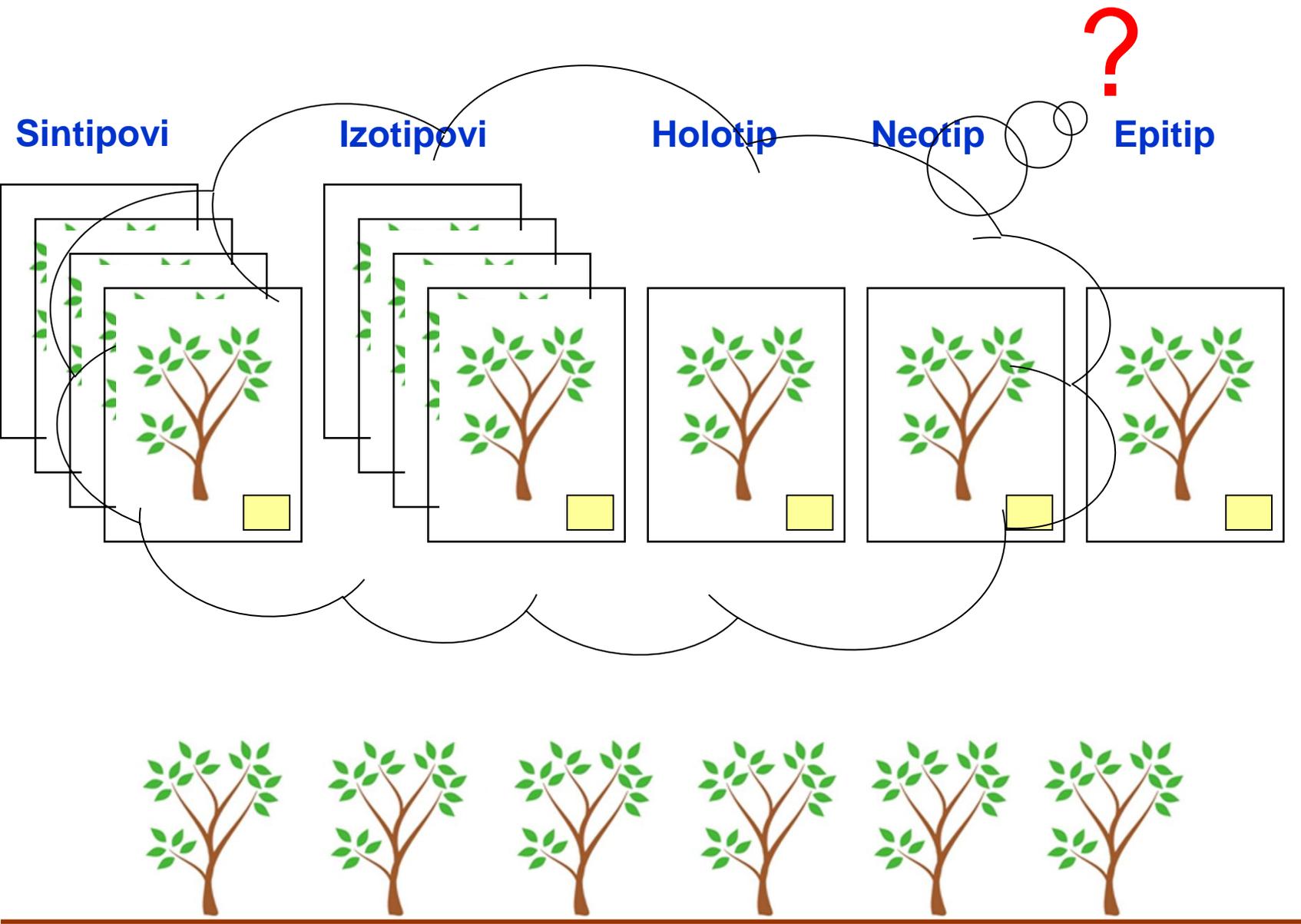


**Paratip** (lat. *paratypus*) je primjerak citiran u izvornoj publikaciji, ali nije ni holotip ni izotip. Ako autor citira dva ili više primjeraka kao tipove, svi su paratipovi osim prvoga (koji je holotip).





**Neotip** (lat. *neotypus*) je primjerak (ili bilo koji drugi element) uzet kao nomenklaturi tip sve dok nedostaje materijal na kojem je utemeljena svojta.



**Epitip** (lat. *epitypus*) je primjerak koji služi kao tipski primjerak za tumačenje ako je holotip, lektotip ili prethodno označeni neotip ili sav izvorni materijal očito nejasan i ne može se kritički usvojiti za točnu primjenu za ime svojte.

- konstrukcije otporne na potres, požare i poplave
- suha i stabilna atmosfera (temperatura do 20 °C, 50-60% vlage); ventilacija

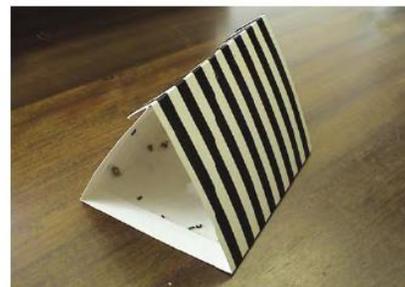
## Štetnici

- vole: Asteraceae, Brassicaceae, Ranunculaceae, Apiaceae, jednosupnice s velikim cvjetovima (*Lilium*, *Arum*)
- ne vole: mahovine, papratnjače, četinjače, trave



A specimen damaged by the cigarette beetle.

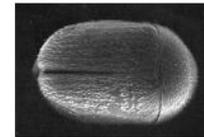
*Lasioderma serricorne*  
*Stegobium paniceum*  
*Blattella germanica*  
*Plodia interpunctella*  
*Trogoderma spp.*  
*Psocid sp.*  
*Lepisma saccharina*



Lasioderma trap.



Adult; side view



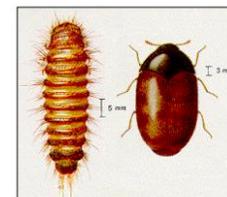
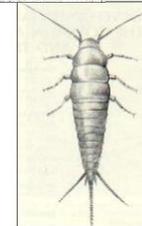
Lasioderma serricorne viewed from top



Lasioderma serricorne from below



Drusstore Beetle



- Temperature and Humidity Controls Insect reproduction *Stegobium* life cycle completed in 6 weeks at 30° C, 1 year at 17.5° C
- Lower humidity protects specimens from fungal growth
- At -20°C, complete mortality for all life stages of *Stegobium paniceum*

## How to prevent insect infestations

### Step 1: Start Clean

- Organise thorough fumigation of all areas where specimens are handled and stored.

### Step 2: Prevent Insect Entry

- Seal any openings where insects may enter.
- Install insect screens on all windows.
- Keep windows and cabinet doors closed when not in use.

### Step 3: Stay Clean

- Keep herbarium cupboard doors closed.
- Never bring potentially contaminated material into the herbarium.
- Avoid contamination: no eating, smoking, wet or muddy gumboots, or umbrellas in the herbarium.
- Monitor continuously.
- React immediately when you spot an infestation.



## ZA

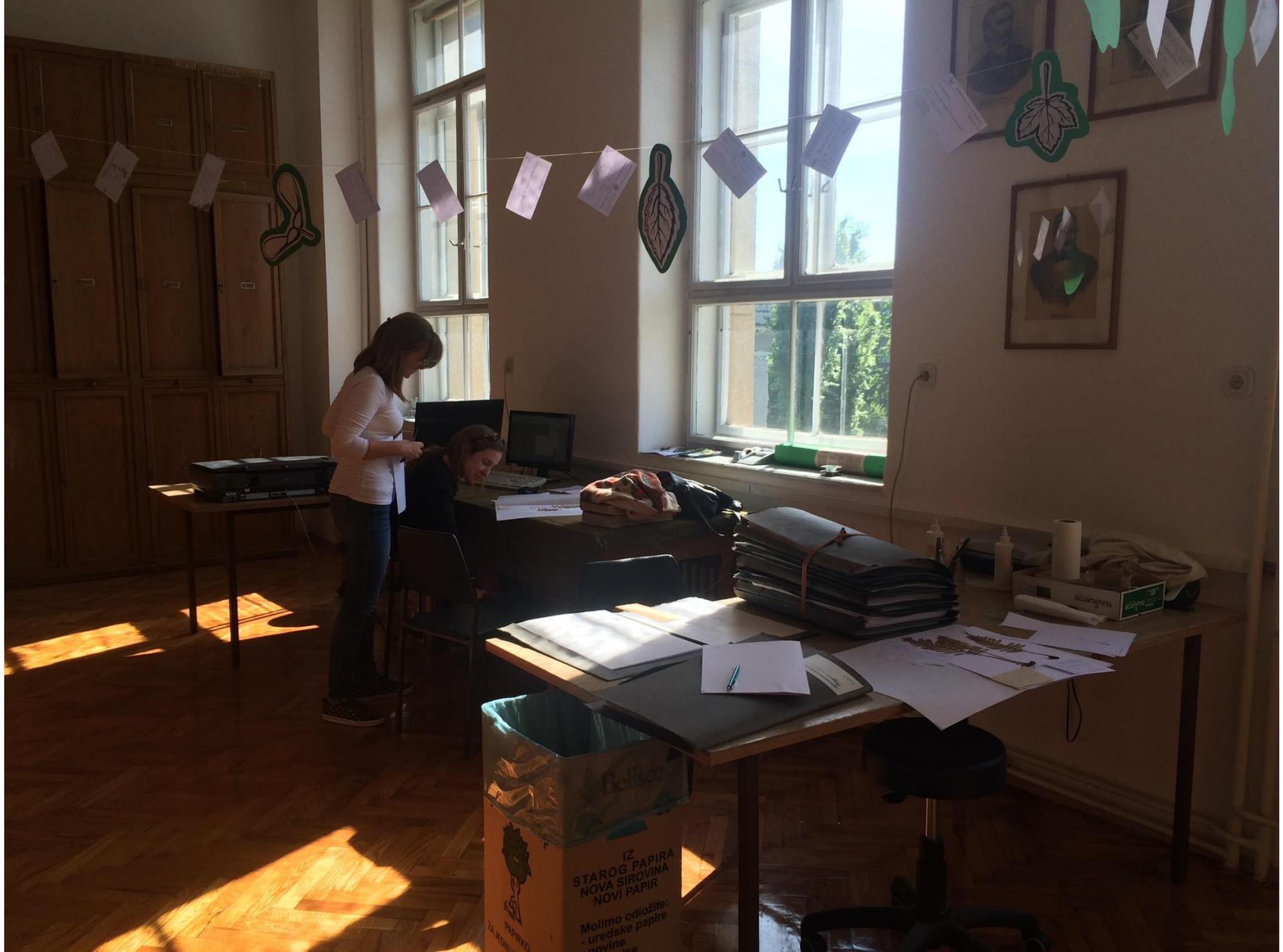
- osnovan 1880. godine
- najstariji i najveći u Hrvatskoj
- oko 180 000 herbarijskih primjeraka
- zbirke poznatih hrvatskih botaničara (A. Haračić, D. Hirc, S. Horvatić, F. Kušan, L. Rossi, J. C. Schlosser, Lj. F. Vukotinović itd.)

