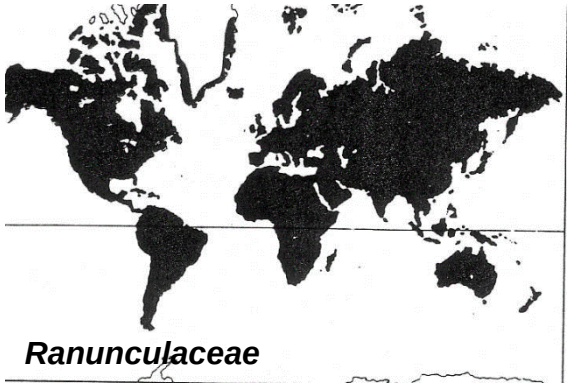
Endemizam

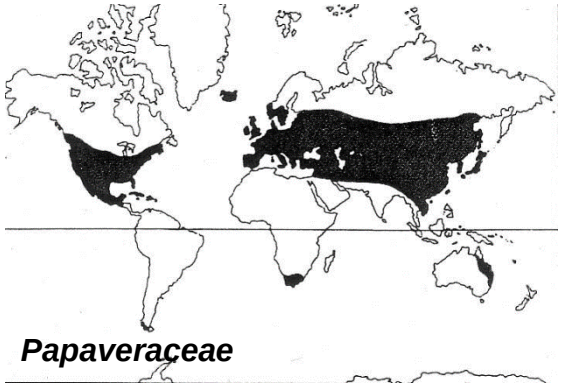
Što su to endemi?

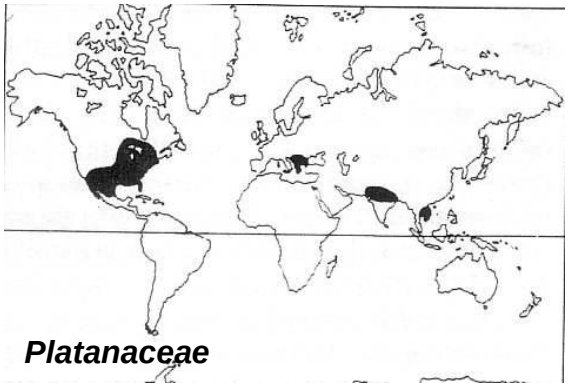
• Pojam koji proizlazi iz biogeografije – znanosti o rasprostranjenosti živih organizama (korologija, horologija). Svojte imaju **areale** ili **područja rasprostranjenosti** – niz utjecajnih čimbenika**.**

• **Kozmopolit** – svojta velike rasprostranjenosti (areala)
• **Endem** – svojta ograničene rasprostranjenosti (areala)
• Iz čega proizlazi
  • definicija endema neposredna je ovisna o geografskom obuhvatu na koji se odnosi;
  • definicija endema neovisna je razini taksonomske hierarhije

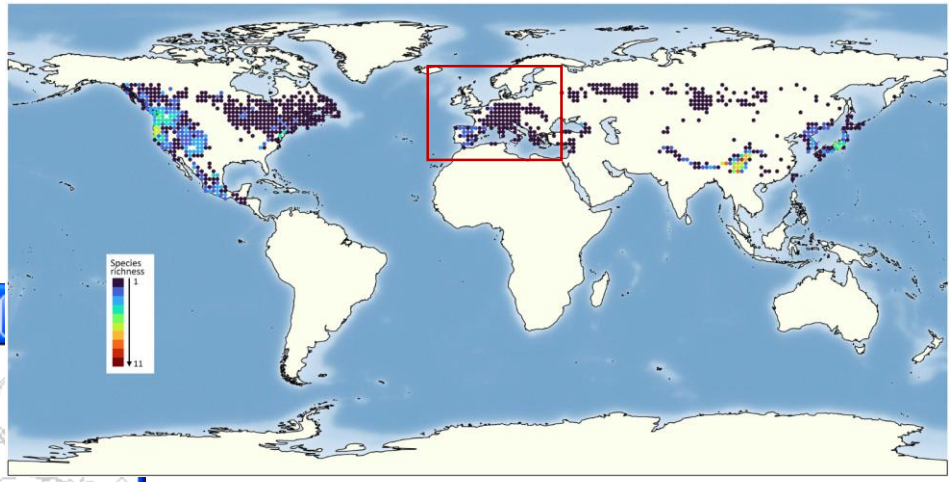
• Svojta može biti endemična za neko područje ako je:
  • evoluirala je na tom području i nije se nikada proširila na druga područja
  • imala veći primarni areal koji je naknadno smanjen na područje porijekla ili drugi manji dio primarnog areala
• Primjeri:


Ranunculaceae


Papaveraceae

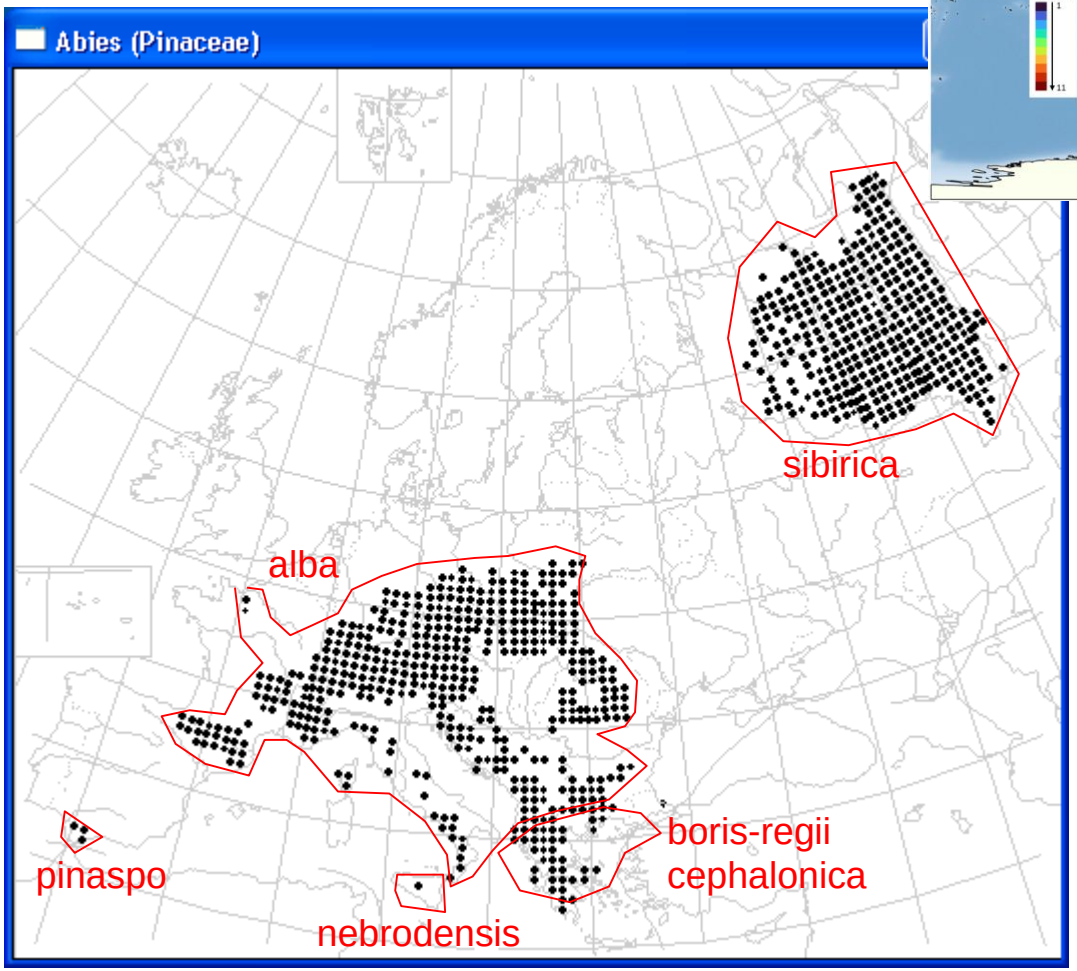

Platanaceae

Primjer:



Rasprostranjenost roda *Abies* u svijetu

Xiang, Qiaoping, Jie Yang, David S. Gernandt, et al. 2024. Ecological and evolutionary factors contribute to the uneven diversification of firs in the northern hemisphere. Journal of Biogeography jbi.15055. https://doi.org/10.1111/jbi.15055.



Rasprostranjenost roda *Abies* u Europi

Nerijetko se termin endem i fenomen endemizma vezuje uz:

- subjektivno shvaćeno „maleno„ područje (Australija vs. Hrvatska)
- stanište ili ekosustav (endem stepa, endem bukovih šuma)
- biogeografsku regiju
- geografsku regiju (npr. južna Azija, Iberski poluotok, ...)
- politički definirano područje (Hr)

Endem – svojta čiji je areal cijeli unutar definiranog područja koje je uzeto kao kriterij

Endemi

Subendemi
Stenoendemi

Paloendemi (2n ili 2n nema)
Neoendemi (2n+xn)

- Shizoendemi (xn)
- Patroendemi (xn iz 2n mali a.)
- Apoendemi (xn iz 2n veliki a.)

Autohtoni
Alohtoni

Srodni pojmovi

Relikte svojte (nekada >)

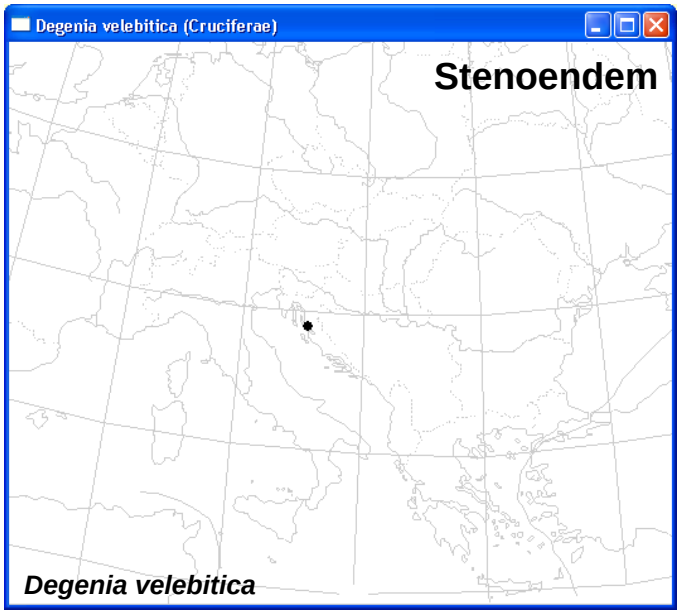
- Taksonomski relikti
- Geografski relikti

Živi fosili
Provincijalizam
Disjunkcija
Rijetke biljke
Refugijalne vrste

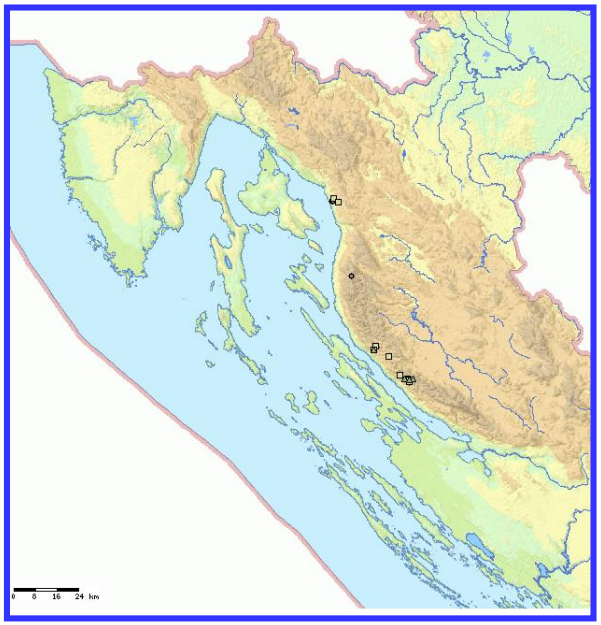
Endemi hrvatske flore

Potreba za iskazivanjem nacionalnog floristićkog bogatstva endemima nameće političke granice na prirodno uvjetovane areale. Nacionalno “dogovorene” kategorije:

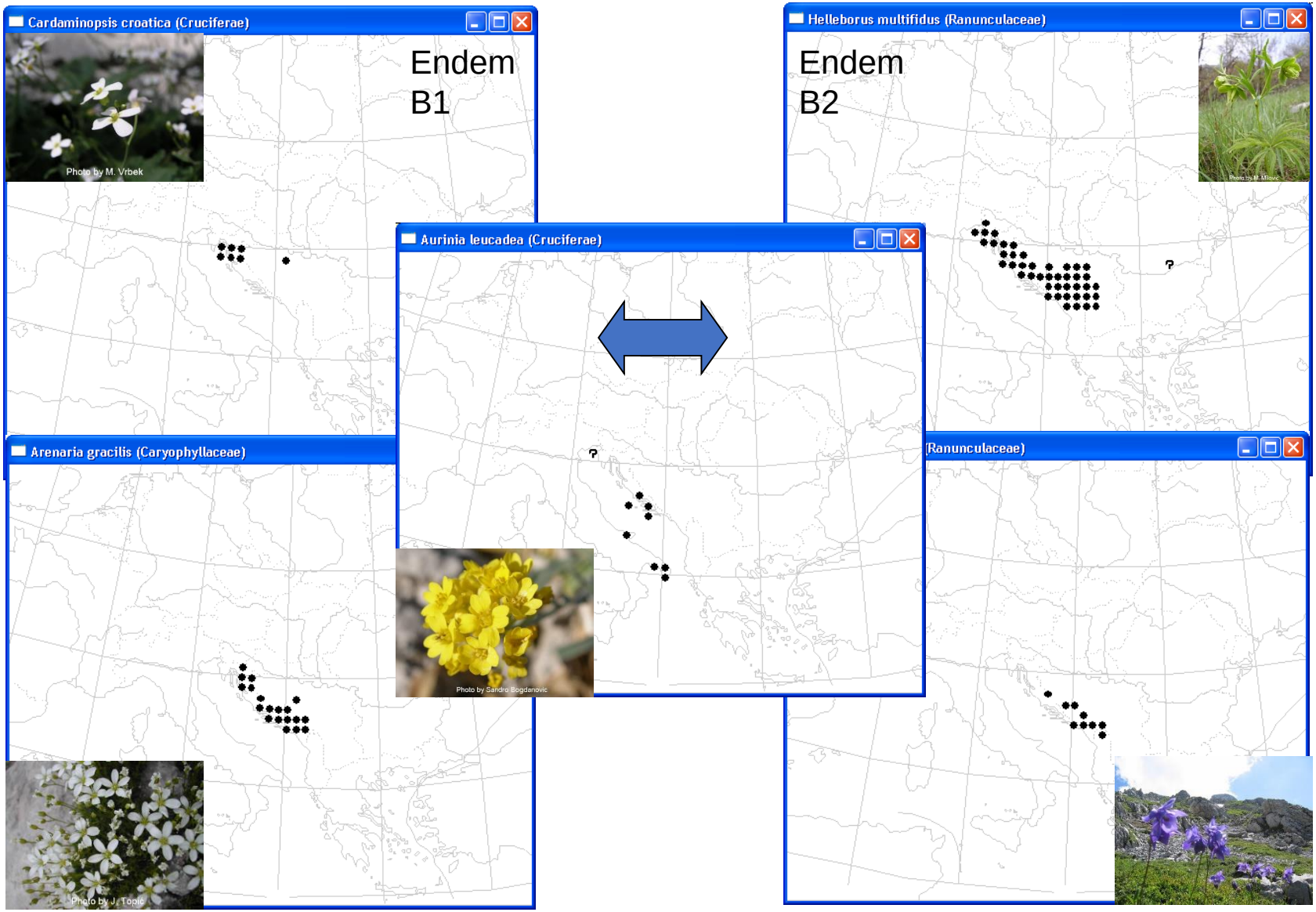
- **A/ Stenoendem**: svojta ograničena na maleno područje isključivo unutar hrvatskih granica, ukupna rasprostranjenost rijetko prelazi 4000 km^2
- **B/ Endem**:
  - B1 - svojta rasprostranjena većim dijelom svojeg areala unutar hrvatskih granica, a manjim može preći u neku od susjednih zemalja (ukupna rasprostranjenost rijetko prelazi cca 40.000 km^2)
  - B2 **-** svojta rasprostranjena većim dijelom svojeg areala unutar jedne ili nekoliko susjednih zemalja, a manjim dijelom dolazi u Hrvatskoj