- Herbarium Croaticum
- Herbarium Generale
- Alge
- Gljive
- Lišajevi
- Mahovine





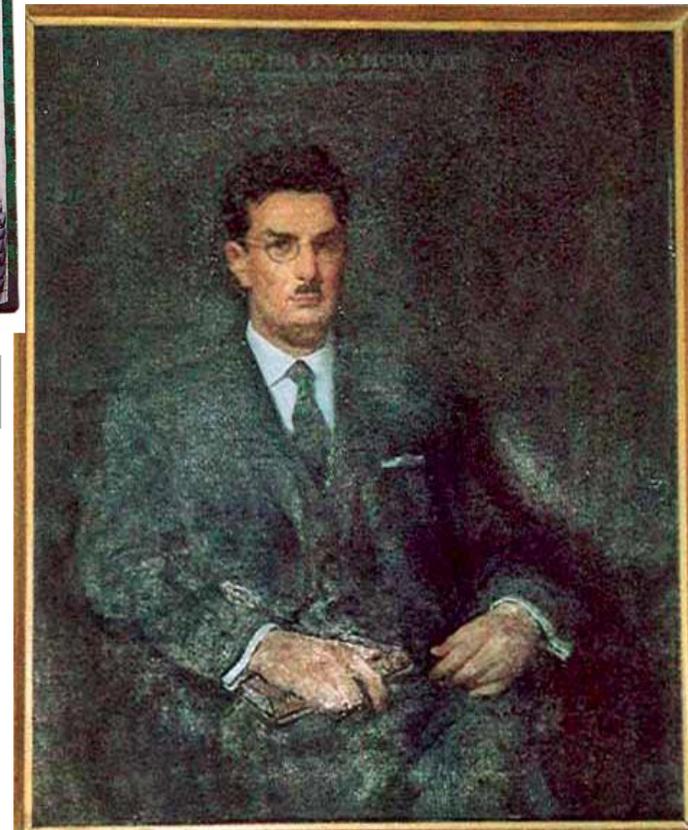
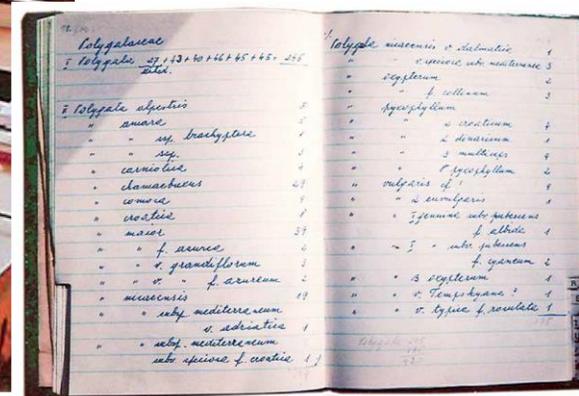






## ZAHO

- herbarij prof. Ive Horvata
- uspostavljen 1918. god. – HAZU
- od 1997. god. Botanički zavod PMF-a
- 71.611 herbarijskih primjeraka



- Alge 7 primjeraka
- Gljive 310 primjeraka
- Lišaji 281 primjeraka
- Mahovine 4.730 primjeraka
- Paprati i Sjemenjače 64.829 primjeraka
- Grčka 976 primjeraka
- Finska 196 primjeraka
- Norveška 282 primjeraka

 NAT. CROAT. | VOL. 16 | No 4 | 267–408 | ZAGREB | December 31, 2007

professional paper / stručni rad

PRIKAZ HORVATOVA HERBARIJA  
(ZAHO) U ZAGREBU

A REVIEW OF THE HORVAT HERBARIUM  
(ZAHO) IN ZAGREB

MARIJA HORVAT<sup>†</sup> & MIŠKO PLAZIBAT



## CNHM

- 1996. god.
- oko 15 000 primjeraka
- Herbarij «Trinajstić» sadrži oko 60.000 primjeraka. Biljni materijal potječe iz skoro čitave Europe, Male Azije i dijela Sjeverne Amerike.





## ZAGR

- 2013. god.
- oko 7.500 primjeraka, iz Hrvatske, balkanskih zemalja i mediteranskog područja





## BEOU - Biološki fakultet, Univerzitet u Beogradu

- 1860. god.
- oko 180 000 primjeraka
- Serbia; Montenegro; Balkan Peninsula; Europe
- V. Stevanović, D. Lakušić, J. Pančić, S. Jovanović, N. Košanin, M. Niketić, Th . Soška, G. Tomović, I. Rudski, M. M. Janković, J. Hruby, S. Vukojičić, J. Petrović, L. Rajevski, G. Džukić





**BEO** - Prirodnjački  
Muzej, Beograd

- 1895. god.
- oko 490 000 primjeraka
- Balkan Peninsula;  
former Yugoslavia,  
including Serbia,  
Montenegro, Slovenia,  
Croatia, Bosnia and  
Herzegovina, and FYR  
Macedonia; Greece;  
Bulgaria; Albania.
- L. Adamović, N. Diklić,  
N. Košanin, V. Lindtner,  
V. Nikolić, J. Pančić, S.  
Petrović





## SARA – Zemaljski muzej Bosne i Hercegovine

- 1890. god.
- 110 000 primjeraka
- Balkans, especially Bosnia and Herzegovina

MUSEUM BOSNAE ET HERCEGOVINAE. SARAJEVO.  
 FLORA BOSNENSIS 13571  
*Corydalis leiosperma* Conr.  
 In cavernis saxorum fancei Zeligian  
 ca m. Krupačka Stijena ca. 550 m. leg. K. Malý  
 No. IV. 1920

Bosnisch-hercegovinisches Landesmuseum. 29  
 Flora graeca.  
 Name: *Lilium Heldreichii* Frey  
 Standort: Auf Elben in der Gegend v.  
 Agoriam am Damass  
 Zeit: 27.6.1903 leg. Chr. Leonis

MUSEUM BOSNAE ET HERCEGOVINAE. SARAJEVO.  
 FLORA HERCEGOVINAE  
*Lilium bosniacum* Frey  
 f. ~~frankae~~ Conr.  
 Vučija bara 1200-1300 m  
 8/XII 25. Ber. Gacko  
 f. *stenophyllum* Griseb  
 08403 leg. J. J. J. J.

**MKNH** - Macedonian National Herbarium, Faculty of Natural Sciences, Skopje

- 1946. god.
- about 171 500 specimens, including: 122 holotypes; 165 000 angiosperms and gymnosperms; 5000 pteridophytes; 750 mosses; 250 hepatics and 500 cultures.





## WU - Universität Wien

- 1897. god.
- 1 400 000 primjeraka
- All plant groups, mainly angiosperms, of central Europe, Balkan peninsula, southwestern Asia, China, South America, and Africa.





WU-Halácsy-Eurpæum



*A. nasuticollis* Hook  
det. A. Ginzberger (1921)

Flora P. madiens.  
*Alysicarpus nasuticollis* L.  
aus dem Museum Epalatos  
April 1907 s. leg. K. Studniczka.



## W - Naturhistorisches Museum Wien

- 1807. g.



Phanerogam Herbarium: c. 4 000 000 sheets  
Cryptogam Herbarium: c. 1 500 000 sheets and capsules  
Wood collection: c. 6 500 pieces  
Spirit collection: c. 2 000 glasses  
Fruit and seed collection  
Slides with diatoms  
Collection of hand-writing and original labels  
Collection of reprints



## IB - Universität Innsbruck

- 1850. g.
- 100 000 primjeraka
- Mikološka kolekcija - 25.000-30.000 primjerka
- Tyrol; alpine flora worldwide; Agaricales, especially *Cortinarius*





## BP - Hungarian Natural History Museum

- 1870. g.
- 1 831 000 primjeraka
- All groups worldwide, especially Carpathian region and Hungary; fungi of Hungary





## PR - National Museum in Prague

- 1818. g.
- 2 000 000 primjeraka
- Worldwide phanerogams and bryophytes, with emphasis on Czech Republic, Slovakia, central Europe, Balkan Peninsula, Australia, Iraq, and Iran









PRC



## PRC - Charles University in Prague

- 1775. g.
- 2 200 000 primjeraka
- Worldwide, especially central Europe, Carpathian Mountains, and Balkan Peninsula

143  
144

143 *Rubiaceae*  
8486 GALIUM  
• xy = finis  
• nemoralia  
• x pomeranicum

144 *Rubiaceae*  
*Caryophyllaceae*  
8486 - 8526  
8486 GALIUM  
• dodatky  
• mimovropaká  
8488 VALLANTIA  
8489 RUBIA  
8515 SAMBUCUS  
8516 VIBURNUM  
8516 SYMPHORICARPOS  
8520 LINNAEA  
8523 LONICERA  
8526 ADOXA - dodatky