Atlas Florea Europeae

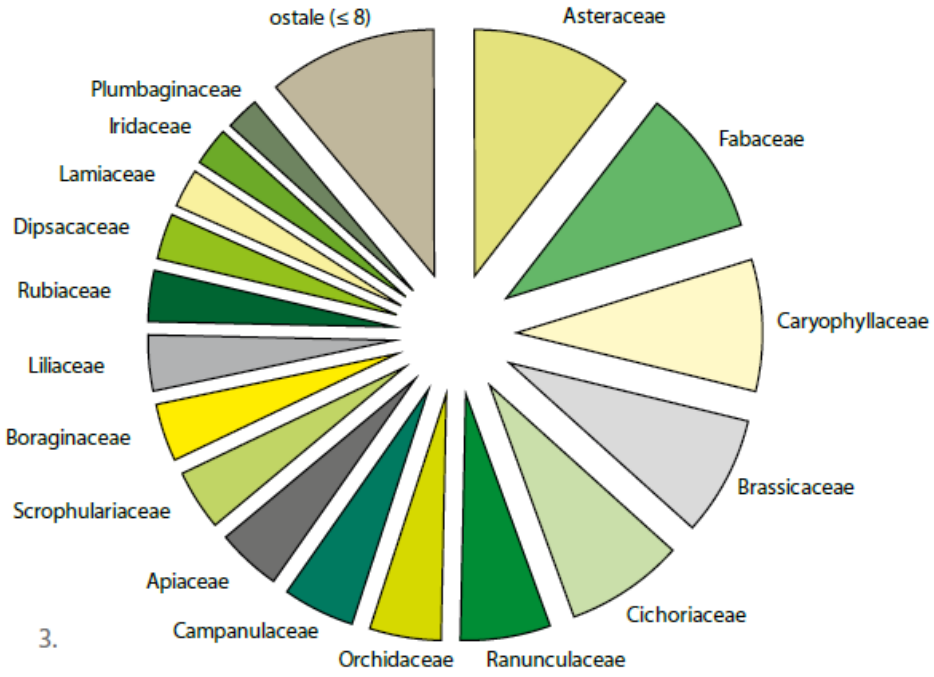


FCD


Cardaminopsis croatica (Cruciferae)
Endem
B1
Photo by M. Vrbek
Helleborus multifidus (Ranunculaceae)
Endem
B2
Aurinia leucadea (Cruciferae)
Photo by Sandro Bogdanovic
Arenaria gracilis (Caryophyllaceae)
Photo by J. Topic
(Ranunculaceae)

Tip endemizma	broj svojti	sp	ssp	%
stenoendemi	110	79	31	2,2
endemi	274	198	76	5,5
Ukupno	384	277	107	7,6

1.



3.

2.

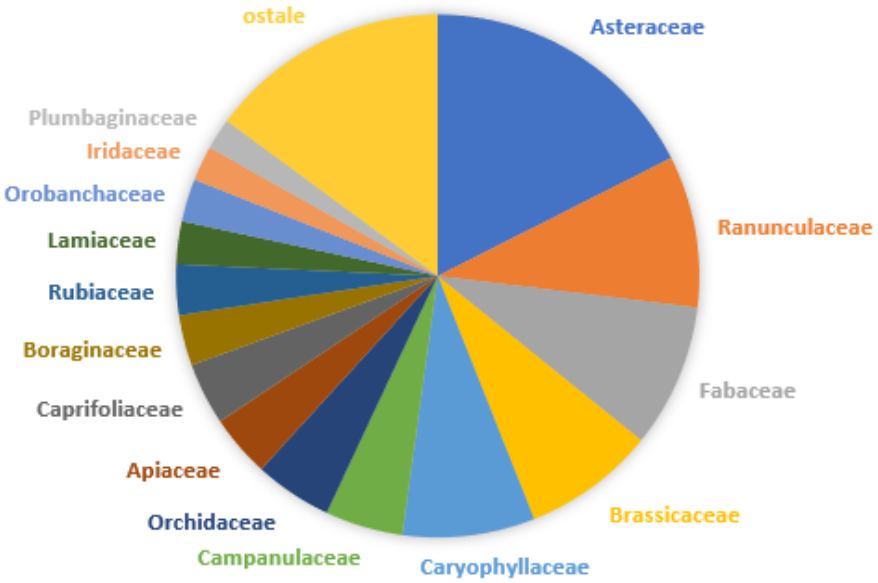
Br.	Porodica	Broj Endema	%
1	Asteraceae	39	10,4
2	Fabaceae	37	9,9
3	Caryophyllaceae	32	8,6
4	Brassicaceae	29	7,8
5	Cichoriaceae	29	7,8
6	Ranunculaceae	22	5,9
7	Orchidaceae	18	4,8
8	Campanulaceae	18	4,8
9	Apiaceae	16	4,3
10	Scrophulariaceae	15	4,0
11	Boraginaceae	14	3,7
12	Liliaceae	14	3,7
13	Rubiaceae	12	3,2
14	Dipsacaceae	12	3,2
15	Lamiaceae	10	2,7
16	Iridaceae	9	2,4
17	Plumbaginaceae	8	2,1
18	ostale (≤ 8)	42	11,2

▲ **Slika 6.** 1/ Broj i udio stenoendema i endema u hrvatskoj flori, 2/ popis porodica s > 8 endemičnih svojti, 3/ grafički prikaz endemima najbogatijih porodica u hrvatskoj flori (izrađeno na temelju podataka akumuliranih u Prilogu 1).

Tip endemizma	broj svojti	sp	ssp	%
stenoendemi	110	79	31	2,2
endemi	274	198	76	5,5
Ukupno	384	277	107	7,6

416

subendemična	206
endemična	68
stenoendemična	142



	Porodica	Broj endema	%
1	Asteraceae	73	17.55
2	Ranunculaceae	39	9.38
3	Fabaceae	37	8.89
4	Brassicaceae	34	8.17
5	Caryophyllaceae	34	8.17
6	Campanulaceae	20	4.81
7	Orchidaceae	20	4.81
8	Apiaceae	16	3.85
9	Caprifoliaceae	16	3.85
10	Boraginaceae	13	3.13
11	Rubiaceae	13	3.13
12	Lamiaceae	11	2.64
13	Orobanchaceae	11	2.64
14	Iridaceae	9	2.16
15	Plumbaginaceae	8	1.92
16	Asparagaceae	7	1.68
17	Plantaginaceae	6	1.44
18	Amaryllidaceae	5	1.20
19	Poaceae	5	1.20
20	Rosaceae	5	1.20

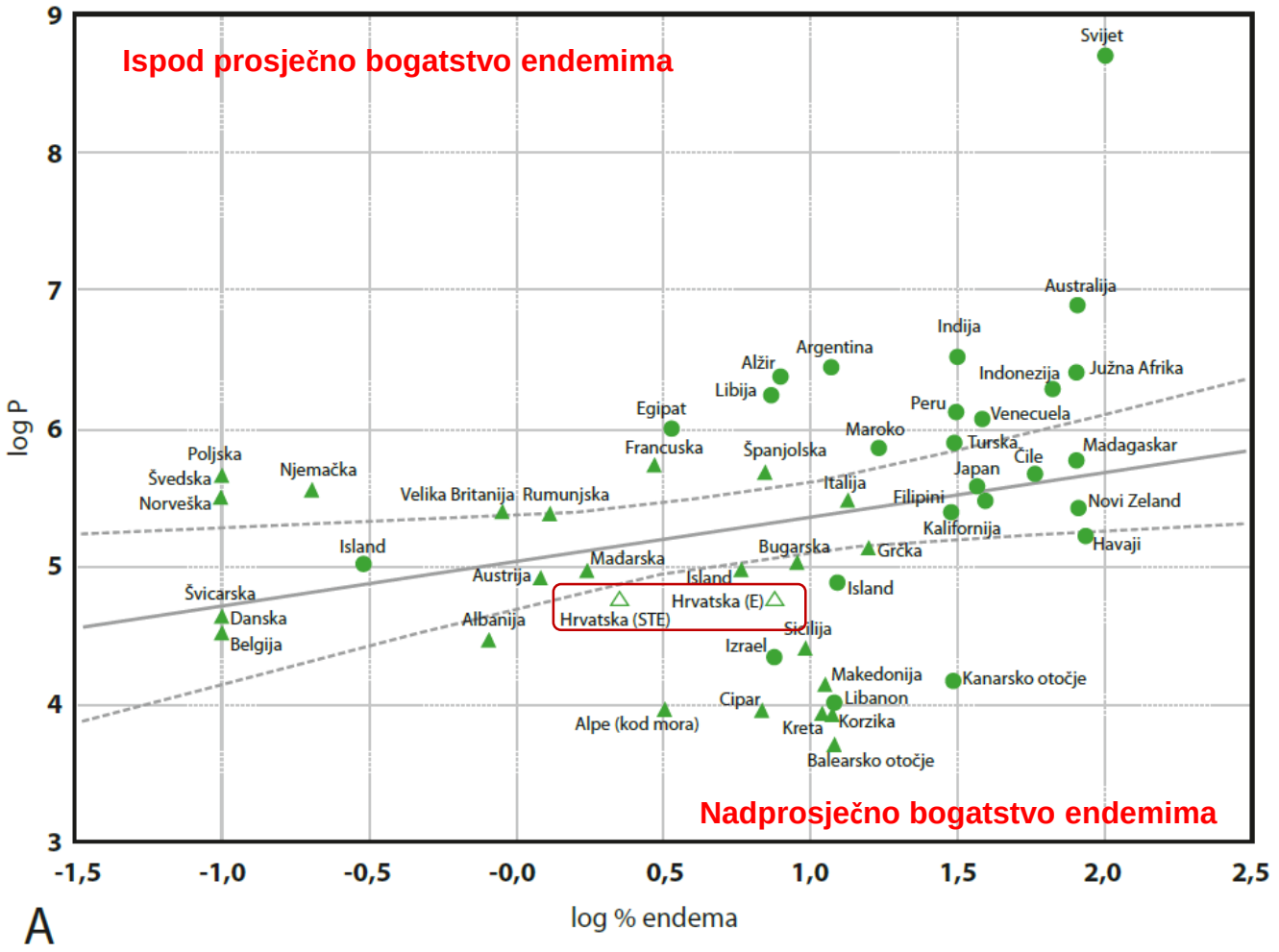
Br.	Porodica	Endema	%
1	Asteraceae	39	10,4
2	Fabaceae	37	9,9
3	Caryophyllaceae	32	8,6
4	Brassicaceae	29	7,8
5	Cichoriaceae	29	7,8
6	Ranunculaceae	22	5,9

No.	Subclass		E	STE	E tot	%E	%STE	% E tot
1	**Lycopodiidae**	Club mosses s.l.	0	0	**0**	0	0	**0**
2	**Equisetidae**	horsetails	0	0	**0**	0	0	**0**
3	**Ophioglossidae**	tongue-plant's s.l.	0	0	**0**	0	0	**0**
4	**Polypodiidae**	ferns s.s.	1	1	**2**	0.02	0.02	**0.04**
5	**Gnetidae**	gnetums	0	0	**0**	0	0	**0**
6	**Pinidae**	conifers	0	1	**1**	0	0.02	**0.02**
		gymnosperms	0	1	**1**	0	0.02	**0.02**
7	**Magnoliidae**	angiosperms	**264**	**110**	**374**	5.29	2.20	**7.49**
		Superorders						
	1	*Asteranae*	109	63	**172**	2.18	1.26	**3.45**
	2	*Buxanae*	0	0	**0**	0	0	**0**
	3	*Caryophyllanae*	27	9	**36**	0.54	0.18	**0.72**
	4	*Ceratophyllanae*	0	0	**0**	0	0	**0**
	5	*Lilianae*	30	20	**50**	0.60	0.40	**1.00**
	6	*Magnolianae*	1	1	**2**	0.02	0.02	**0.04**
	7	*Nymphaeanae*	0	0	**0**	0	0	**0**
	8	*Proteanae*	0	0	**0**	0	0	**0**
	9	*Ranunculanae*	25	2	**27**	0.50	0.04	**0.54**
	10	*Rosanae*	71	15	**86**	1.42	0.30	**1.72**
	11	*Santalanae*	0	0	**0**	0	0	**0**
	not classified	*Saxifragales*	1	0	**1**	0.02	0	**0.02**
	Total		**265**	**112**	**377**	**5.31**	**2.24**	**7.56**

	Family	no. of endemic taxa	% of the total number	indigenous taxa	% endemics in the family
1	Asteraceae	73	17.55	793	9.21
2	Ranunculaceae	39	9.38	207	18.84
3	Fabaceae	37	8.89	452	8.19
4	Brassicaceae	34	8.17	278	12.23
5	Caryophyllaceae	34	8.17	249	13.65
6	Campanulaceae	20	4.81	86	23.26
7	Orchidaceae	20	4.81	200	10.00
8	Apiaceae	16	3.85	250	6.40
9	Caprifoliaceae	16	3.85	87	18.39
10	Boraginaceae	13	3.13	106	12.26
11	Rubiaceae	13	3.13	82	15.85
12	Lamiaceae	11	2.64	250	4.40
13	Orobanchaceae	11	2.64	99	11.11
14	Iridaceae	9	2.16	40	22.50
15	Plumbaginaceae	8	1.92	15	53.33
16	Asparagaceae	7	1.68	62	11.29
17	Plantaginaceae	6	1.44	150	4.00
18	Amaryllidaceae	5	1.20	65	7.69
19	Poaceae	5	1.20	384	1.30
20	Rosaceae	5	1.20	214	2.34

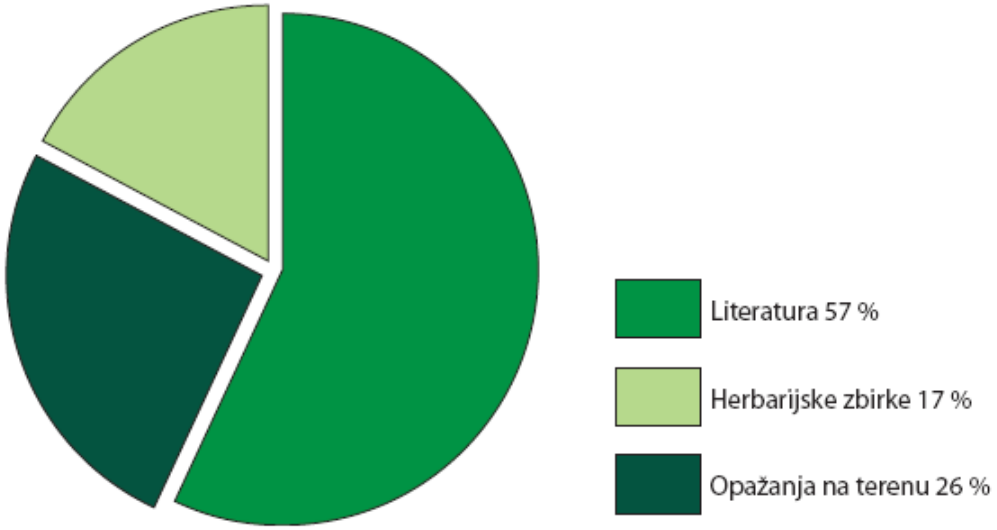
Usporedba s drugim područjima

Obzirom na površinu i primjenom Bykeovog indeksa, endemizam u Hrvatskoj tri je puta veći od prosjeka uspoređivanih zemalja.



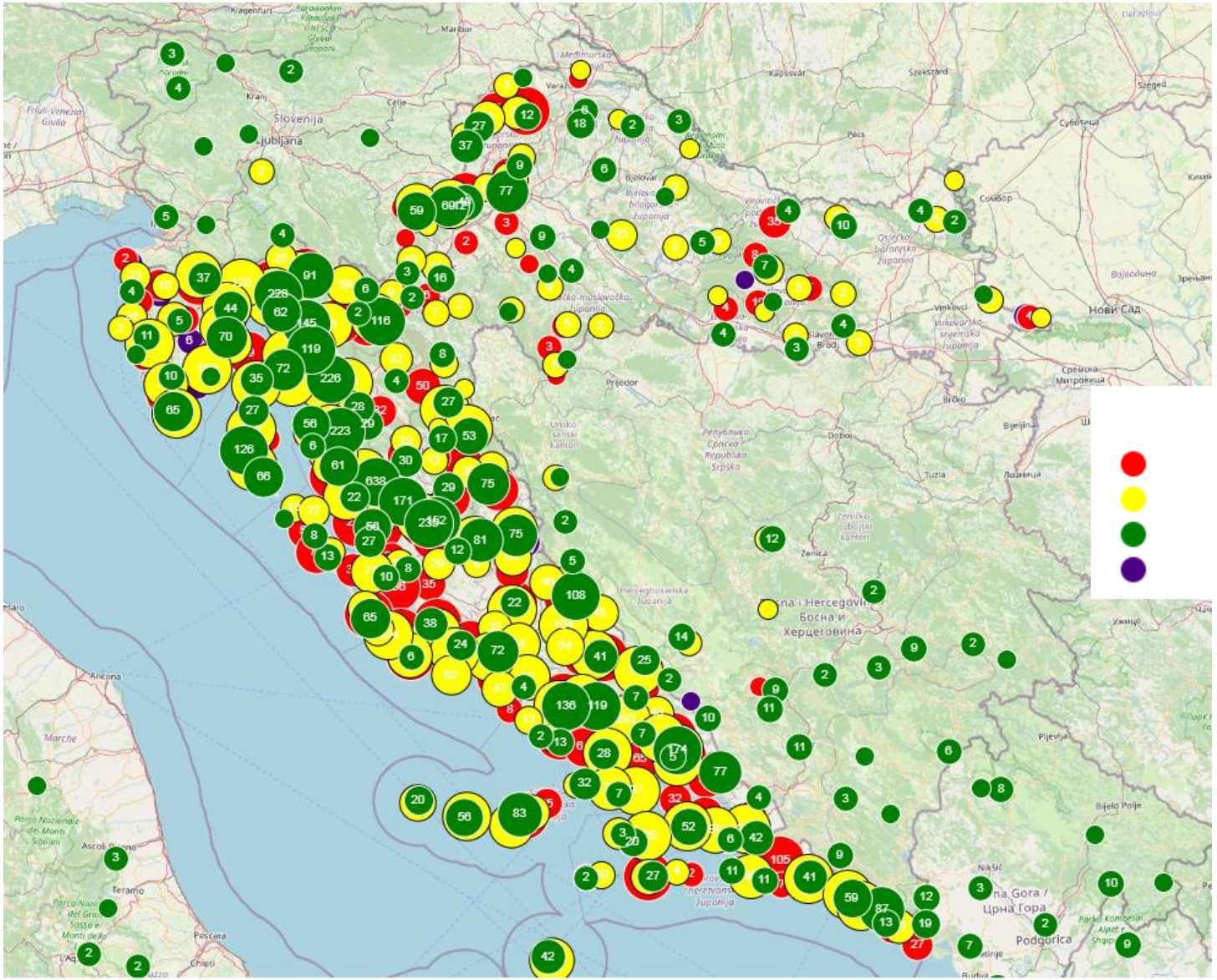
▲ **Slika 7.** Bykov grafikon za određivanje prosječnog udjela endema na uzorku od 33 države: države smještene iznad regresijskog pravca imaju is-podprosječan udio endema, a države smještene ispod regresijskog pravca imaju iznadprosječan udio endema (log y = 5,0701+0,5658*log10[x]) (Hr-STE: udio stenoendema, Hr-E: udio endema, Hr-Euk: ukupni udio endema) (podatci za izvanhrvatska područja preuzeti iz GROOMBRIDGE 1992) (△▲ – europska područja, ● – izvaneuropska područja).

Porijeklo podataka o nalazištima

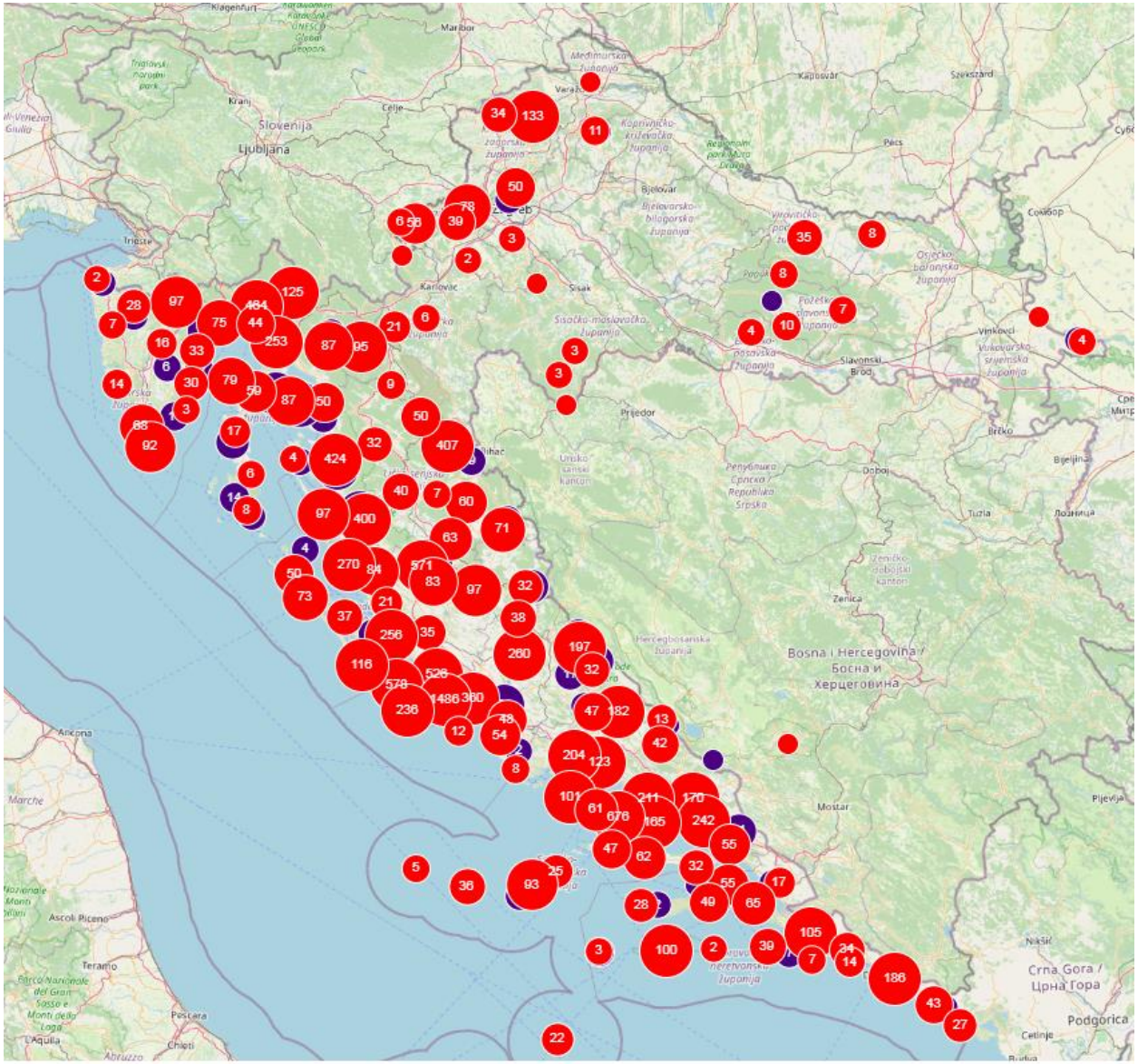


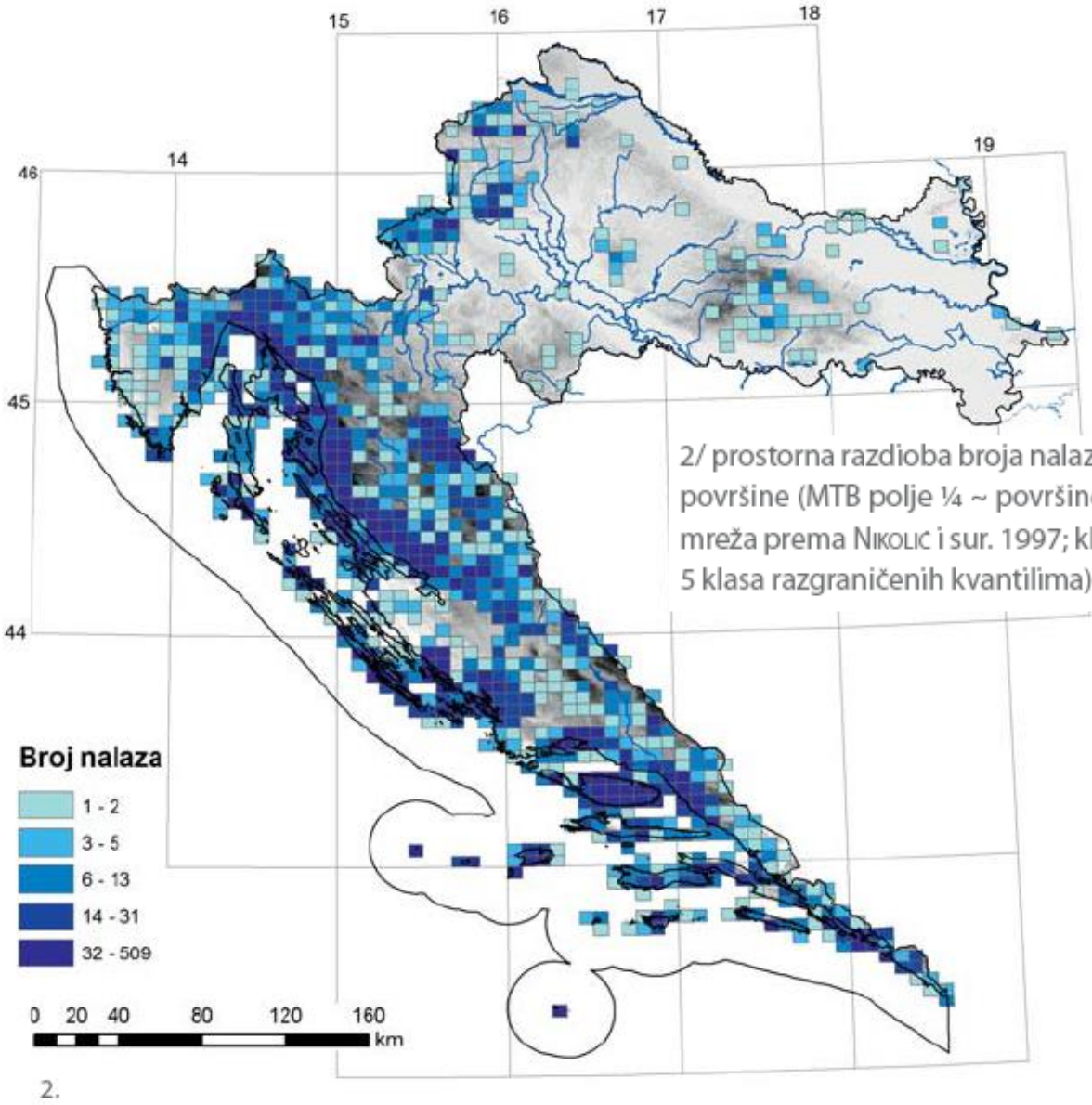
▲ **Slika 8.** Podatci o nalazištima endemičnih svojti prema podrijetlu (sukladno sadržaju FCD-a, prosinac 2011).

Prostorna razdioba nalaza endemičnih svojti na temelju ~ 25 000 geokodiranih podataka FCD različite preciznosti