## BM - The Natural History Museum, London

- 1753. g.
- 5 200 000 primjeraka

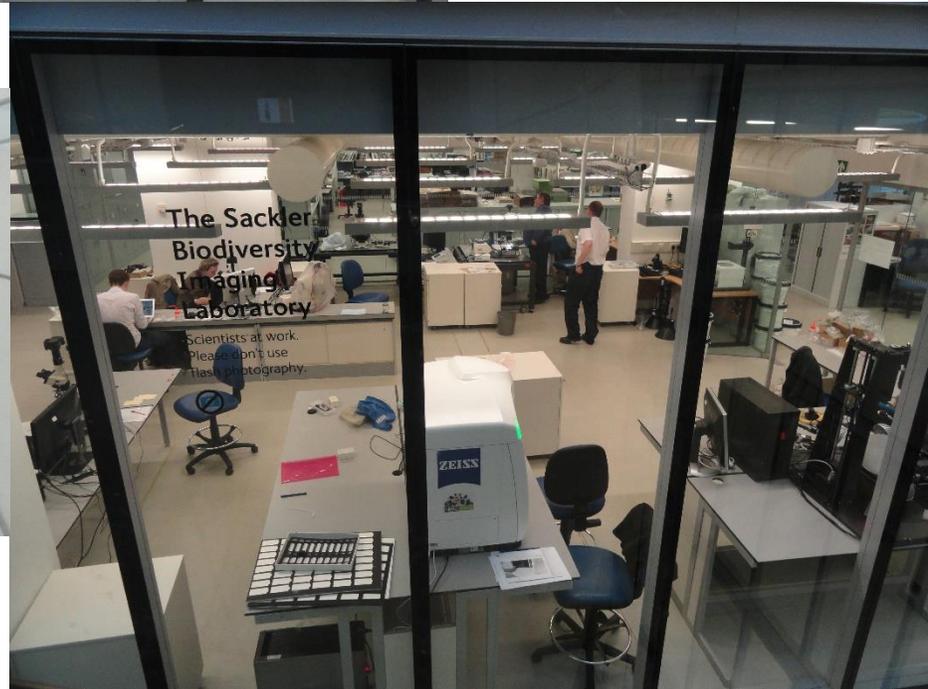
- Angiosperms and pteridophytes worldwide, especially of British Isles, Europe, Africa, North America, West Indies, and Himalaya; bryophytes; algae; lichens.





# Don't look down!

The cocoon is eight storeys high. Six of them protect our insect and plant research collections, but two are specially designed for you to explore.













## TBI - Georgian Academy of Sciences

- 1894. g.
- 1 000 000 primjeraka
- Caucasia; central Asia; Turkey; Iran



## P Herbarium

- founded in 1635
- now: 15 locations in France, 2000 people
- designed for 6 million specimens, was packed with 10 million sheets
- 2006 – Start of the project
- 2009 – Start of the works
- 2010 (June) – Start of digitization
- 2012 – End of the project

Overall project cost:  
24,5 Million €



**Floor by floor renovation**



**Herbarium**



**Warehouse**



**Industrial Partner**



**Digitization  
Reconditioning  
Sorting**



- Planned production rate: 17 000 sheets per day over 24 months
  - ca. 15 seconds / sheet
- Two teams of 20 workers in two shifts working from 6am to 9pm



# High-performance digitization of natural history collections: Automated imaging lines for herbarium and insect specimens

Riitta Tegelberg, Tero Mononen & Hannu Saarenmaa

Research Article

PhytoKeys 38: 15-30 (19 May 2014)

doi: 10.3897/phytokeys.38.7168

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## The use of Optical Character Recognition (OCR) in the digitisation of herbarium specimen labels

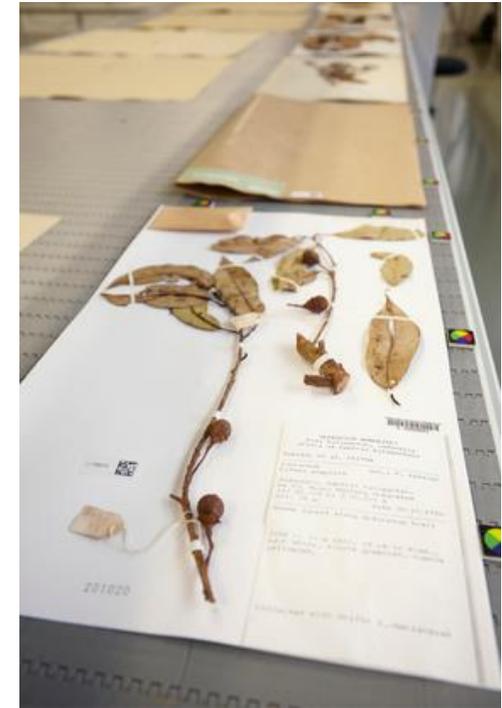
Robyn E. Drinkwater<sup>1</sup>, Robert W. N. Cubey<sup>1</sup>, Elspeth M. Haston<sup>1</sup>



## Herbarium Sheets

The Herbarium Digitstreet that Picturae developed for Naturalis Biodiversity Center digitises more than 40,000 Herbarium sheets per day.

JESSY VISSER | PICTURAE



Naturalis manages a collection of 37 million biological and geological objects for the purpose of scientific research into past and present biodiversity. From this collection, seven million objects are currently being digitized. These objects have priority due to their economic and public importance. This has been translated into current research questions from the Netherlands and other countries. The collection to be digitized is highly diverse, ranging from insects to whales and from minerals to meteorites.

The entire project –one of the biggest digitization projects of natural history collections in the world –is therefore on schedule: in 2015 seven million objects will have been digitized.

Everything you can find

## What's in a museum specimen?

Studies on collections have contributed to illustrate what kind of information each physical specimen contains and which goals that information may serve to. The accurate, persistent and precise data that can be extracted from specimens enable scientists to establish the relevant services that the broader community needs as the basis for innovative approaches and new discoveries.

<https://www.dissco.eu/>



**Genomic data**



**Biochemical data**



**Morphological data**



**Geographical data**



**Taxonomic information**



**Species interactions data**

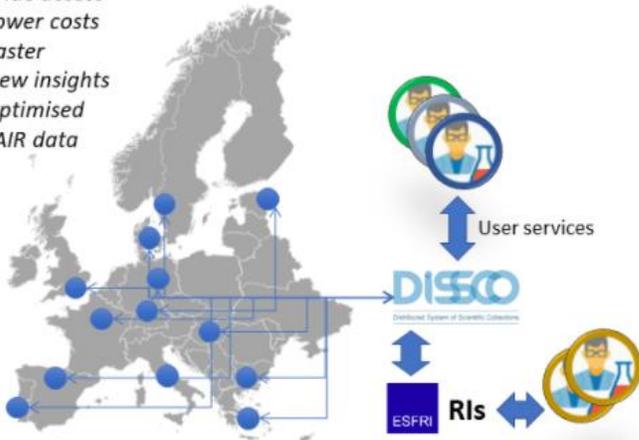


**Ecological data**



### Integrated RI model

Wide access  
Lower costs  
Faster  
New insights  
Optimised  
FAIR data



The first mass scale initiative to re-unite and serve genomic, chemical, geographical, morphological and taxonomic information and link it to collections objects

Hrvatski English

**Dobro došli!**  
Welcome!

Vascular Plants Taxonomy & Bibliography of Croatian Flora

**FCDD**

**Flora Croatica Database**

Menu

Crvena knjiga	Bibliografija	Korisno bilje	Alohtone biljke	Galerija	Staništa	Porodice
Opažanja	Herbar	Analiza raznolikosti	Geoportal	Poveznice	Kako koristiti bazu	

Prijava korisnika  
07.04.2016. 13:25:42

FCD trenutno sadrži 8 podrazreda, 19 nadredova, 56 redova, 189 porodica, 1090 rodova, 4528 vrsta i 1163 podvrsta.  
Ukupan broj vrsta i podvrsta: 5014

Osnovni podaci	Ugroženost	Nalazište / stanište
Podrazred		<input type="checkbox"/> Sa slikom
Nadred		<input type="checkbox"/> Endem
Red		<input type="checkbox"/> Sporna
Porodica		<input type="checkbox"/> Korov
Rod		<input type="checkbox"/> U kulturi
Latinsko ime vrste		
Narodno ime		
Sinonim		

Hrvatski prirodoslovni muzej  
Croatian Natural History Museum

POČETNA O MUZEJU ODJELI I ZBIRKE STALNI POSTAV DOGAĐANJA ZNANOST KONTAKT

Botanički odjel Geološko-paleontološki odjel Mineraloško-petrografski odjel Zoološki odjel Restauratorsko-preparatorski odjel

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Herbarijski primjerci mogu se pretraživati unosom riječi ili njezinog dijela unutar bilo kojeg polja u obrascu, odnosno odabirom ponuđenih podataka klikom na "Traži". Može se pretraživati istovremenim upitom na različita polja. Niži jedno polje nije osjetljivo na mala i velika slova.

Oznaka (\*) se koristi kao nadomjestak bilo kojeg dijela podatka koji se pretražuje (npr. za pretraživanje svih vrsta čiji naziv započinje slovima Poly, u polje "Ime vrste" unesemo Poly\*, ili ukoliko u polje "Nalazište" unesemo \*gor\* u rezultatu će se prikazati svi lokaliteti koji u svom nazivu sadrže gor. npr. Zagrebačka gora, Gornje Jelenje, ...)

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**ZA & ZAHO**  
**Virtualni herbarij**

INVENTARNA KNJIGA

PRIRODOSLOVNI MUZEJ RIJEKA  
NATURAL HISTORY MUSEUM RIJEKA

NASLOVNA ZBIRKE IZDOJENO POMOĆ IMPRESUM MUZEJ ENGLISH

Zbirka: COZ HERBARUSKA ZBIRKA Inventar na oznaku: Hrvatski naziv: Latinski naziv: PRETRAŽI

>> NAPREDNO PRETRAŽIVANJE

DETALJI Br. predmeta: 2131 Br. stranice: 1 / 65

Skupina podataka o identifikaciji

Inventar na oznaku: PMR-08429  
Oznaka u zbirci: NHMR 11  
Oznaka kataloga (zbirke): COZ HERBARUSKA ZBIRKA  
Vrsta predmeta: Kormofita  
Naziv predmeta latinski: *Saxatrina Mérat*

PMR-08419	NHMR 3	<i>Equisetum palustre</i> L.
PMR-08420	NHMR 1	<i>Linaria vulgaris</i> Mill.
PMR-08421	NHMR 2	<i>Galium mollugo</i> L.
PMR-08422	NHMR 4	<i>Polygala comosa</i> Schkuhr
PMR-08423	NHMR 5	<i>Mentha arvensis</i> L.
PMR-08424	NHMR 6	<i>Gentiana austriaca</i> (Kerner) Holub

ZAGR Virtual Herbarium

Faculty of Agriculture University of Zagreb

Rednja promjena: 17.7.2015.

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- Index Herbariorum
- Flora Croatica Database
- Global Biodiversity Information Facility
- Biodiversity Information Standards
- Synthesis of Systematic Resources
- Croatian Plant Genetic Resources Database
- Croatian Botanical Society
- ISTORE Plant Science
- Global Plants Initiative

HOME

The Herbarium  
January 2013  
provided by  
vascular plant  
territories and  
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examination  
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**Biološki odsjek**  
PRIRODOSLOVNO MATEMATIČKI FAKULTET

SVEUČILIŠTE U ZAGREBU

ODSJEK STUDIJSKI PROGRAMI ZNANOST ZAVODI DJELATNICI

# Herbarium WU

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References

Collections of participating institutions

## Home

The foundation of this collection MARILAUN (1831 - 1898), had entire collection had been trans exsiccata series "Flora exsiccata" (Schedae ad floram exsiccata) (e.g., herbaria of A. KERNER: it approached considerable size institute. Today the herbarium is found in the printed version of it

[Access the database](#)



m, Anton KERNER von become necessary, as the had created the well-known een issued also in book form mens. Due to gifts and bequests collecting expeditions it soon so has left his herbarium to the worldwide. Further details can be



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WHAT'S ON

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SCIENCE



Botanischer Garten und Botanisches Museum Berlin-Dahlem

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Research

Biological Collections

Herbarium

Living Collections

Dahlem Seed Bank

DNA Bank

Data Access

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Home » Science » Biological Collections » DNA Bank

## DNA Bank

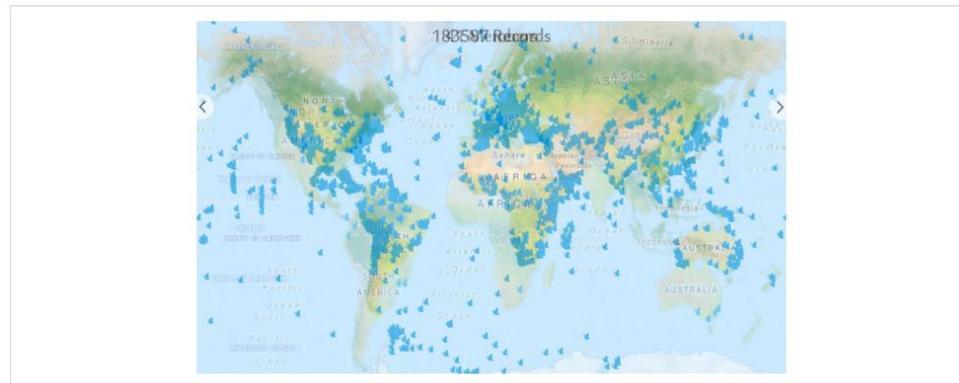
The Berlin-Dahlem plant DNA bank, at the Botanic Garden and Botanical Museum (BGBM) is a member of the DNA Bank Network (see below) and comprises approximately 10.000 DNA and tissue samples. The DNA bank holds samples obtained from plants, fungi, algae and protists collected in the wild, or of documented origin, associated with full relevant documentation. Its declared purpose is to enhance taxonomic and evolutionary studies world-wide by providing

- at-cost availability of DNA material for further, complementary or corroborating studies, subject to the recipient's compliance with the letter and spirit of the Convention on Biological Diversity.
- permanent storage of DNA material on which molecular studies have been performed, so that results can be corroborated and complemented in the future.
- full documentation of each sample, in a database accessible online, with the provenance of plant material, the place of deposit of herbarium voucher (digital images online accessible), DNA extraction techniques and links to extant molecular data (when published).

The stored DNA material derives either from molecular research work performed at the BGBM or from donations by researchers at other institutions, which are accepted under the provisos specified below. The provenance, the extraction method and date, and the year of incorporation into the DNA bank, are specified for each sample.

DNA Bank Network





<b>Samples</b>	
DNA	59044
Tissues	65464
Enviros	61
Repositories	12
<b>Vouchers</b>	
Cultures	21825
eVouchers	0
Specimens	35739
Unknown	1454
Collections	12
<b>Taxa</b>	
Families	1769
Genera	7888
Species	22440
<b>Total</b>	
	183587

### News

- 04. April 2016 - GGBN March 2016 Newsletter Released
- 29. March 2016 - Carnegie Museum of Natural History joins GGBN
- 15. March 2016 - GGBN 2016 conference Berlin: deadline for early bird registration extended to April 1
- 15. March 2016 - Call for expressions of interest to host the GGBN 2018 conference
- 09. March 2016 - Collections Associate Position Opening
- 08. March 2016 - GGBN 2016 Early Conference Registration closes 12am March 16th
- 26. January 2016 - 'Life in Data' ESBB/GGBN paper published on Biobanking and Biopreservation

### Explore GGBN

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Documents



About



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### Identification(s):

**Name:** *Fibigia lunarioides* Sweet  
**Taxonomy:** CRUCIFERAE ( familia )

### Collection Info:

**Project:** Rhodos 4-08  
**Collector(s):** M. Ristow  
**Field number:** 41-08  
**Collection Date:** 08.04.2008  
**Collection Date Begin:** 2008-04-08  
**Country:** Greece ( GR )  
**Locality:** Rhodos. Burg Kritinia, NW Kritinia.

### Other Info:

**Country:** Greece ( GR )  
**Continent :** Europe

**Coordinates (Lat/Lon) :** 36.2638893127 | 27.8088874817  
**Biotope:** Felsritzen auf Kalk



### DNA Tissue Specimen

**Unit ID/Catalog Number:** DB 2403  
**Institution Code:** B  
**Collection Code:** DNA Bank  
**Record Basis:** MaterialSample  
**Kind of Unit:** DNA

### Relation to B 10 0340693 (Herbarium Berlinense / B ):

DNA and specimen from the same population

### Extraction:

**Extraction Date:** 2008-08-08T00:00:00  
**Extraction Method:** DNeasy Plant Mini Spin Kit Qiagen  
**Extraction Staff:** Schories, Astrid

### Quality:

**Concentration:** 17.72ng/ul  
**Ratio of Absorbance:** 1.78 OD<sub>280nm</sub> / OD<sub>280nm</sub>  
**Ratio of Absorbance:** 2.46 OD<sub>230nm</sub> / OD<sub>280nm</sub>

# Lessons learned from extracting DNA from herbarium specimens

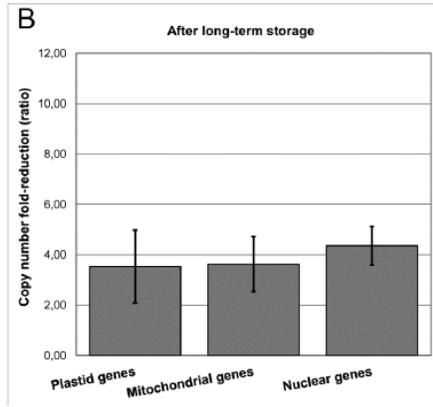
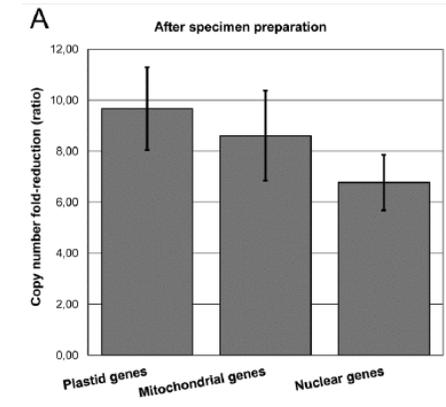
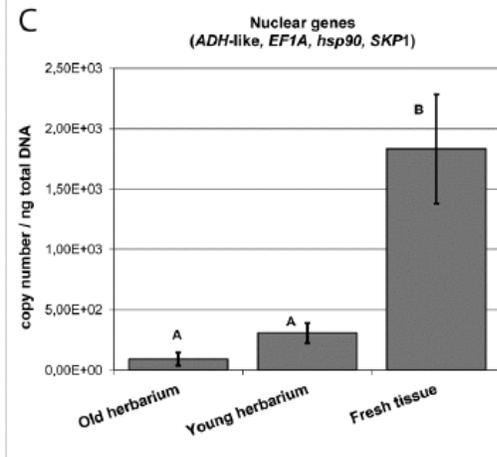
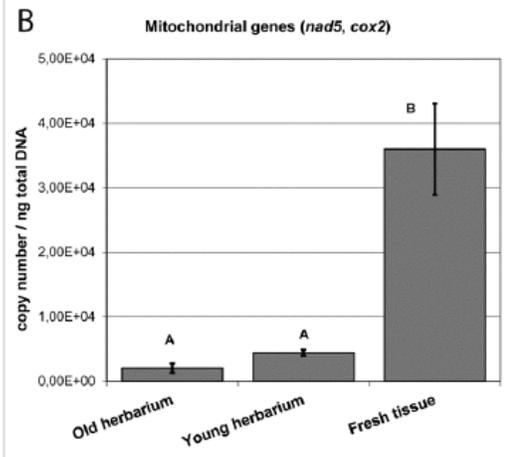
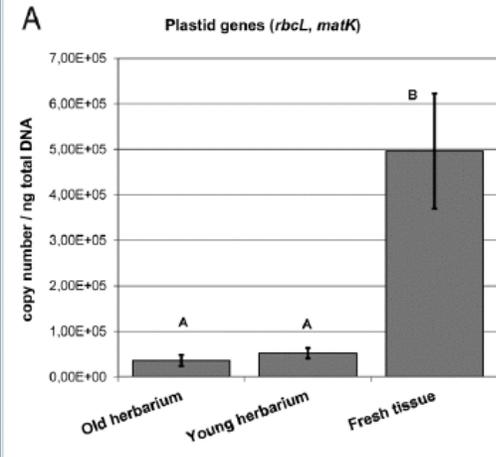
Martijn Staats and Freek Bakker

Wageningen University, Biosystematics Group, the Netherlands

	Extraction method	Kit	Median DNA yield (ng)	Median DNA purity (260/280 ratio)	PCR success <i>rcbL</i> (670 bp)	PCR success <i>LEAFY</i> (260 bp)	PCR success P6 loop (10 – 143 bp)
1.	Silica column	DNeasy Plant Mini Kit	432.7	2.12	♥ 11 / 47	16 / 47	♥ 45 / 47
2.	Silica column	NucleoSpin Plant Kit II	595.6	♥ 1.88	♥ 9 / 47	♥ 17 / 47	42 / 47
3.	Silica column	Canadian Centre for DNA barcoding (Guelph, Ontario)	261.8	1.56	3 / 47	12 / 47	29 / 47
4.	Chloroform + Silica column	CTAB + Wizard DNA Clean-up (Promega)	1708	♥ 1.62	3 / 47	♥ 31 / 47	♥ 47 / 47
5.	Chloroform	CTAB	♥ 3000	1.35	0 / 47	4 / 47	37 / 47
6.	Chloroform + Silica column	Urea pre-treatment + DNeasy	328.1	2.11	2 / 47	13 / 47	41 / 47
7.	Magnetic charge	ChargeSwitch gDNA Plant Kit	♥ 2127.4	1.46	4 / 47	9 / 47	16 / 47
8.	Anion exchange	Genomic Tip 20/G	0.0	0.60	7 / 47	12 / 47	34 / 47

- Small amounts of material (~2mg) is sufficient for PCR.
- DNA quality most important, not quantity.
- Silica-based purification methods performed best.
  - e.g. DNeasy plant kit (QIAGEN)
- The type of DNA polymerase affect PCR success.
- DNA fragmentation is a major problem, aim low!