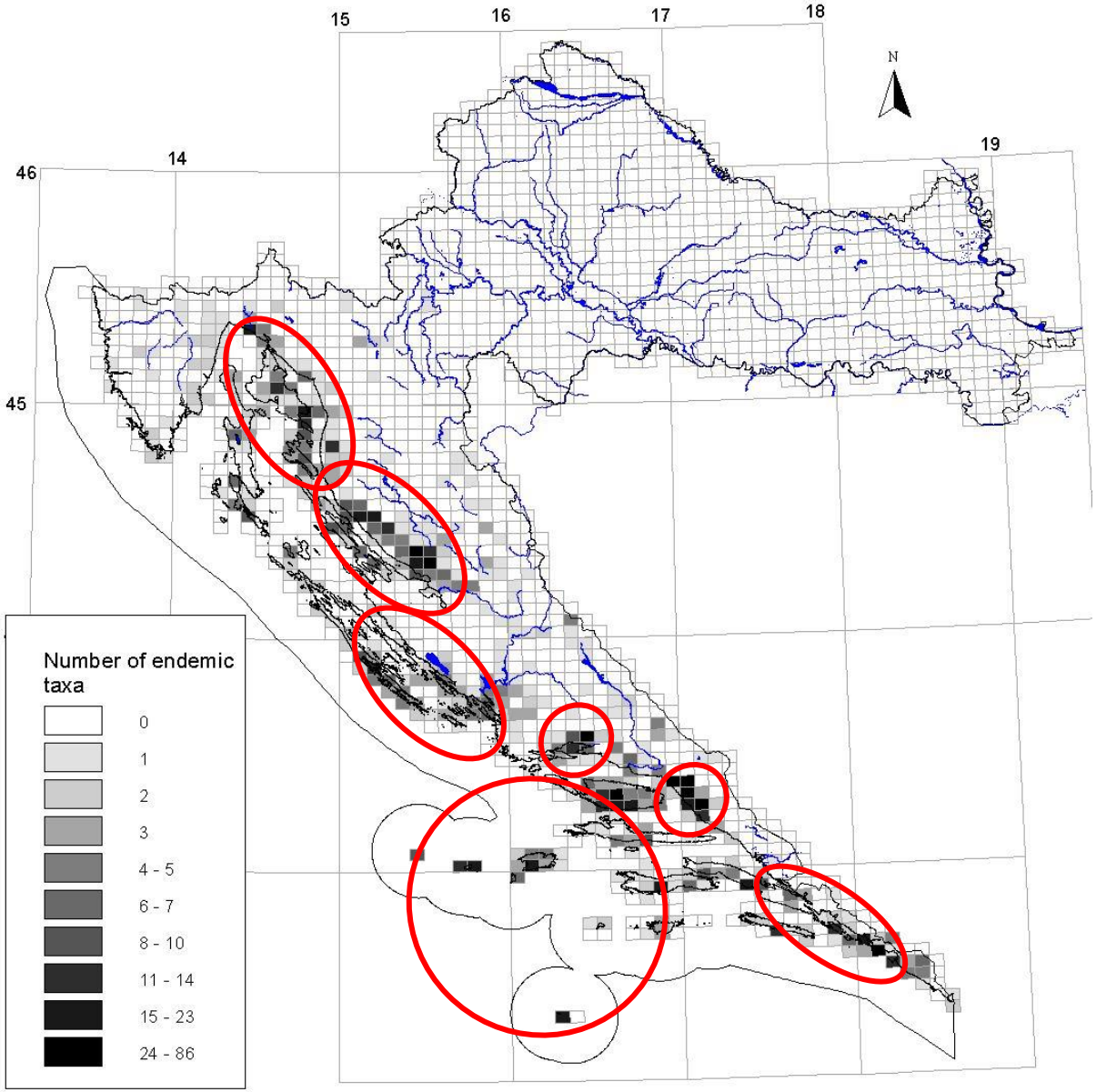


Prostorna razdioba nalaza endemičnih svojti na temelju opažanja i fotografija



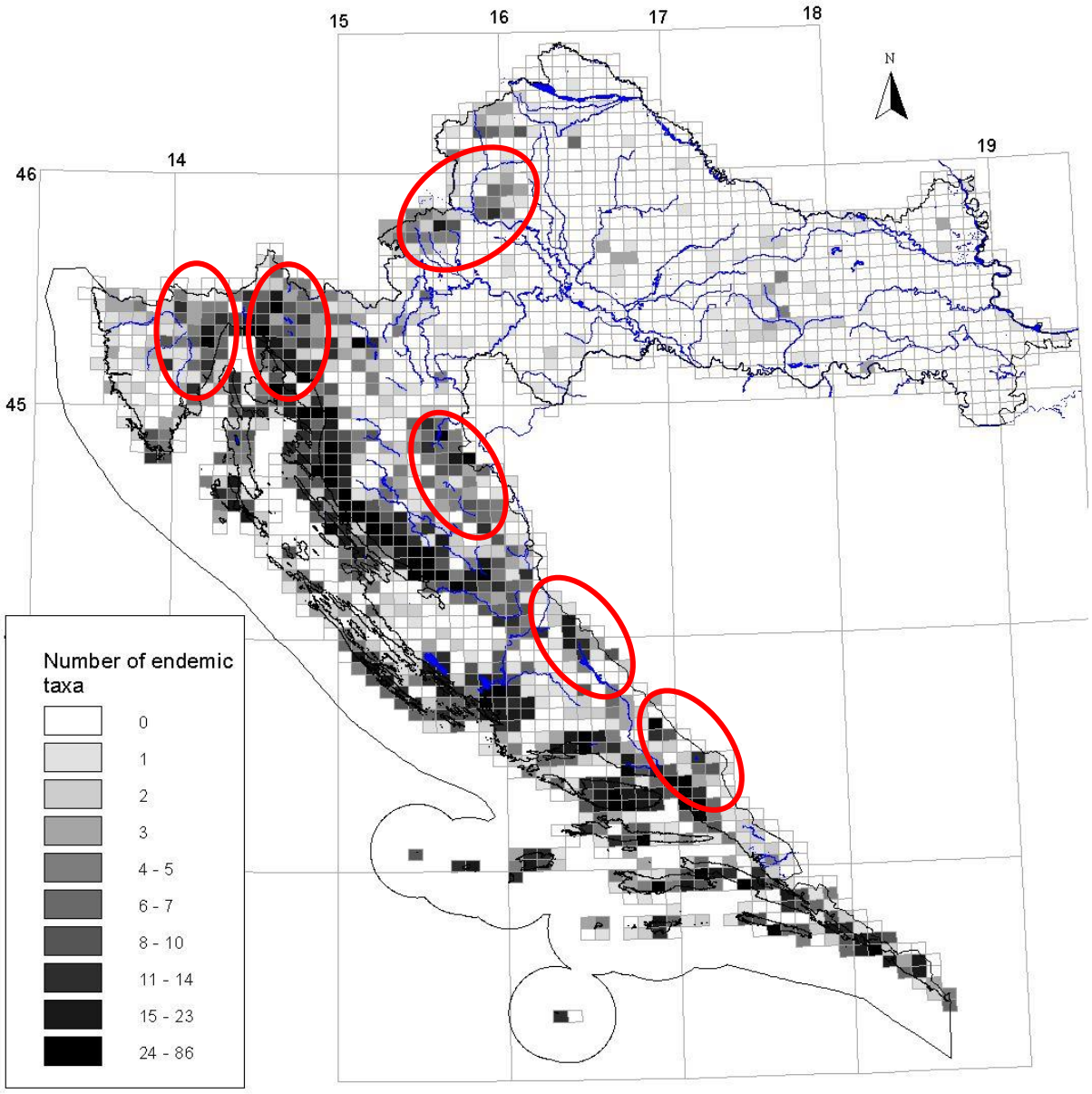


2/ prostorna razdioba broja nalaza po jedinici površine (MTB polje ¼ ~ površine od 25 km², mreža prema NIKOLIĆ i sur. 1997; klasificirano u 5 klasa razgraničenih kvantilima).



Centri stenoendemizma

Kvarner
Velebit
Šibenski arh.
Kozjak-Mosor
Otoci
Biokovo
Konavle



Centri stenoendemizma:

Kvarner
Velebit
Šibenski arh.
Kozjak-Mosor
Otoci
Biokovo
Konavle

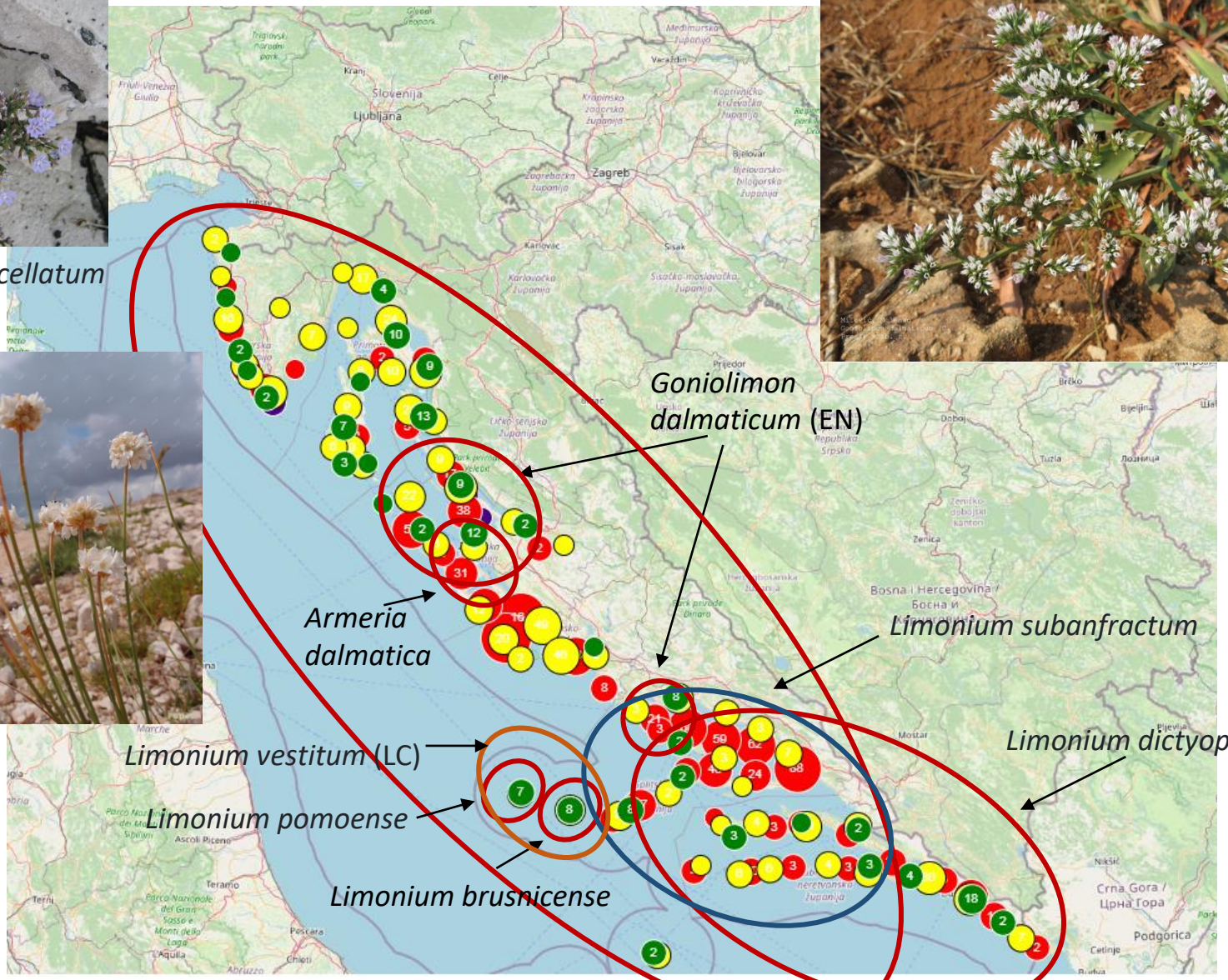
+

Centri endemizma

Učka-Ćičarija
Gorski Kotar
Kapela
Lička p. Plitvice
Dinara
Kamešnica
Žumberačko g.
Samoborsko g.

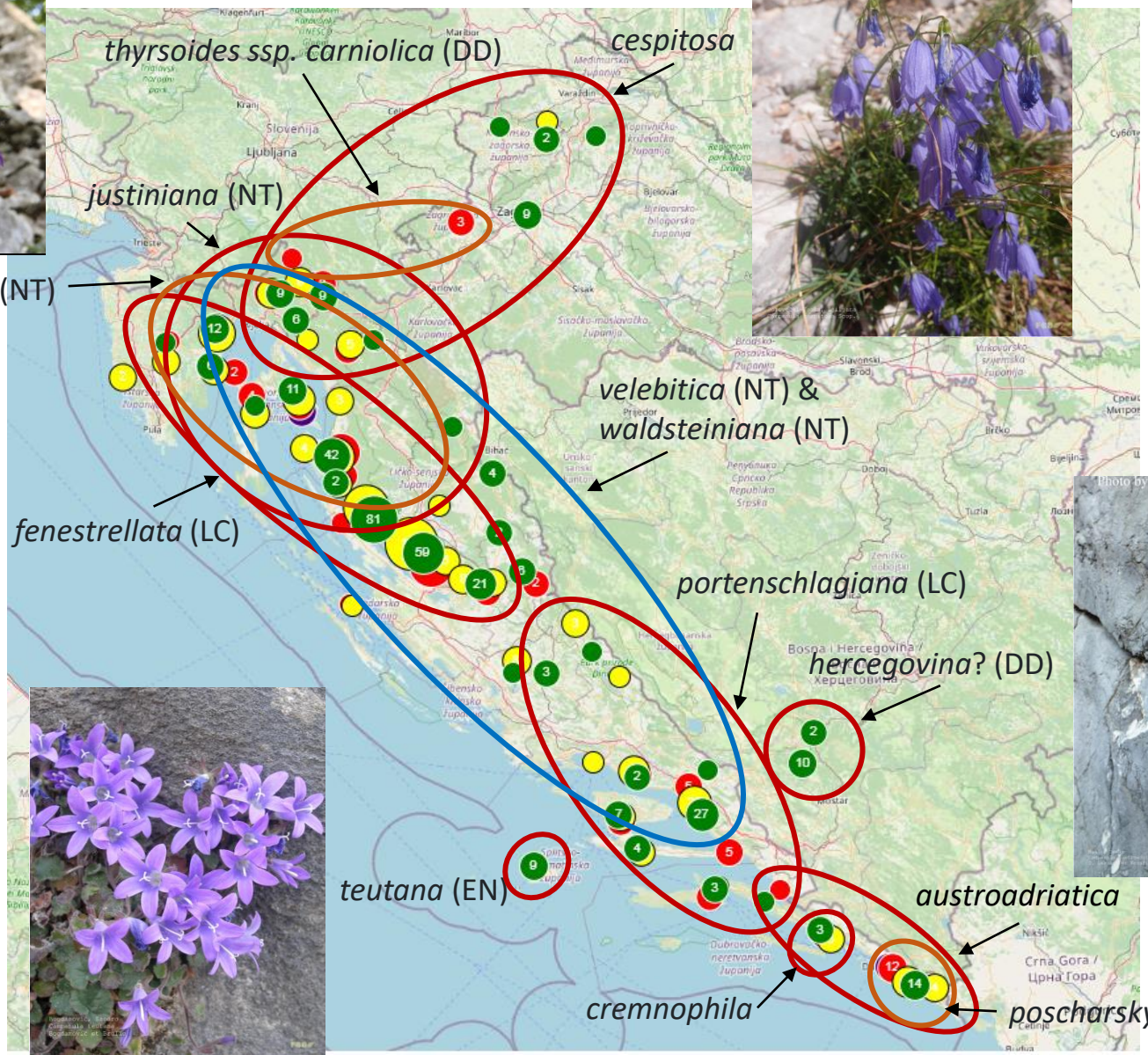
Plumbaginaceae: 8 od ukupno 15 vrsta su endemi -> 53.33%

Limonium cancellatum

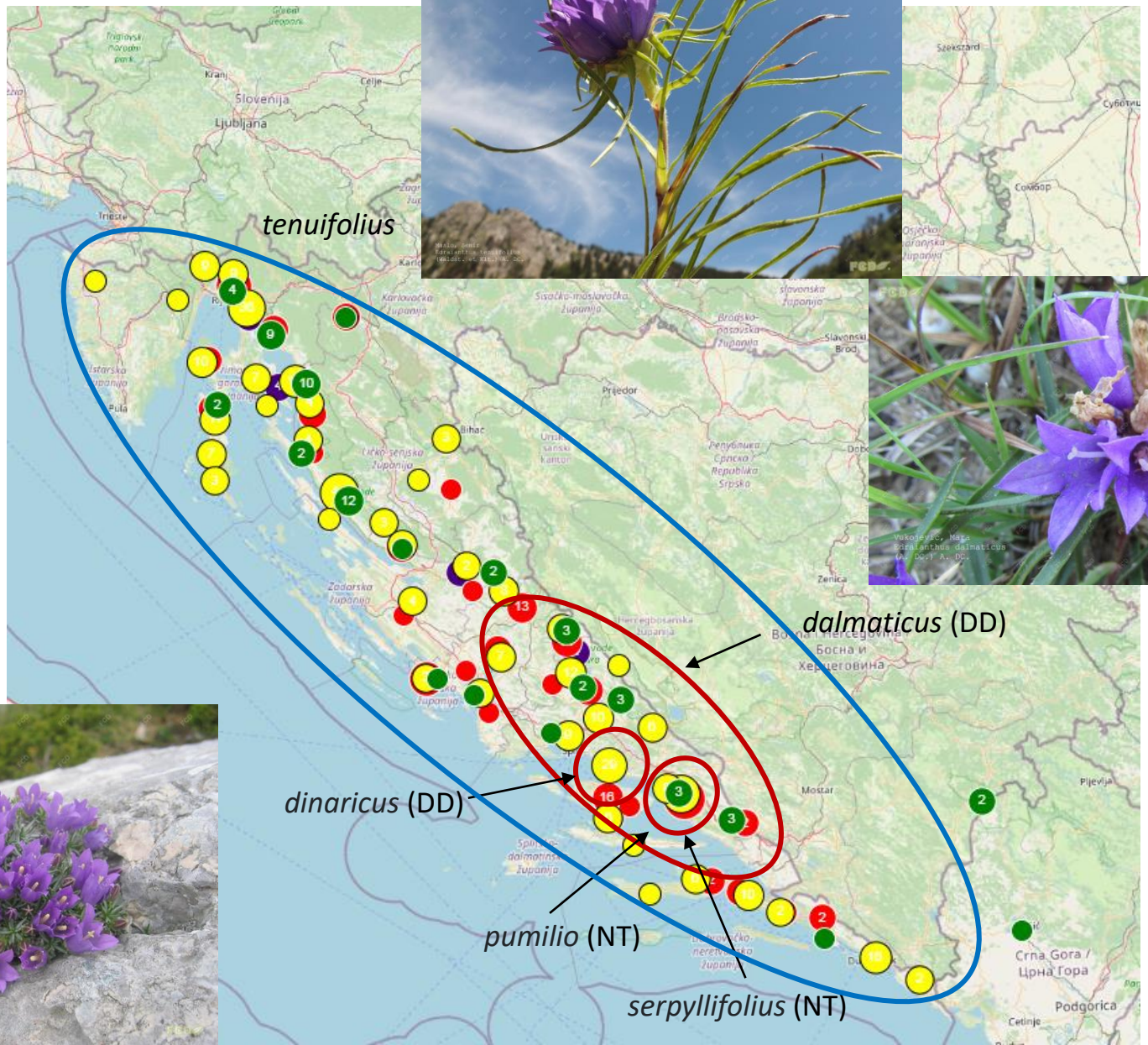


Campanulaceae: 20 od ukupno 86 vrsta su endemi -> 23.26%

Campanula -> 15 svojti



Edraianthus -> 5 svojti



E. pumilio

Flora Hrvatske

Applications in Plant Sciences

Applications in Plant Sciences 2015 3(3): 1400117

PRIMER NOTE

NEW MICROSATELLITE MARKERS FOR *CAMPANULA PYRAMIDALIS* (CAMPANULACEAE) AND CROSS-AMPLIFICATION IN CLOSELY RELATED SPECIES[1]

IVAN RADOSAVLJEVIĆ[2], JERNEJ JAKSE[3], ZLATKO SATOVIC[4], BRANKA JAVORNIK[3], IVANA JANKOVIĆ[5], AND ZLATKO LIBER[2,6]

Plant Biosystems, Vol. 142, No. 1, March 2008, pp. 40–50

Taylor & Francis

Relations between western Balkan endemic *Campanula* L. (Campanulaceae) lineages: Evidence from chloroplast DNA

ZLATKO LIBER, SANJA KOVAČIĆ, TONI NIKOLIĆ, SAŠA LIKIĆ & GORDANA RUSAK

Acta Bot. Croat. 73 (1), 221–254, 2014

Ecology and niche assembly of *Campanula tommasiniana*, a narrow endemic of Mt Učka (Liburnian karst, north-western Adriatic)

BOŠTJAN SURINA[1,2*], ANDREJ MARTINČIČ[3]

TAXON 62 (3) • June 2013: 505–524

Lakušić & al. • **Systematics of the *Campanula pyramidalis* complex**

Molecular phylogeny of the *Campanula pyramidalis* species complex (Campanulaceae) inferred from chloroplast and nuclear non-coding sequences and its taxonomic implications

Dmitar Lakušić,[1] Zlatko Liber,[2] Toni Nikolić,[2] Boštjan Surina,[3] Sanja Kovačić,[2] Sandro Bogdanović[4] & Saša Stefanović[5]

Botanical Journal of the Linnean Society, 2023, **202**, 215–232. With 4 figures.

Acta Bot. Croat. 63 (2), 171–202, 2004
Review paper

CODEN: ABCRA 25
ISSN 0365–0588

The genus *Campanula* L. (Campanulaceae) in Croatia, circum-Adriatic and west Balkan region

SANJA KOVAČIĆ*

Journal of Biogeography (*J. Biogeogr.*) (2011) **38**, 1381–1393

Areography, environmental heterogeneity and spatial models explain patterns of past and present diversity in *Edraianthus* (Campanulaceae)

PETER GLASNOVIĆ[1], ŽIVA FIŠER[1], MATIC JANČIČ[1], MANICA BALANT[1,2] and BOŠTJAN SURINA[1,3,*]

Stefanović & al. • **Phylogeny of *Edraianthus***

TAXON 57 (2) • May 2008: 452–475

ORIGINAL ARTICLE

Quaternary range dynamics of ecologically divergent species (*Edraianthus serpyllifolius* and *E. tenuifolius*, Campanulaceae) within the Balkan refugium

Boštjan Surina[1,2], Peter Schönswetter[1,3] and Gerald M. Schneeweiss[1]*

MOLECULAR ECOLOGY

Molecular Ecology (2014) **23**, 2861–2875

doi: 10.1111/mec.12779

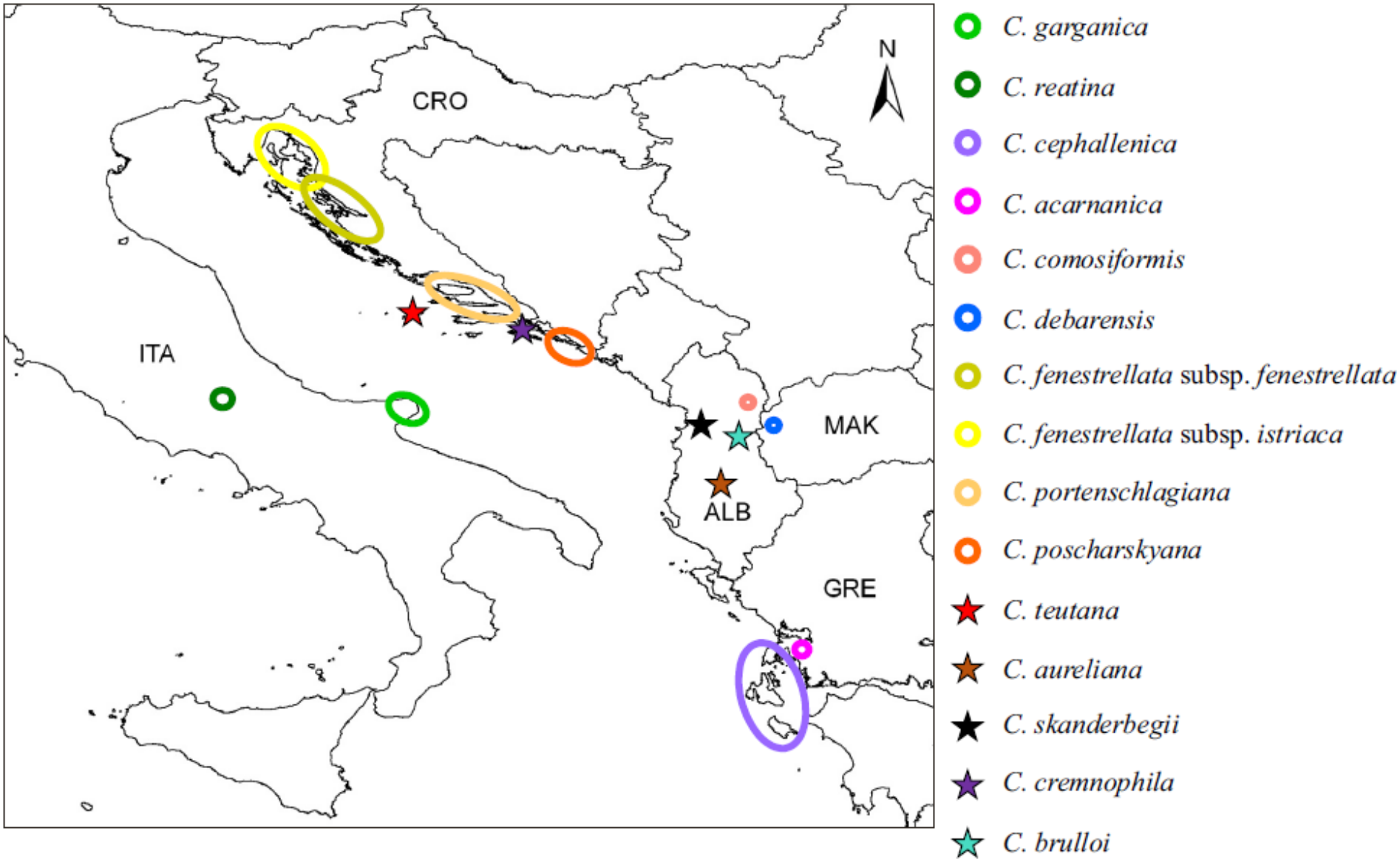
Molecular phylogeny of *Edraianthus* (Grassy Bells; Campanulaceae) based on non-coding plastid DNA sequences

Saša Stefanović[1]*, Dmitar Lakušić[2], Maria Kuzmina[1], Safer Međedović[3], Kit Tan[4] & Vladimir Stevanović[2]

Testing the efficiency of nested barriers to dispersal in the Mediterranean high mountain plant *Edraianthus graminifolius* (Campanulaceae)

BOŠTJAN SURINA,*† GERALD M. SCHNEEWEISS,* PETER GLASNOVIĆ† and PETER SCHÖNSWETTER‡

Campanula ser. *Garganicae* Trinajstić (10 + 5 new taxa)



Campanula teutana

Phytotaxa 162 (1): 001–017
www.mapress.com/phytotaxa/

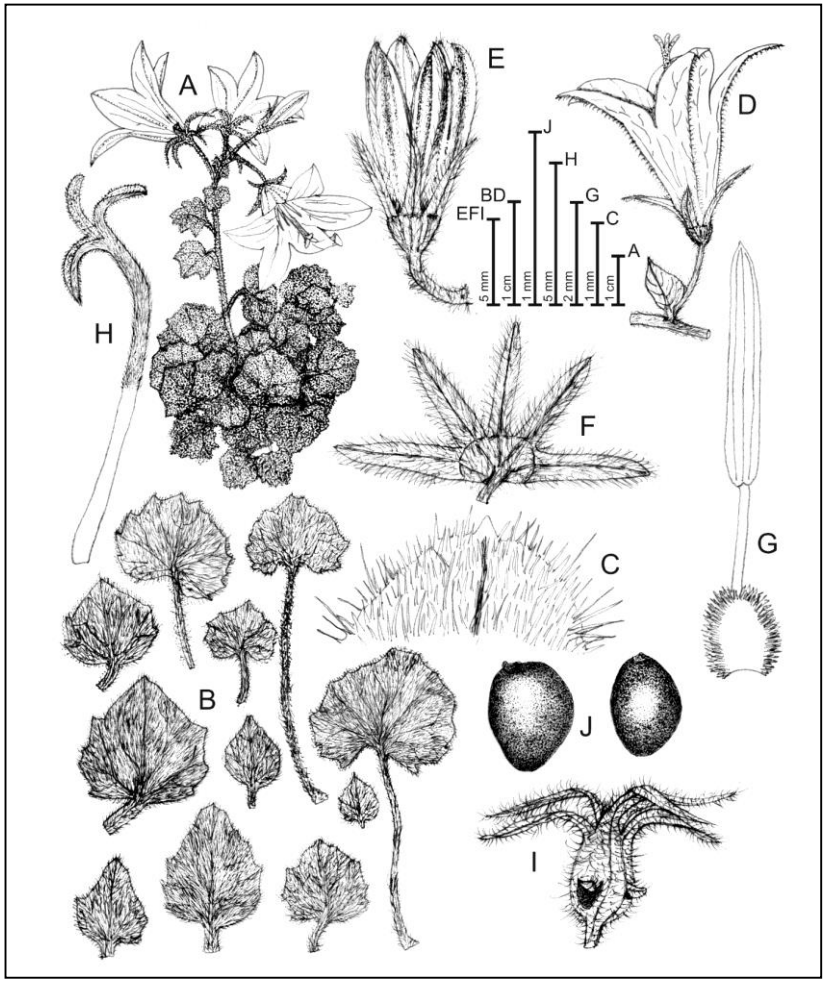
Article

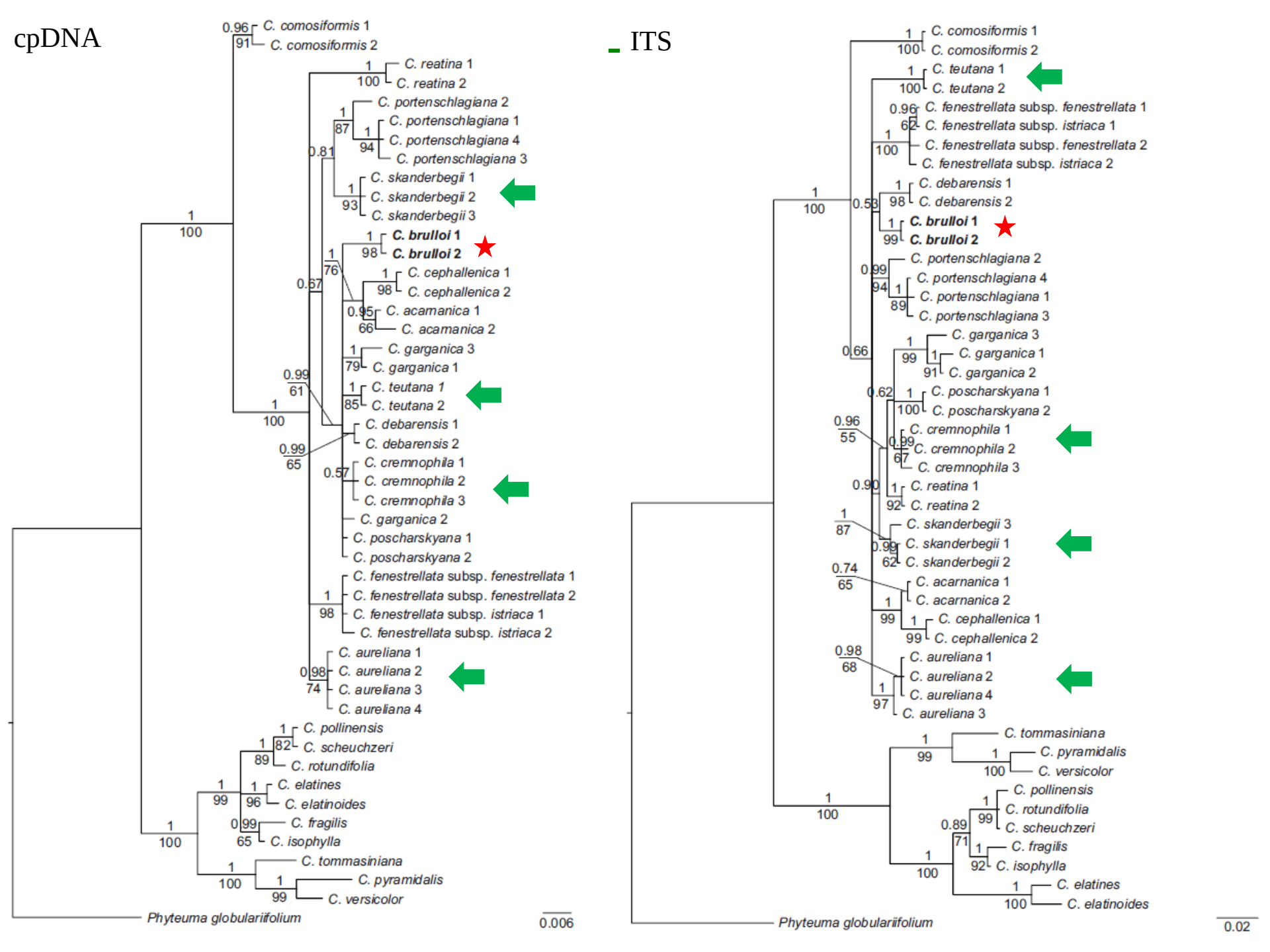
ISSN 1179-3155 (print edition)
PHYTOTAXA
ISSN 1179-3163 (online edition)

http://dx.doi.org/10.11646/phytotaxa.162.1.1

Campanula teutana, a new isophyllous _Campanula_ (Campanulaceae) from the Adriatic region