# Aim: Assess the extent & nature of DNA post-mortem damage in herbarium specimens.



- Main damage type: polymerase non-bypassable damage and not miscoding lesions.
- The C→T/G→A sequence error rate is negligible (0.03%).
- None-preferential degradation of organelle vs. nuclear DNA.
- Only a fraction of herbarium DNA is accessible to DNA polymerase.
- Herbarium specimen preparation (oven drying method) and not storage causes most DNA damage.

## Successful DNA amplification of a more than 200-year-old herbarium specimen: recovering genetic material from the Linnaean era

Katarina Andreasen<sup>1</sup>, Mariette Manktelow<sup>1</sup> & Sylvain G. Razafimandimbison<sup>2</sup>



## Successful extraction of DNA from 100-year-old herbarium specimens of the liverwort *Bazzania trilobata*

Authors: Jankowiak, Kamila<sup>1</sup>; Buczkowska, Katarzyna<sup>2</sup>; Szweykowska-Kulinska, Zofia<sup>1</sup>

Source: *Taxon*, Volume 54, Number 2, May 2005, pp. 335-336(2)



## Mycological Research

Volume 108, Issue 5, May 2004, Pages 471–479



- vascular plant *Phaulopsis talbotii* S. Moore (Acanthaceae)
- 800-bp region between 16S ribosomal DNA and the 3' part of the trnI gene (16S-trnI) in the chloroplast genome
- oldest for bryophytes
- plant pathogens: 159 year-old *Phytophthora infestans* (Mont.) de Bary
- 100 bp fragment of rDNA specific for *P. infestans* was amplified from 90% of the specimens ( $n = 186$ ), from dried potato and tomato leaves from herbarium specimens collected during the Irish potato famine and later

## Identity of the mtDNA haplotype(s) of *Phytophthora infestans* in historical specimens from the Irish Potato Famine

Kimberley Jane May, Jean Beagle Ristaino  



Research

### Methods

Genetic time traveling: sequencing old herbarium specimens, including the oldest herbarium specimen sequenced from kingdom Fungi, reveals the population structure of an agriculturally significant rust

- the specimen from France collected in c. 1811 is the oldest herbarium specimen sequenced from kingdom Fungi

OPEN

SUBJECT AREAS:  
NATURAL VARIATION  
GENOMIC ANALYSIS

Received  
5 November 2013  
Accepted  
13 May 2014

# Minimally destructive sampling of type specimens of *Pyropia* (Bangiales, Rhodophyta) recovers complete plastid and mitochondrial genomes

Jeffery R. Hughey<sup>1</sup>, Paul W. Gabrielson<sup>2</sup>, Laurence Rohmer<sup>3</sup>, Jacquie Tortolani<sup>1</sup>, Mayra Silva<sup>1</sup>, Kathy Ann Miller<sup>4</sup>, Joel D. Young<sup>5</sup>, Craig Martell<sup>5</sup> & Erik Ruediger<sup>5</sup>

- 14 plastid and 15 mitochondrial genomes attributed to the red algae *Pyropia perforata*, *Py. fucicola*, and *Py. kanakaensis*, Complete genomes are attainable from 19th and early 20th century type specimens

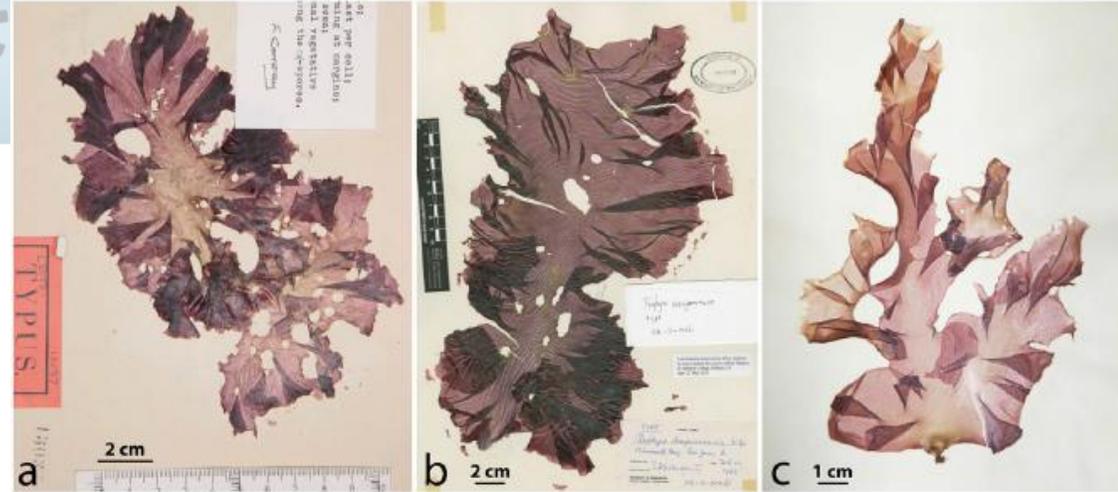


Table 2 | Comparison of assembly and genomic data for the specimens of *Pyropia* analyzed in this study

Species/Voucher/Year Collected	36 mers	N50	Velvet Contigs	Max Contig	mtDNA Length	Chloroplast Length
<i>Py. perforata</i> /LD-Ag 13037/1874 <sup>1</sup>	68,784,178	35,758	526	54,271	33,919	189,789
<i>Py. perforata</i> /LD-Ag 13038/1874 <sup>*</sup>	5,194,297	15,937	321	43,667	33,921	189,789
<i>Py. perforata</i> /LD-Ag 13031/unknown <sup>1</sup>	18,738,480	54,271	114	99,206	32,662	189,789
<i>Py. perforata</i> /LD-Ag 13032/unknown <sup>*</sup>	4,758,357	36,270	67	55,056	32,662	189,789
<i>Py. perforata</i> /UC 95735/1899 <sup>*</sup>	4,716,038	15,629	1,845	42,644	33,958	189,889
<i>Py. perforata</i> /UC 1450590/1968 <sup>1</sup>	29,767,819	2,712	2,103	18,231	32,491	189,794
<i>Py. perforata</i> /UC 2019900/2011 <sup>*</sup>	5,842,020	54,265	506	99,200	34,968	189,789
<i>Py. perforata</i> /UC 2019901/2013 <sup>1</sup>	19,624,308	2,850	689	9,639	34,870	189,789
<i>Py. perforata</i> /UC 2019902/2013 <sup>*</sup>	6,197,218	24,095	613	42,643	34,968	189,788
<i>Po. sanjuanensis</i> /VK-11-00061/1968 <sup>1</sup>	27,059,510	54,271	36	99,206	40,042	189,788
<i>Po. perforata</i> f. <i>segregata</i> /UC 807662/1895 <sup>1</sup>	35,213,087	4,879	912	23,135	35,144	189,752
<i>Po. perforata</i> f. <i>segregata</i> /UC 95739/1895 <sup>1</sup>	20,234,514	437	4,249	13,714	35,142	189,752
<i>Py. fucicola</i> /VK-11-00121/1968 <sup>1</sup>	35,473,374	20,526	304	70,564	35,035	~191,982
<i>Py. kanakaensis</i> /Mumford #161/1973 <sup>1</sup>	27,347,099	34,197	153	94,550	38,463	~194,631
<i>Py. kanakaensis</i> /UC 1863980/1999 <sup>1</sup>	24,529,495	23,010	1,484	51,361	39,300	~194,631

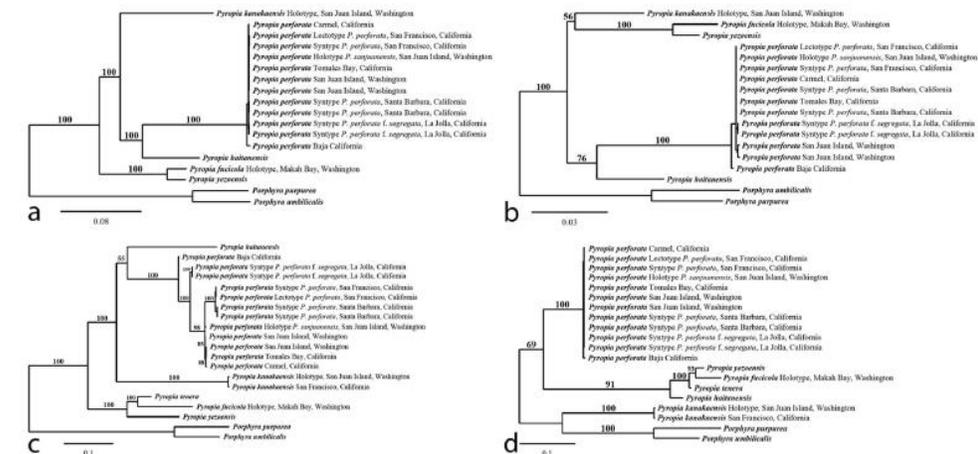


Figure 2 | Maximum likelihood analysis of chloroplast genomes (a), *rbcL* sequences (b), mitochondrial genomes (c), and COI sequences (d) of *Pyropia* and *Porphyra*. Numbers above branches are maximum likelihood bootstrap values based on 1,000 replicates. The legend below represents the scale for nucleotide substitutions. The analysis was performed using RAxML and the default parameters in Galaxy<sup>43-45</sup>. The tree was constructed with TreeDyn 198.3 at Phylogeny.fr<sup>46</sup>.