SANDRO BOGDANOVIĆ[1], SALVATORE BRULLO[2], IVANA REŠETNIK[3], ZLATKO SATOVIC[4] & ZLATKO LIBER[3]




cpDNA
C. comosiformis 1
C. comosiformis 2
C. reatina 1
C. reatina 2
C. portenschlagiana 2
C. portenschlagiana 1
C. portenschlagiana 4
C. portenschlagiana 3
C. skanderbegii 1
C. skanderbegii 2
C. skanderbegii 3
C. brulloi 1
C. brulloi 2
C. cephallenica 1
C. cephallenica 2
C. acarnanica 1
C. acarnanica 2
C. garganica 3
C. garganica 1
C. teutana 1
C. teutana 2
C. debarensis 1
C. debarensis 2
C. cremnophila 1
C. cremnophila 2
C. cremnophila 3
C. garganica 2
C. poscharskyana 1
C. poscharskyana 2
C. fenestrellata subsp. fenestrellata 1
C. fenestrellata subsp. fenestrellata 2
C. fenestrellata subsp. istriaca 1
C. fenestrellata subsp. istriaca 2
C. aureliana 1
C. aureliana 2
C. aureliana 3
C. aureliana 4
C. pollinensis
C. scheuchzeri
C. rotundifolia
C. elatines
C. elatinoides
C. fragilis
C. isophylla
C. tommasiniana
C. pyramidalis
C. versicolor
Phyteuma globulariifolium
0.006
ITS
C. comosiformis 1
C. comosiformis 2
C. teutana 1
C. teutana 2
C. fenestrellata subsp. fenestrellata 1
C. fenestrellata subsp. istriaca 1
C. fenestrellata subsp. fenestrellata 2
C. fenestrellata subsp. istriaca 2
C. debarensis 1
C. debarensis 2
C. brulloi 1
C. brulloi 2
C. portenschlagiana 2
C. portenschlagiana 4
C. portenschlagiana 1
C. portenschlagiana 3
C. garganica 3
C. garganica 1
C. garganica 2
C. poscharskyana 1
C. poscharskyana 2
C. cremnophila 1
C. cremnophila 2
C. cremnophila 3
C. reatina 1
C. reatina 2
C. skanderbegii 3
C. skanderbegii 1
C. skanderbegii 2
C. acarnanica 1
C. acarnanica 2
C. cephallenica 1
C. cephallenica 2
C. aureliana 1
C. aureliana 2
C. aureliana 4
C. aureliana 3
C. tommasiniana
C. pyramidalis
C. versicolor
C. pollinensis
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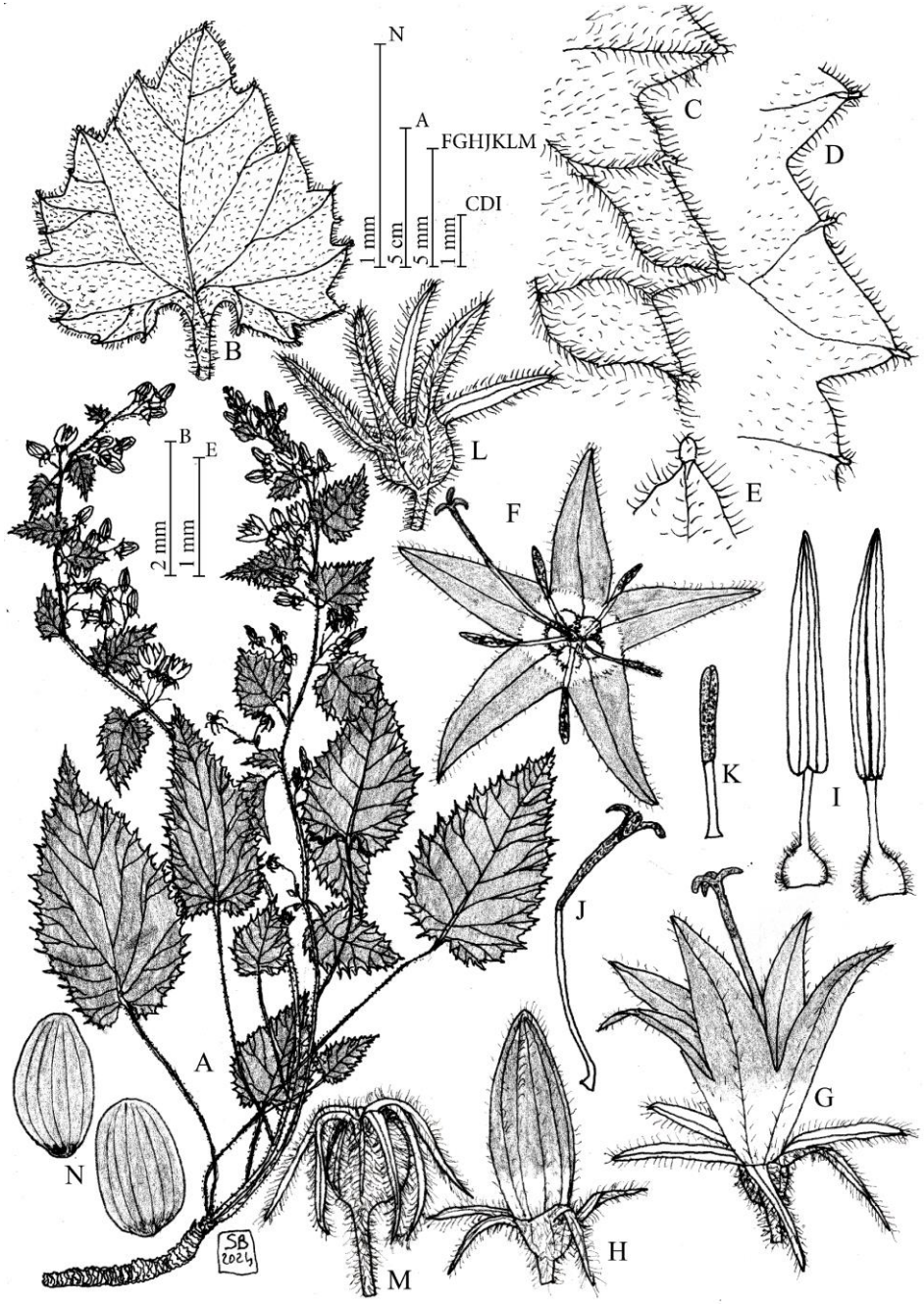
C. elatines
C. elatinoides
Phyteuma globulariifolium
0.02



Campanula brulloi

Holotype: Albania, Mati River, S of Klos, Ura e Vashës canyon, in rocky crevices and on walls near the bridge, 4128′02.65″N, 2006′16.23″E, 26 Jun 2019.
Leg. *S. Bogdanović, I. Rešetnik & D. Shuka s.n.* (ZAGR 80847!; isotypes: B!, CAT!, TIR!, ZA!, ZAGR!).

Plant Systematics and Evolution (2020) 306:42
https://doi.org/10.1007/s00606-020-01668-6

ORIGINAL ARTICLE

Phylogeography of *Campanula fenestrellata* s.l. (Campanulaceae) in the northern Adriatic

Ivana Rešetnik[1] · Martina Temunović[2] · Zlatko Liber[1,5] · Zlatko Satovic[3,5] · Sandro Bogdanović[4,5]

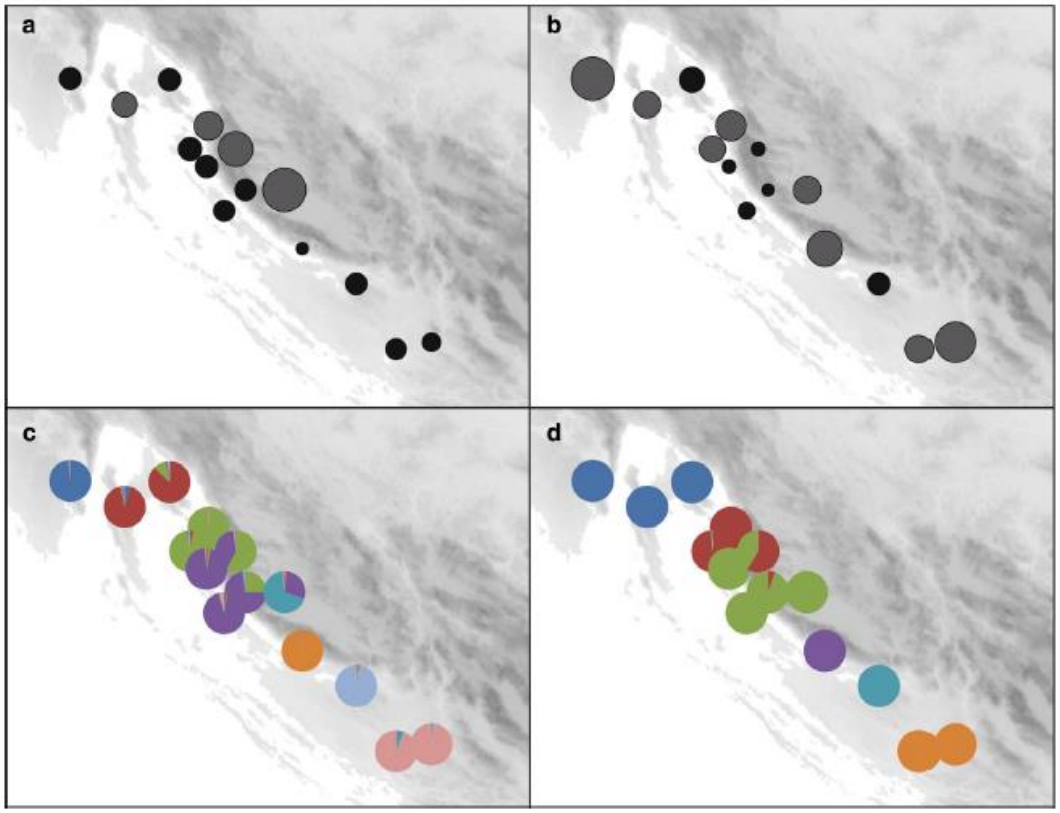
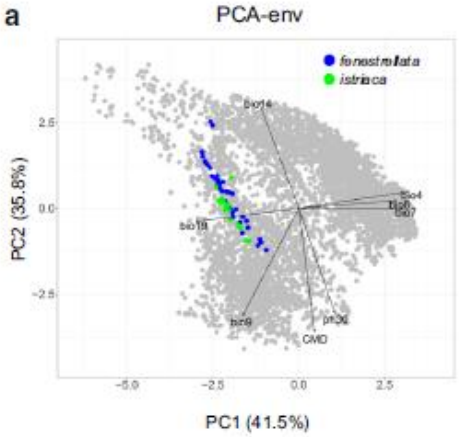


Fig. 4 AFLP variation of *Campanula fenestrellata* s.l. populations. **a** Shannon's information index (I). **b** Frequency down-weighted marker values (DW). In **a** and **b**, the size of the circles is proportional to the depicted values (dark grey colour represents values above average across populations and black represents values below average). **c** Bayesian analysis of the population structure using the software STRUCTURE assuming $K=8$. **d** Bayesian multilocus assignment method using the software BAPS assuming $K=6$. In **c** and **d**, the proportions of the ancestry of each population in each of the defined gene pools are colour-coded



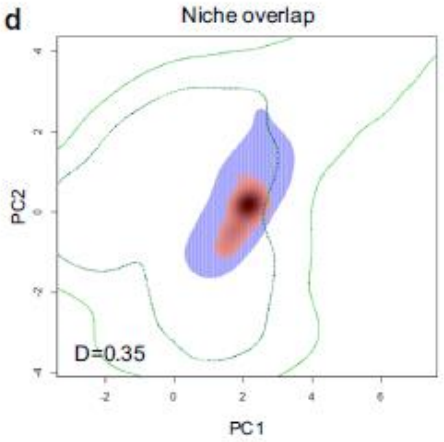


Fig. 5 Environmental niche analyses results. **a** E

Iridaceae: 9 od ukupno 40 vrsta su endemi -> 22.5%

Iris -> 5 svojti

illyrica x variegata

croatica (NT)

x rotschildii

adriatica (NT)

illyrica (LC)

pseudopallida

Crocus -> 4 svojte

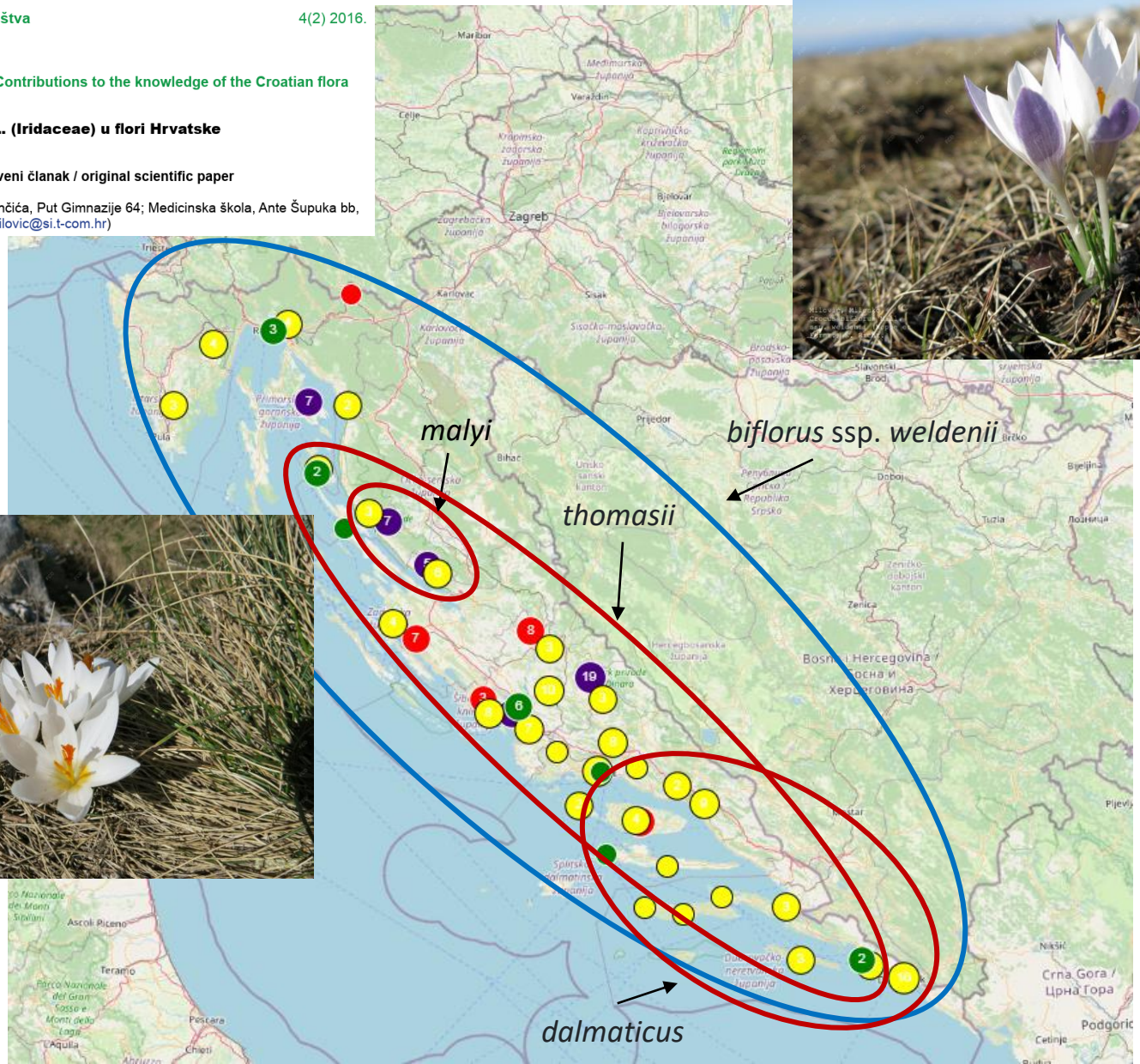
Glasnik Hrvatskog botaničkog društva 4(2) 2016.

Prilozi poznavanju flore Hrvatske / Contributions to the knowledge of the Croatian flora

Rod *Crocus* L. (Iridaceae) u flori Hrvatske

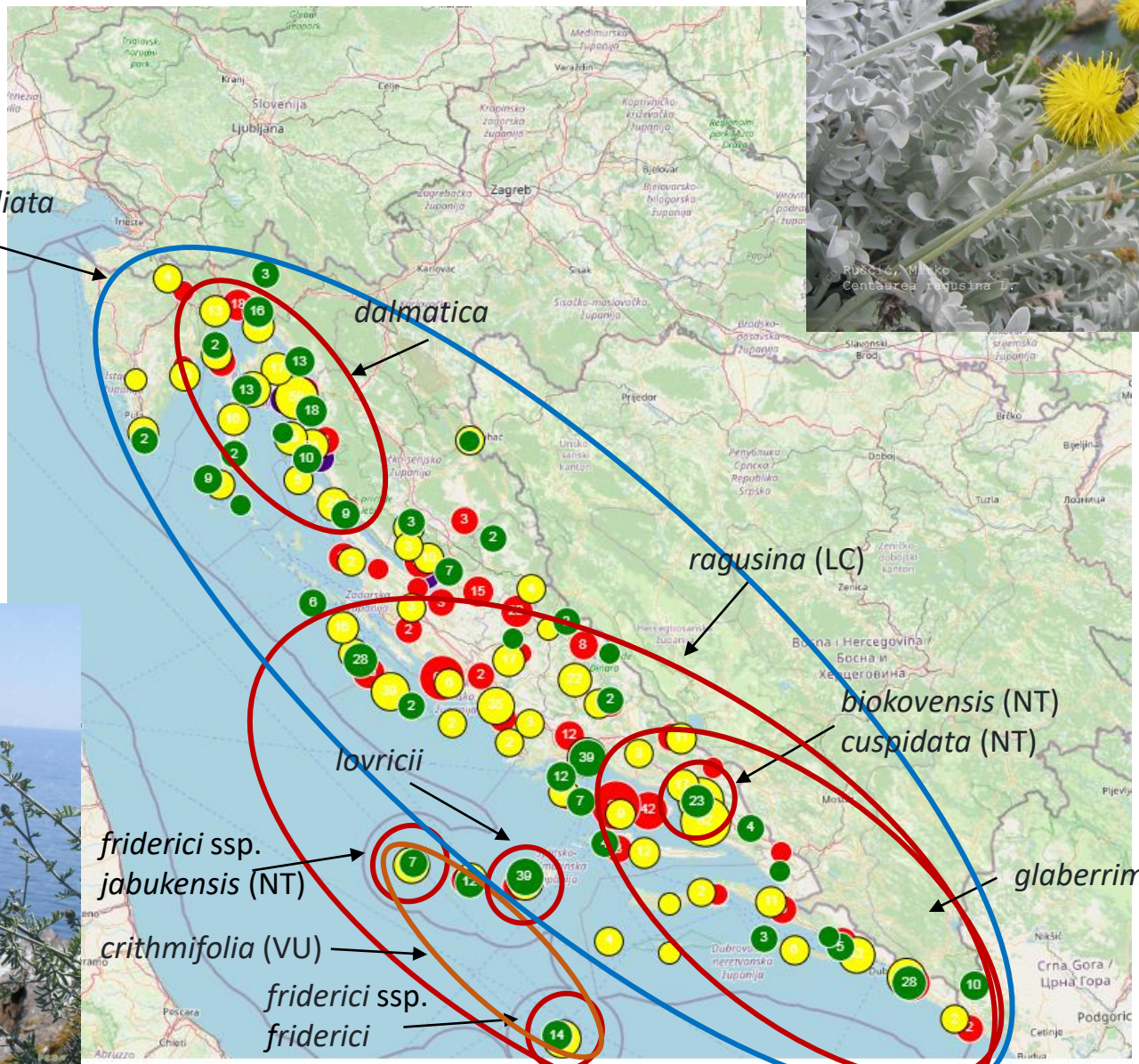
izvorni znanstveni članak / original scientific paper

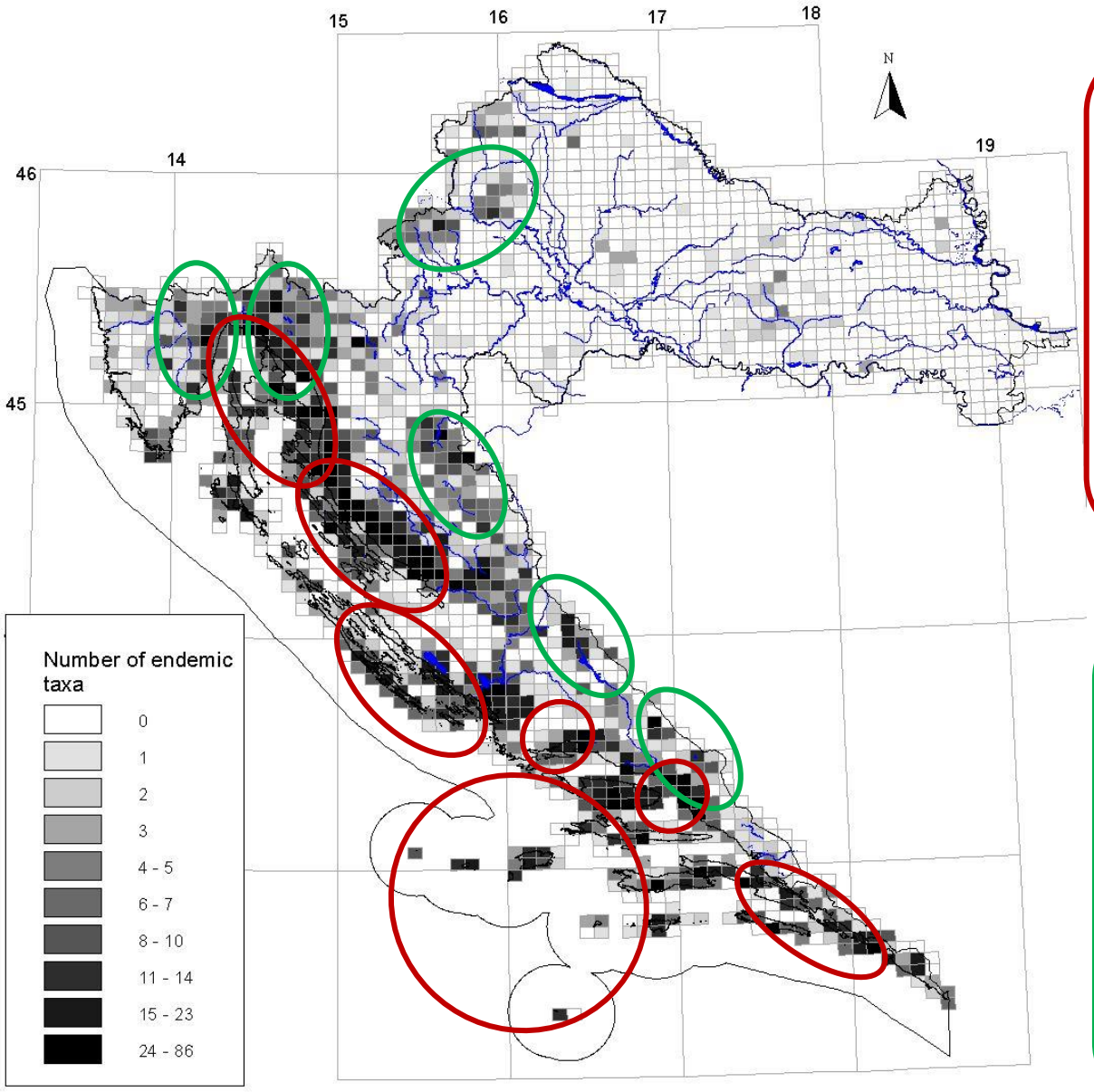
Milenko Milović (Gimnazija Antuna Vrančića, Put Gimnazije 64; Medicinska škola, Ante Šupuka bb, HR-22000 Šibenik, Hrvatska; milenko.milovic@si.t-com.hr)



Asteraceae: 73 od ukupno 793 vrsta su endemi -> 9.21%

Centaurea -> 32 svojte





Centri stenoendemizma:

Kvarner
Velebit
Šibenski arh.
Kozjak-Mosor
Otoci
Biokovo
Konavle

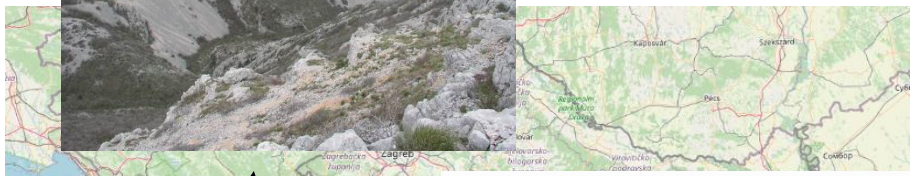
+

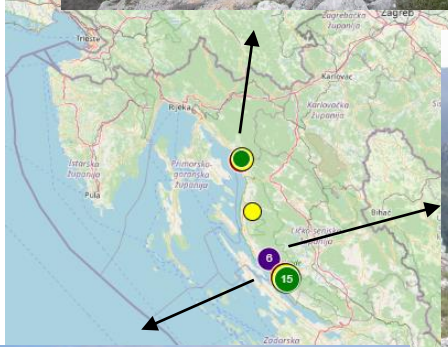
Centri endemizma

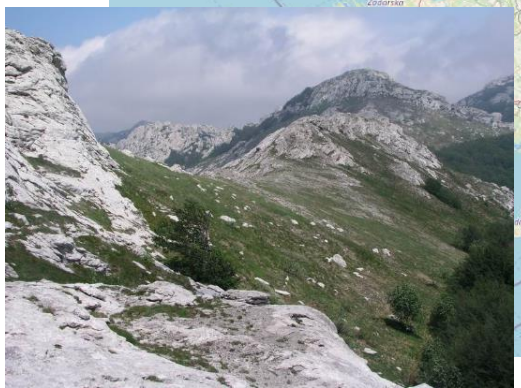
Učka-Ćičarija
Gorski Kotar
Kapela
Lička p. Plitvice
Dinara
Kamešnica
Žumberačko g.
Samoborsko g.

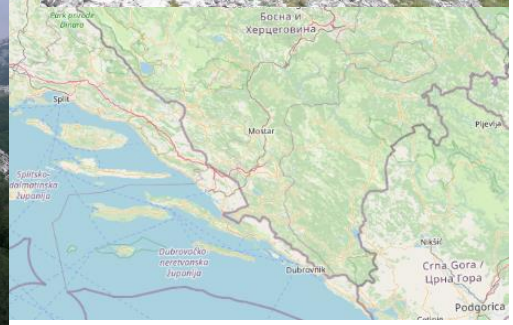
***Degenia velebitica* (Degen) Hayek**

(=*Lesquerella velebitica* Degen) **(EN)**









- Biljku je otkrio mađarski botaničar Arpad Degen 1907. godine, istražujući područje oko Šugarske dulibe
- najprije je zaključio da je naišao na novu vrstu gromotulje (rod *Alyssum*) ili gromotuljke (rod *Vesicaria*)
- Zaključuje da novo nađena velebitska vrsta pripada endemičnom sjevernoameričkom rodu *Lesquerella*. Degen službeno svoj nalaz objavljuje javnosti 1909. godine kao prvi nalaz vrste *Lesquerella velebitica Deg.* (Österr. Bot. Zeitschr. 60: 93, 1910)
- Austrijski botaničar August Hayek, zaključuje, međutim, da se radi o dosada nepoznatom rodu u euroazijskoj flori
- 1910. godine u čast originalnog otkrivača, opisuje novi rod *Degenia*, a vrsta dobiva ime *Degenia velebitica* (Degen) Hayek (Hayek 1910)

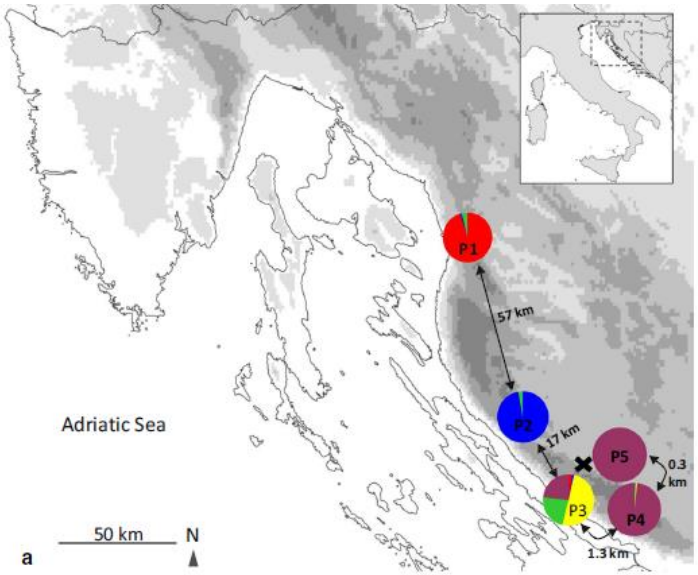
Degenia velebitica (Degen) Hayek (EN)

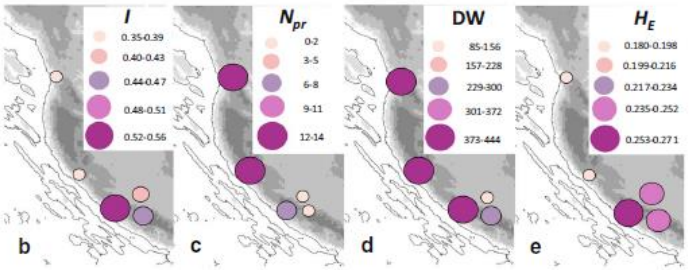
Plant Systematics and Evolution (2020) 306:64
https://doi.org/10.1007/s00606-020-01695-3

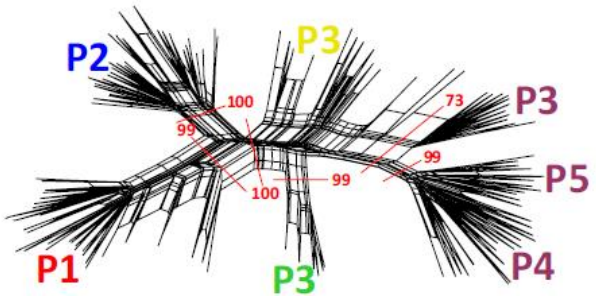
ORIGINAL ARTICLE

Spatial distribution, niche ecology and conservation genetics of *Degenia velebitica* (Brassicaceae), a narrow endemic species of the north-western Dinaric Alps

Zlatko Liber[1,2] · Boštjan Surina[4,5] · Toni Nikolić[1] · Danijel Škrtić[1] · Zlatko Šatović[2,3]







- pojavljuje se na 4,85 ha, s cca **37.000** primjeraka
- raste na slabo pokretnim točilima u zajednici planinskog koporca i ognjice (ass. *Bunio-Iberetum carnosae* (srednji i južni Velebit, > 1000 m ndm) i zajednici jadranskih kamenjara kadulje i kovilja (ass. *Stipo-Salvietum officinalis* (Kapela ~ 300 m ndm)
- nije pronađena na locus classicus!