# Genetic identity of putative Linnaean plants: Successful DNA amplification of Linnaeus’s crab apple *Malus baccata*

Katarina Andreasen,<sup>1</sup> Mariette Manktelow,<sup>1</sup> Jasna Sehic<sup>2</sup> & Larisa Garkava-Gustavsson<sup>3</sup>



Fig. 1. Lectotype of *Malus baccata* (L.) Borkh. (*Pyrus baccata* L.), Herb. Linn. 647.4 (LINN). Reproduced with permission of the Linnean Society of London.

- genetic comparisons of Linnaeus’s own herbarium specimens with potentially remnant plants from his cultivations
- five loci of microsatellites

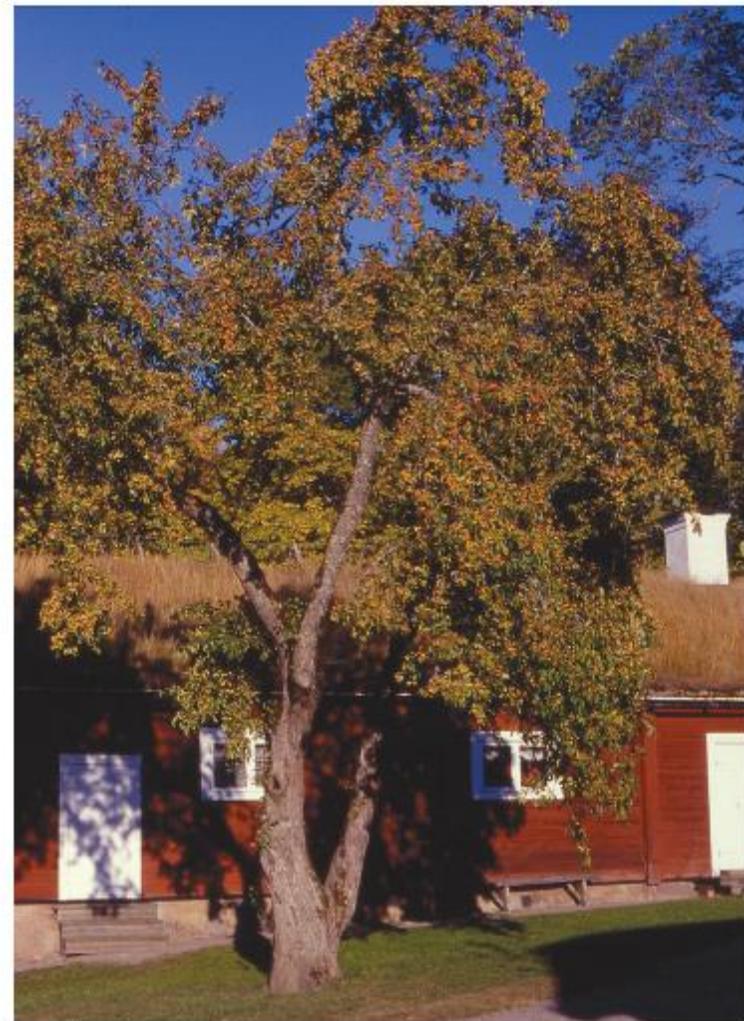
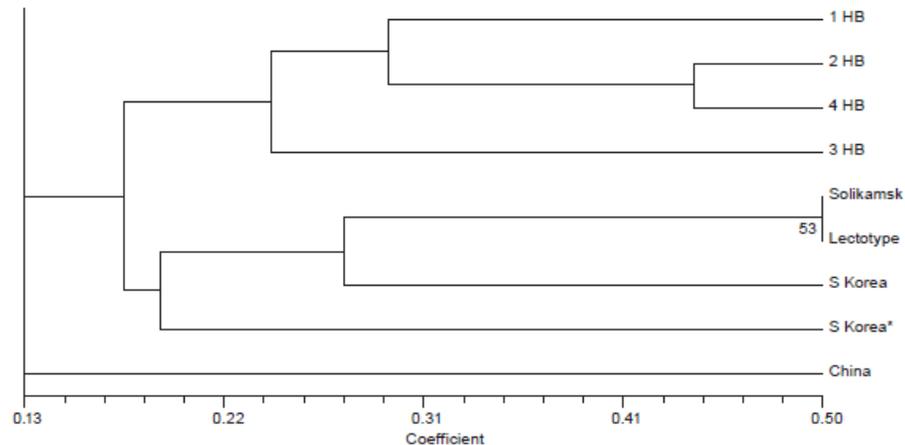


Fig. 2. *Malus baccata* tree probably planted by Linnaeus in the courtyard in Linnaeus’s Hammarby, Uppsala, Sweden.

# DNA FROM HERBARIUM SPECIMENS SETTLES A CONTROVERSY ABOUT ORIGINS OF THE EUROPEAN POTATO<sup>1</sup>

MERCEDES AMES AND DAVID M. SPOONER<sup>2</sup>

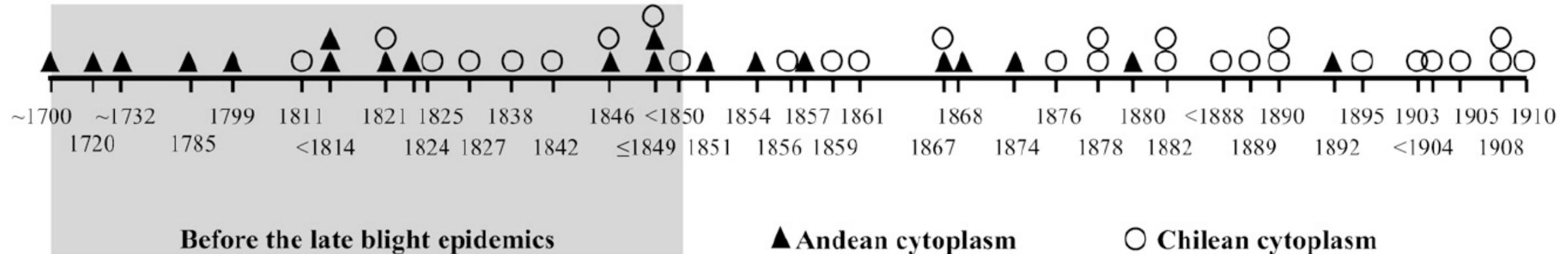


Fig. 4. Chronological summary of the 241-bp deletion in the *trnV-UAC/ndhC* intergenic spacer region of the plastid DNA of 49 herbarium specimens of *Solanum tuberosum* collected in Europe from the early 1700s to 1910, distinguishing germplasm originating from the high Andes or from lowland Chile. The gray box highlights those collected before the late blight epidemics that were well established in the UK by 1850.



Research Article

## Use of herbarium data to evaluate weediness in five congeners

Ana M. Hanan-A.<sup>1</sup>, Heike Vibrans<sup>2\*</sup>, N. Ivalú Cacho<sup>3</sup>, José L. Villaseñor<sup>3</sup>, Enrique Ortiz<sup>3</sup>  
and Vinicio A. Gómez-G.<sup>4</sup>

**TAXON** 59 (5) • October 2010: 1321–1323

Lister & al. • Herbarium specimens in phylogeographic studies

POINT OF VIEW

## Herbarium specimens expand the geographical and temporal range of germplasm data in phylogeographic studies

Diane L. Lister,<sup>1</sup> Mim A. Bower<sup>1</sup> & Martin K. Jones<sup>2</sup>

## Herbarium specimens reveal a historical shift in phylogeographic structure of common ragweed during native range disturbance

MICHAEL D. MARTIN,\*†‡ ELIZABETH A. ZIMMER,† MORTEN T. OLSEN,\* ANDREW D. FOOTE,\* M. THOMAS P. GILBERT\* and GRACE S. BRUSH‡

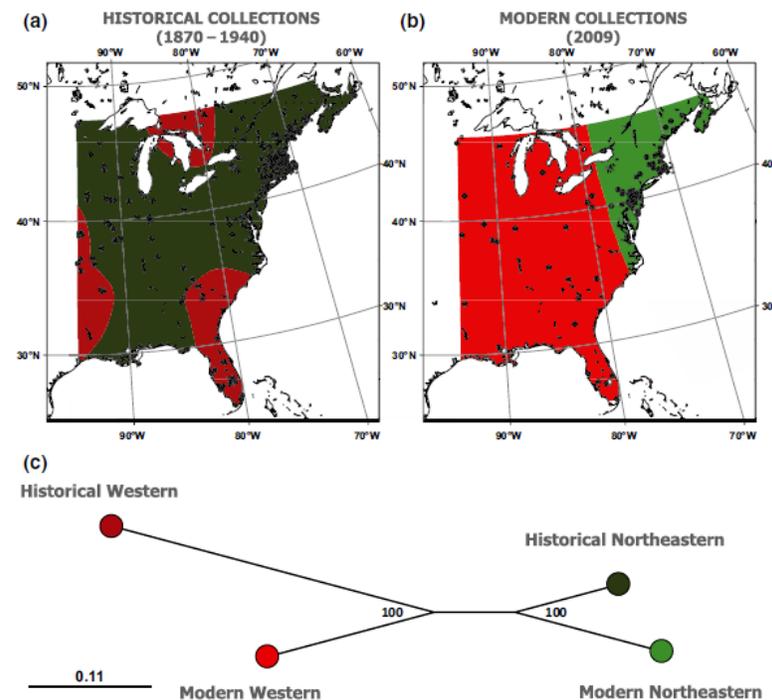


Fig. 2 Common ragweed genetic clusters identified by spatially explicit Bayesian analysis in GENELAND. Maps show of (a) historical individual collections and (b) modern populations. Black dots indicate sampling locations. Coloured regions represent the 95% confidence limits of assignment of that spatial cell to that cluster. Historical data set consists of 473 herbarium specimens collected from diffuse localities. Modern data set consisting of 453 individuals collected from 45 wild populations in 2009. (c) Unrooted neighbour-joining tree showing the topological relationship between the four clusters inferred in GENELAND. Branch lengths (unitless chord distances) are as indicated by the scale bar. Bootstrap support values (percentage) are indicated at internal nodes. Branch tips (and their colours) correspond to clusters defined in (a) and (b).

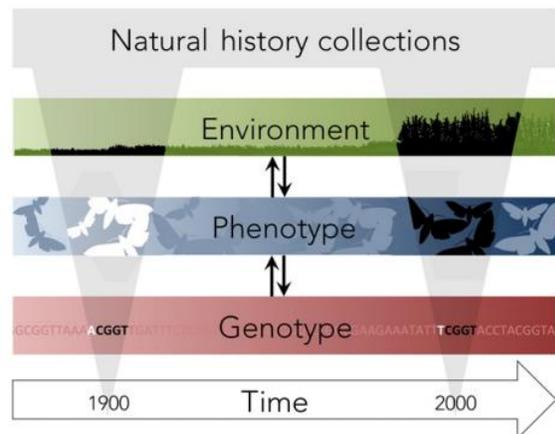


Fig. 1 Natural history collections provide specimens dating back, in some cases, over 100 years. These large repositories provide an opportunity to study evolution in response to changes in the environment. Whereas it has always been possible to study phenotypic change, new advances in genomic techniques are allowing researchers to also study the impacts of environmental change on genetic processes.

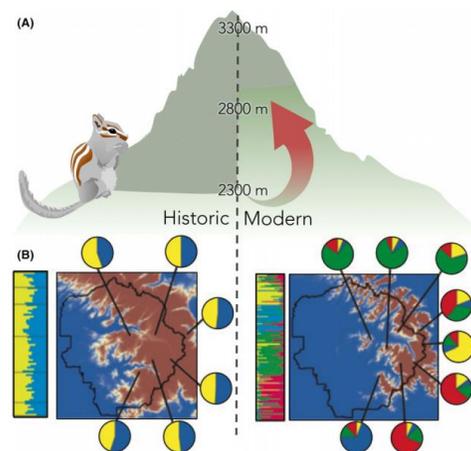


Fig. 4 Ecological and genetic investigations on alpine chipmunks, *Tamias alpinus*, show the value of museum specimens for documenting ecological shifts and analyzing genetic change over time. (A) Cross-hatching indicates elevational range occupied by *Tamias*

## INVITED REVIEWS AND SYNTHESSES

### Natural history collections as windows on evolutionary processes

MICHAEL W. HOLMES,\*†<sup>1</sup> TALISIN T. HAMMOND,\*<sup>1</sup> GUINEVERE O. U. WOGAN,\*<sup>1</sup> RACHEL E. WALSH,\* KATIE LABARBERA,\* ELIZABETH A. WOMMACK,\*‡ FELIPE M. MARTINS,\* JEREMY C. CRAWFORD,\* KATYA L. MACK,\* LUKE M. BLOCH\* and MICHAEL W. NACHMAN\*

# Typification of *Lilium jankae* A. Kern. and *Lilium martagon* var. *cattaniae* Vis.

Ivana Rešetnik & Sandro Bogdanović



Fig. 1. – Lectotype of *Lilium jankae* A. Kern.  
[Kerner s.n., WU] [© Universität Wien Herbarium. Reproduced with permission]

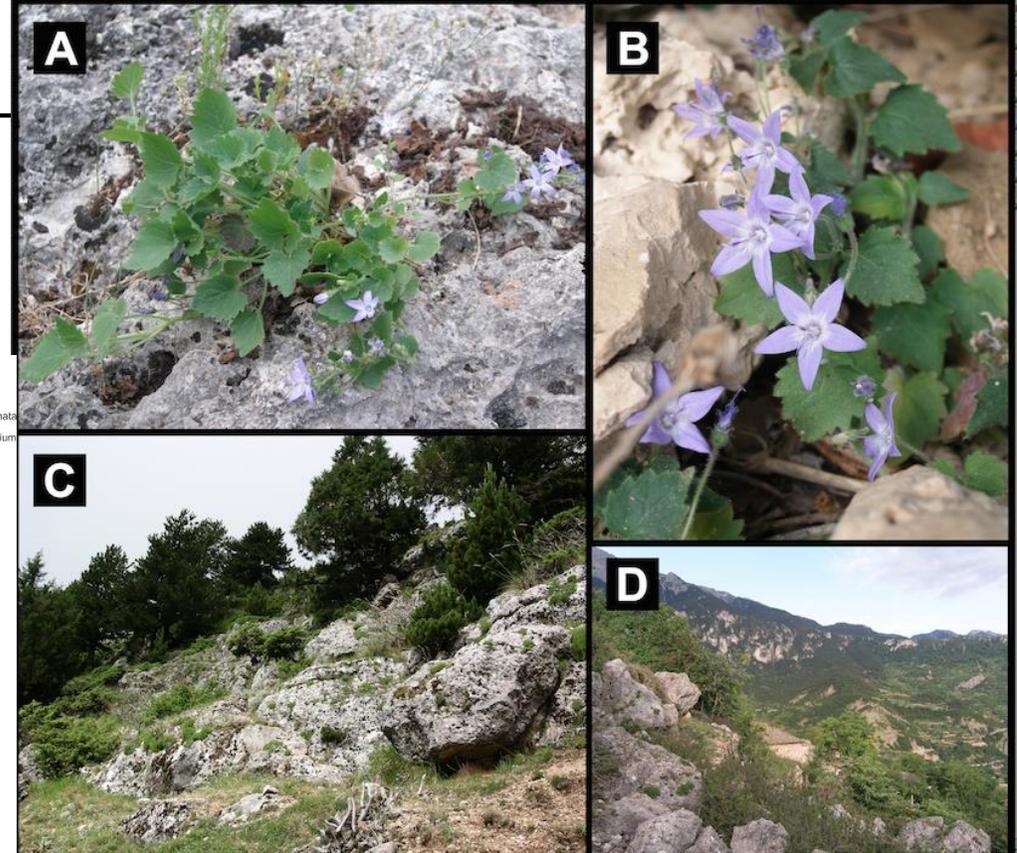
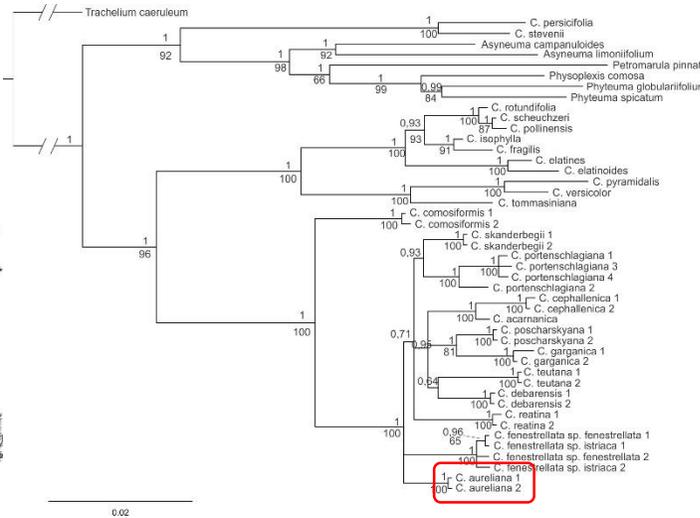
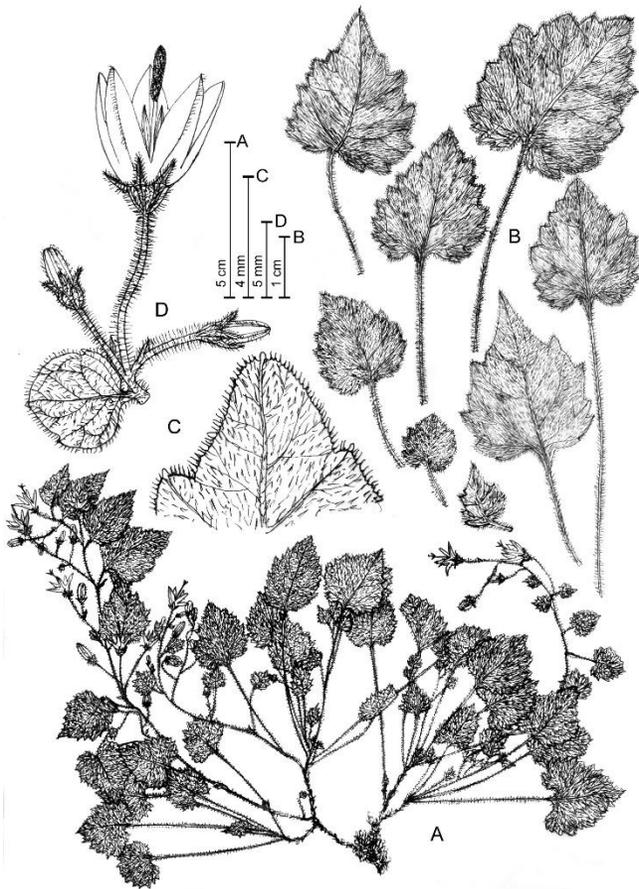


Fig. 2. – Lectotype of *Lilium martagon* var. *cattaniae* Vis. [specimen on the left side].  
[Maria de Cattani s.n., PAD] [© Erbario Patavinum, Università degli Studi di Padova. Reproduced with permission]

- *Lilium jankae* was described by Kerner (1877) although Janka was the first who, noticed that this lily was somewhat different from species described
- 1868 Janka found this lily in Verespatak (Romania)
- Kerner (1877) described the new species, which he names *L. jankae* in honour of Victor Janka
  
- In PAD we traced a specimen having the original Visiani's autograph description of this taxon which is identical to the description given in the protologue.
- Visiani refers to Maria de Cattani as the collector and Much (Muć) locality (Croatia) as the collection site

## *Campanula aureliana* (Campanulaceae), a new species from Albania

Sandro Bogdanović · Ivana Rešetnik · Salvatore Brullo · Lulëzim Shuka



- detailed investigation on herbarium specimens and literature data indicated the occurrence of an endemic variety of *C. garganica* Ten., named var. *albanica* Markgr. in central Albania
- variety was described by Markgraf on material from a single locality in Albania (Tomori: Kapinova, Kalkfels im Dorf, 800 m, bl., 19.VI.1928)
- no type specimens exist to confirm this finding, as the deposited material to Berlin Herbarium (B) was burned and destroyed during the Second World War
- checks in B and BP herbaria – no type nor any duplicates
- *Campanula aureliana* Bogdanović, Rešetnik, Brullo & Shuka, sp. nov.

# To collect or not to collect? The ZA and ZAHO herbarium specimens of some frequent species

IVANA REŠETNIK\*, MARTINA BEŠENIĆ, LUCIJA DUJMOVIĆ, MATEA RUBINIĆ, ZVONIMIR VRBANEC

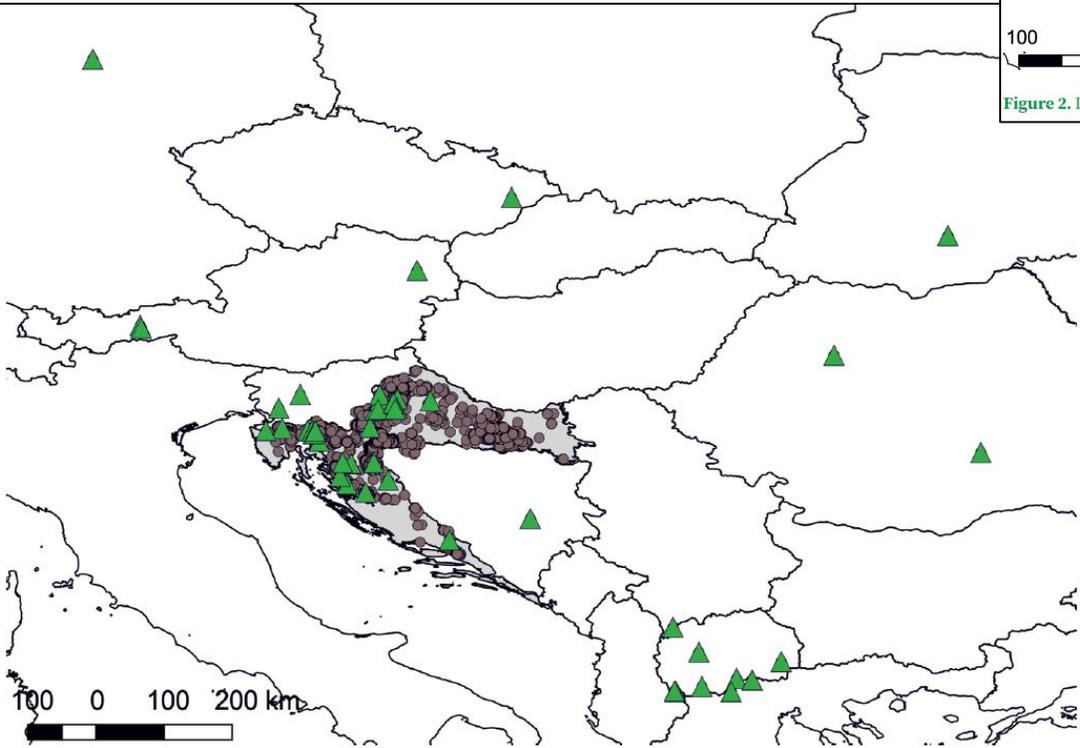


Figure 1. Distribution map of *Fagus sylvatica* from Croatia and neighbouring countries. Green triangles represent the localities from herbarium specimens of ZA and ZAHO collections, brown dots represent the literature, field and other observation data stored in FCD.

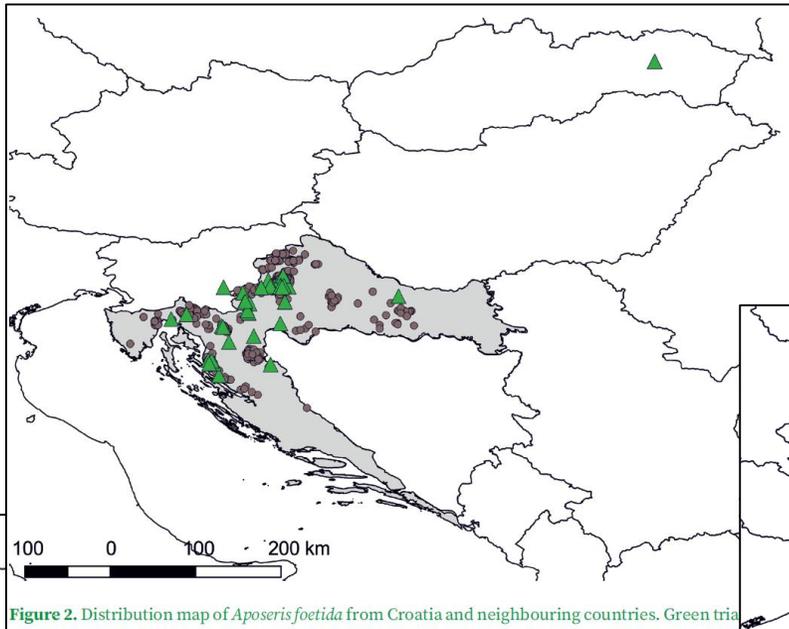


Figure 2. Distribution map of *Aposeris foetida* from Croatia and neighbouring countries. Green triangles represent the localities from herbarium specimens of ZA and ZAHO collections, brown dots represent the literature, field and other observation data stored in FCD.

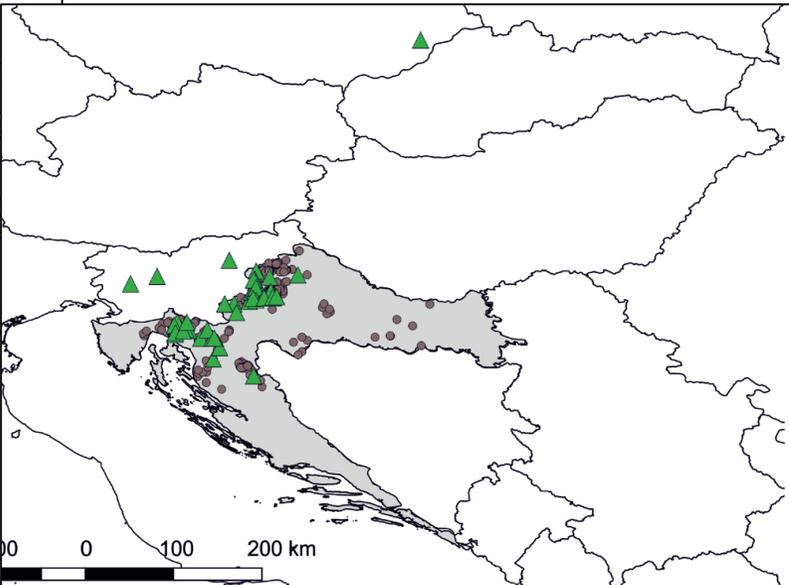


Figure 3. Distribution map of *Hacquetia epipactis* from Croatia and neighbouring countries. Green triangles represent the localities from herbarium specimens of ZA and ZAHO collections, brown dots represent the literature, field and other observation data stored in FCD.

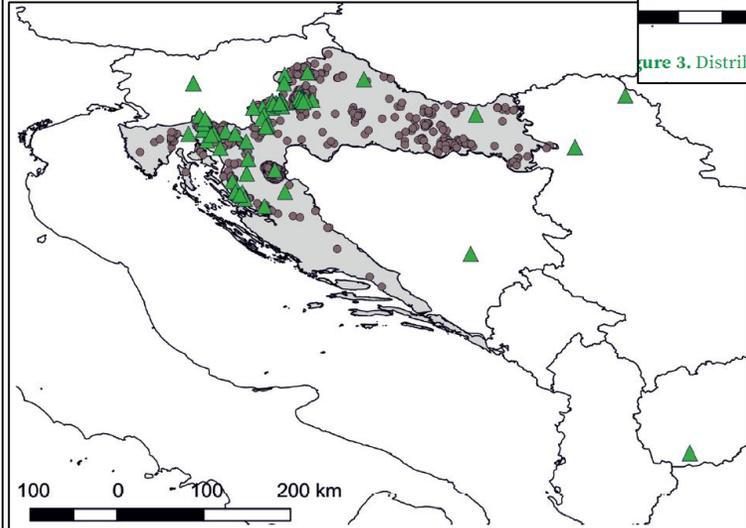
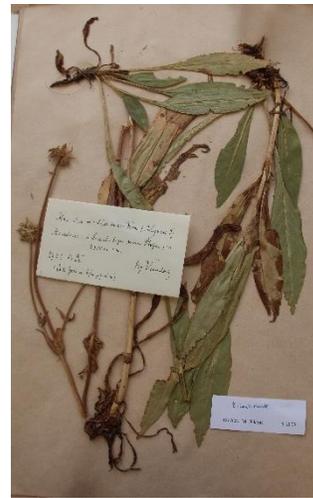


Figure 4. Distribution map of *Sanicula europaea* from Croatia and neighbouring countries. Green triangles represent the localities from herbarium specimens of ZA and ZAHO collections, brown dots represent the literature, field and other observation data stored in FCD.





*Asperula pilosa* (Beck)

*A. pilosa* (Beck) ist durch ihren kurzen Stängel von sämtlichen anderen Verbeten der Gruppe verschieden und würde demnach in dieser Gruppe mit dem Übergang zu den Kurzgrüfligen, *Cynanchica*-Bildern.

*A. pilosa* Beck hat doppelt breitere Blätter, welche hauptsächlich am Rückenschnitt u. den Randern kurz behaart sind und die Laubblätter an Länge überlegen, sie hat Blätter 5-7 mm lange Stülblättchen mit einer doppelt längeren Spindel.

Beck



Dr. G. de Beck: Plantae Bosniae et Hercegovinae.  
Series II.

Nr. 227

*Knautia lancifolia* Keuff.  
var. *K. sarajewensis* G. Beck  
(an *K. transylvanica* Lhu.?)

Bosnia. In dumetis m<sup>te</sup> Trebovic pr. Sarajevo,  
solo calc. ca. 1200 m. (loc. class.) G. Beck  
VII. 1888.

# Hvala!