Resetnikia triquetra (DC.) Španiel, Al-Shehbaz, D. A. German et Marhold (LC)

Molecular Phylogenetics and Evolution 69 (2013) 772–786

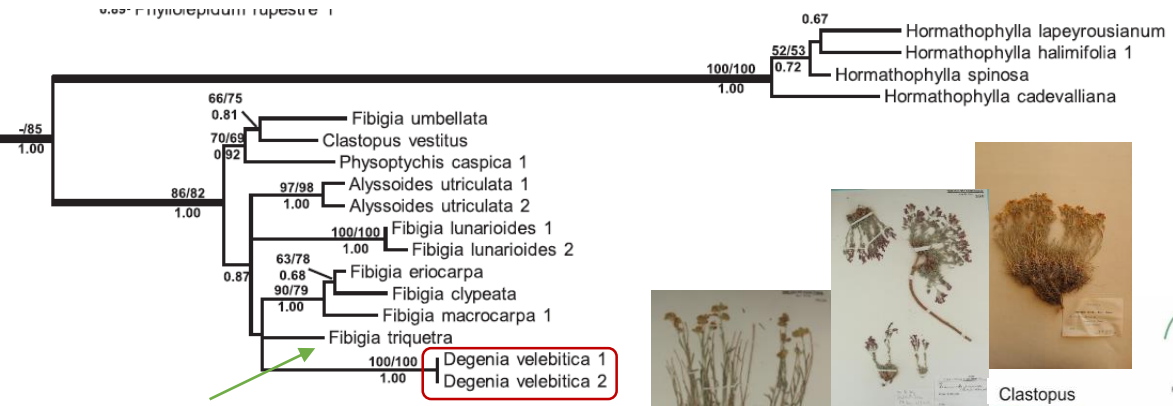
Contents lists available at SciVerse ScienceDirect

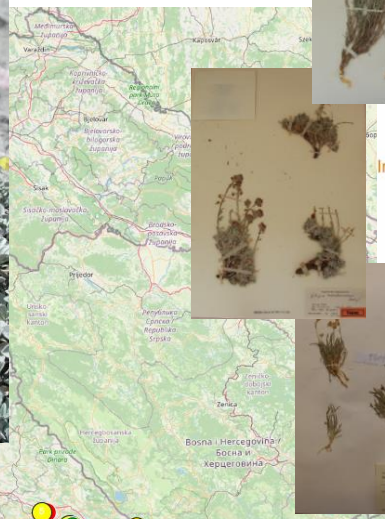
Molecular Phylogenetics and Evolution

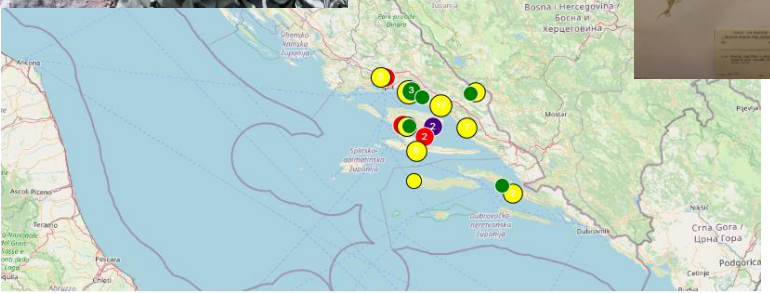
journal homepage: www.elsevier.com/locate/ympev

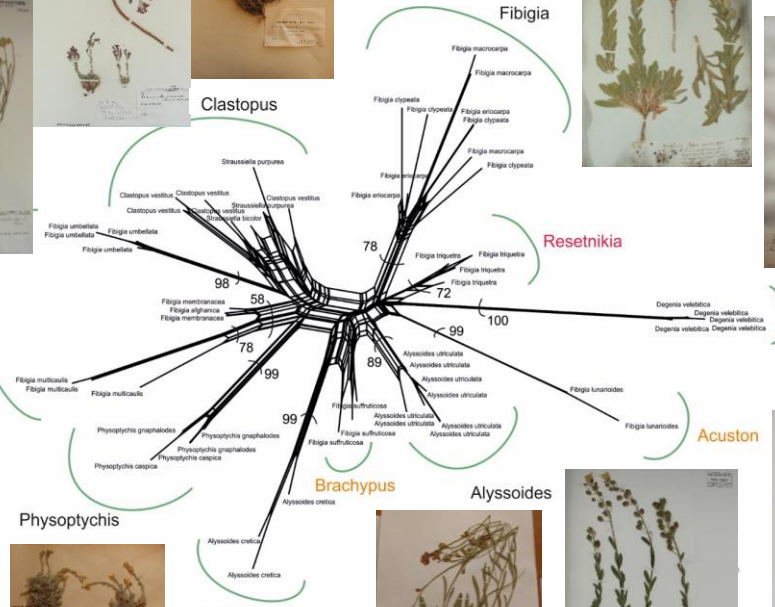
Phylogenetic relationships in Brassicaceae tribe *Alysseae* inferred from nuclear ribosomal and chloroplast DNA sequence data

Ivana Rešetnik [a,*], Zlatko Satovic [b], Gerald M. Schneeweiss [c], Zlatko Liber [a]







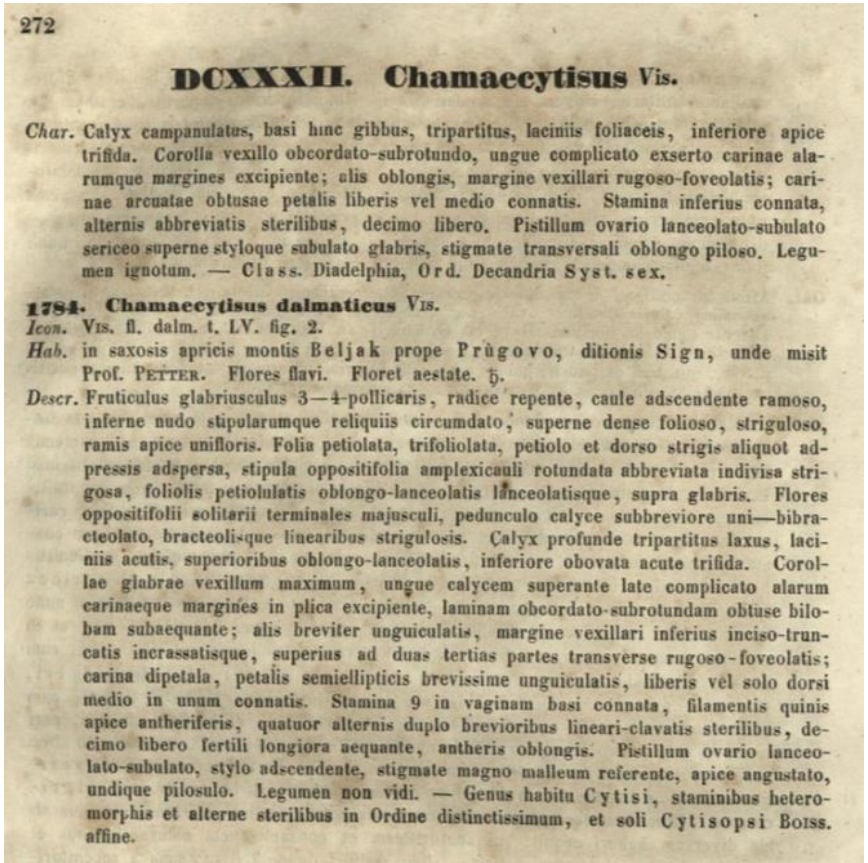


Dalmatocytisus dalmaticus (Vis.) Trinajstić (EN)

Roberto de Visiani (1852) Flora Dalmatica vol. 3

Hab. in saxosis apricis montis Beljak prope Prugovo, ditionis Sign, unde misit Prof. Petter.

Typus: PAD-HD06392



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DCXXXII. Chamaecytisus Vis.

Char. Calyx campanulatus, basi hinc gibbus, tripartitus, laciniis foliaceis, inferiore apice trifida. Corolla vexillo obcordato-subrotundo, ungue complicato exserto carinae alarumque margines excipiente; alis oblongis, margine vexillari rugoso-foveolatis; carinae arcuatae obtusae petalis liberis vel medio connatis. Stamina inferius connata, alternis abbreviatis sterilibus, decimo libero. Pistillum ovario lanceolato-subulato sericeo superne styloque subulato glabris, stigmate transversali oblongo piloso. Legumen ignotum. — Class. Diadelphia, Ord. Decandria Syst. sex.

1784. Chamaecytisus dalmaticus Vis.

Icon. Vis. fl. dalm. t. LV. fig. 2.

Hab. in saxosis apricis montis Beljak prope Prùgovo, ditionis Sign, unde misit Prof. Petter. Flores flavi. Floret aestate. ♄.

Descr. Fruticulus glabriusculus 3—4-pollicaris, radice repente, caule adscendente ramoso, inferne nudo stipularumque reliquiis circumdato, superne dense folioso, striguloso, ramis apice unifloris. Folia petiolata, trifoliolata, petiolo et dorso strigis aliquot adpressis adspersa, stipula oppositifolia amplexicauli rotundata abbreviata indivisa strigosa, foliolis petiolulatis oblongo-lanceolatis lanceolatisque, supra glabris. Flores oppositifolii solitarii terminales majusculi, pedunculo calyce subbreviore uni—bibracteolato, bracteolisque linearibus strigulosis. Calyx profunde tripartitus laxus, laciniis acutis, superioribus oblongo-lanceolatis, inferiore obovata acute trifida. Corollae glabrae vexillum maximum, ungue calycem superante late complicato alarum carinaeque margines in plica excipiente, laminam obcordato-subrotundam obtuse bilobam subaequante; alis breviter unguiculatis, margine vexillari inferius inciso-truncatis incrassatisque, superius ad duas tertias partes transverse rugoso-foveolatis; carina dipetala, petalis semiellipticis brevissime unguiculatis, liberis vel solo dorsi medio in unum connatis. Stamina 9 in vaginam basi connata, filamentis quinis apice antheriferis, quatuor alternis duplo brevioribus lineari-clavatis sterilibus, decimo libero fertili longiora aequante, antheris oblongis. Pistillum ovario lanceolato-subulato, stylo adscendente, stigmate magno malleum referente, apice angustato, undique pilosulo. Legumen non vidi. — Genus habitu Cytisi, staminibus heteromorphis et alterne sterilibus in Ordine distinctissimum, et soli Cytisopsi Boiss. affine.

Chamaecytisus Vis. (1852) ≠ *Chamaecytisus* Link (1831)

Ascherson & Graebner (1907) -> *Argyrolobium dalmaticum* (Vis.) Asch. & Graebn.

Ball (1968) -> *Argyrolobium zanonii* (Turra) P. W. Ball.

NAT. CROAT. | VOL. 10 | No 2 | 83–88 | ZAGREB | June 30, 2001

ISSN 1330-0520
UDK 581.961:582.739(497.5)

original scientific paper / izvorni znanstveni rad

ABOUT THE TAXONOMIC STATUS
OF »*CHAMAECYTISUS DALMATICUS* VIS.«
(FABACEAE)

IVO TRINAJSTIĆ

Fig. 1. *Dalmatocytisus dalmaticus* (Vis.) Trinajstić – lectotypus (all stems originated from one individuum)

Genus *Dalmatocytisus* Trinajstić, nom. nov.

= *Chamaecytisus* Vis., Fl. Dalm. 3: 272 (1851), non Link, Handb. 2: 154 (1831)

= *Argyrolobium* Ecklon et Zeyher, subsect. *Chamaecytisus* (Vis.) Ascherson et Graebner, Syn. Mitteleur. Fl. 6(2): 234 (1907)

***D. dalmaticus* (Vis.) Trinajstić, comb. nov.**

Bas. = *Chamaecytisus dalmaticus* Vis., Fl. Dalm. 3: 272 (1851)

Syn. = *Argyrolobium dalmaticum* (Vis.) Ascherson et Graebner, Syn. Mitteleur. Fl. 6(2): 234 (1907)

NAT. CROAT. | VOL. 31 | No 2 | 241-250 | ZAGREB | December 30, 2022

original scientific paper / izvorni znanstveni rad
DOI 10.20302/NC.2022.31.17

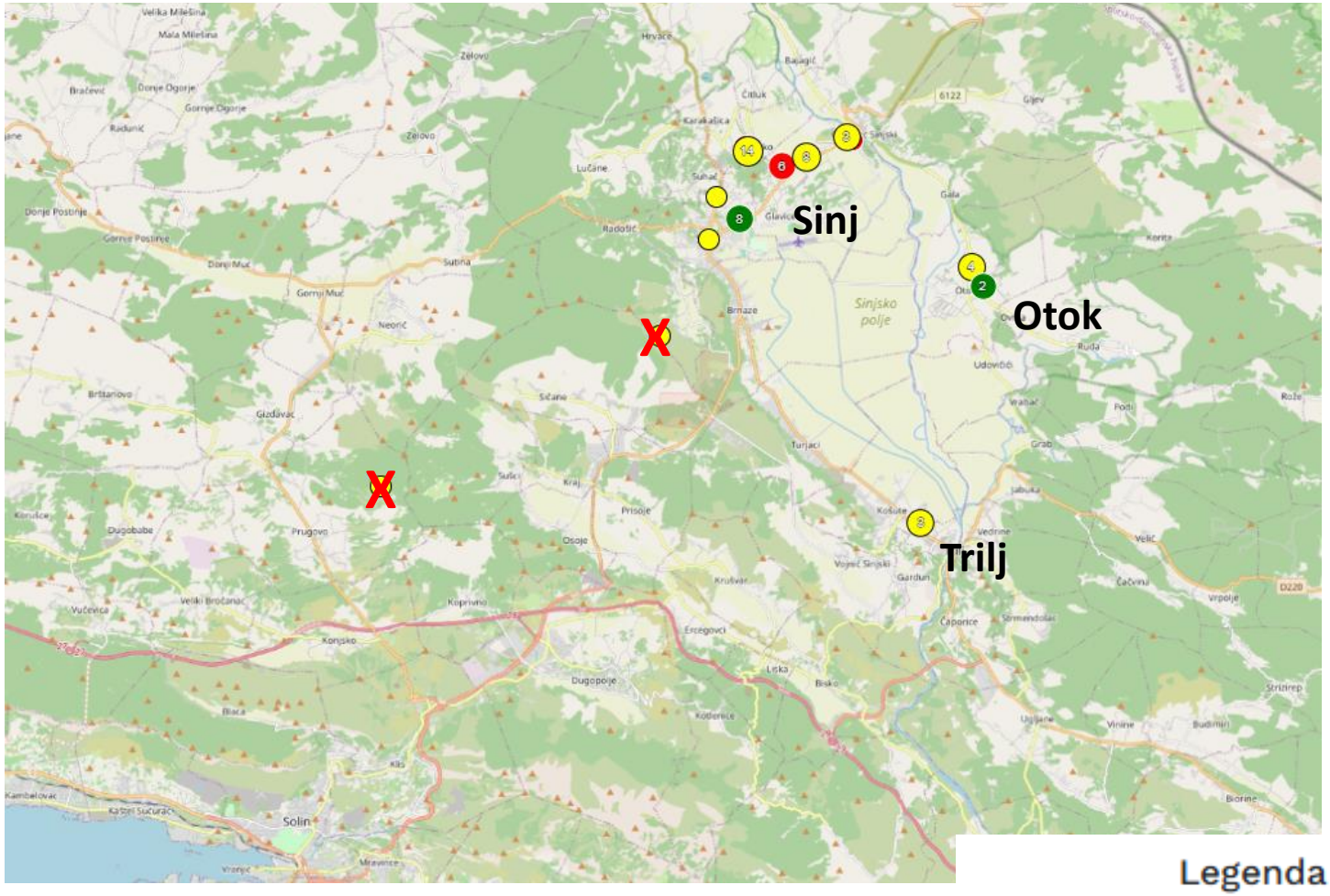
A CONTRIBUTION TO KNOWLEDGE OF THE DISTRIBUTION OF *DALMATOCYTISUS DALMATICUS* (VIS.) TRINAJSTIĆ (FABACEAE)

Milenko Milović[1]*, Jagoda Karađole[2] & Marija Pandža[3]

Category: EN

Assessment criteria: B2ab(ii,iii,iv)

B2: area of occupancy (AOO): 20 km² (Sinj 12 km², Otok 4 km² and Trilj 4 km²),



Current population trends: decreasing (observed & inferred)

Pinus nigra forest

Mediterranean-type shrubby vegetation

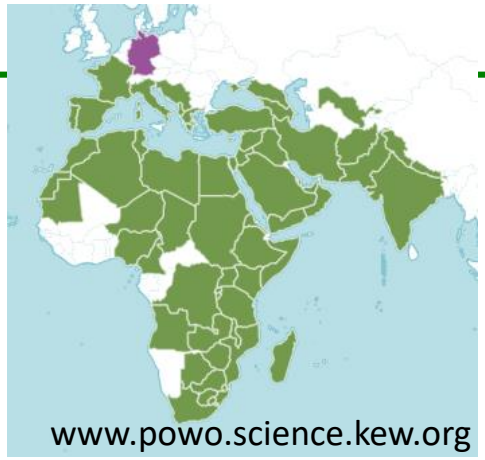
rocky dry grasslands

Locus classicus – montis Beljak prope Prugovo?

Trinajstić (2001) – Šušnjevača mountain above Poljak hamlet in Sinj

Clementi (2017) – Debeljak Hill, near the village Prugovo, southwest of Sinj –> extinct?

Argyrolobium Eckl. & Zeyh.



- ca. 81 species
- old world distribution
- southern Africa through tropical and northern Africa into Mediterranean and west to India
- centre of diversity in southern Africa -> 47 species
- NOT monophyletic!

?

=

Argyrolobium zanonii

(Turra) P.W.Ball

Brač

ITS

Bayesian phylogram

Argyrolobium Eckl. & Zeyh.

clade 4 -
not monophyletic!

4a - Middle East (*A. biebersteinii*)
4b - Caucasus (*A. biebersteinii*)
4c - Mediterranean (*A. zanonii*)

Argyrolobium zanonii

Dalmatocytisus

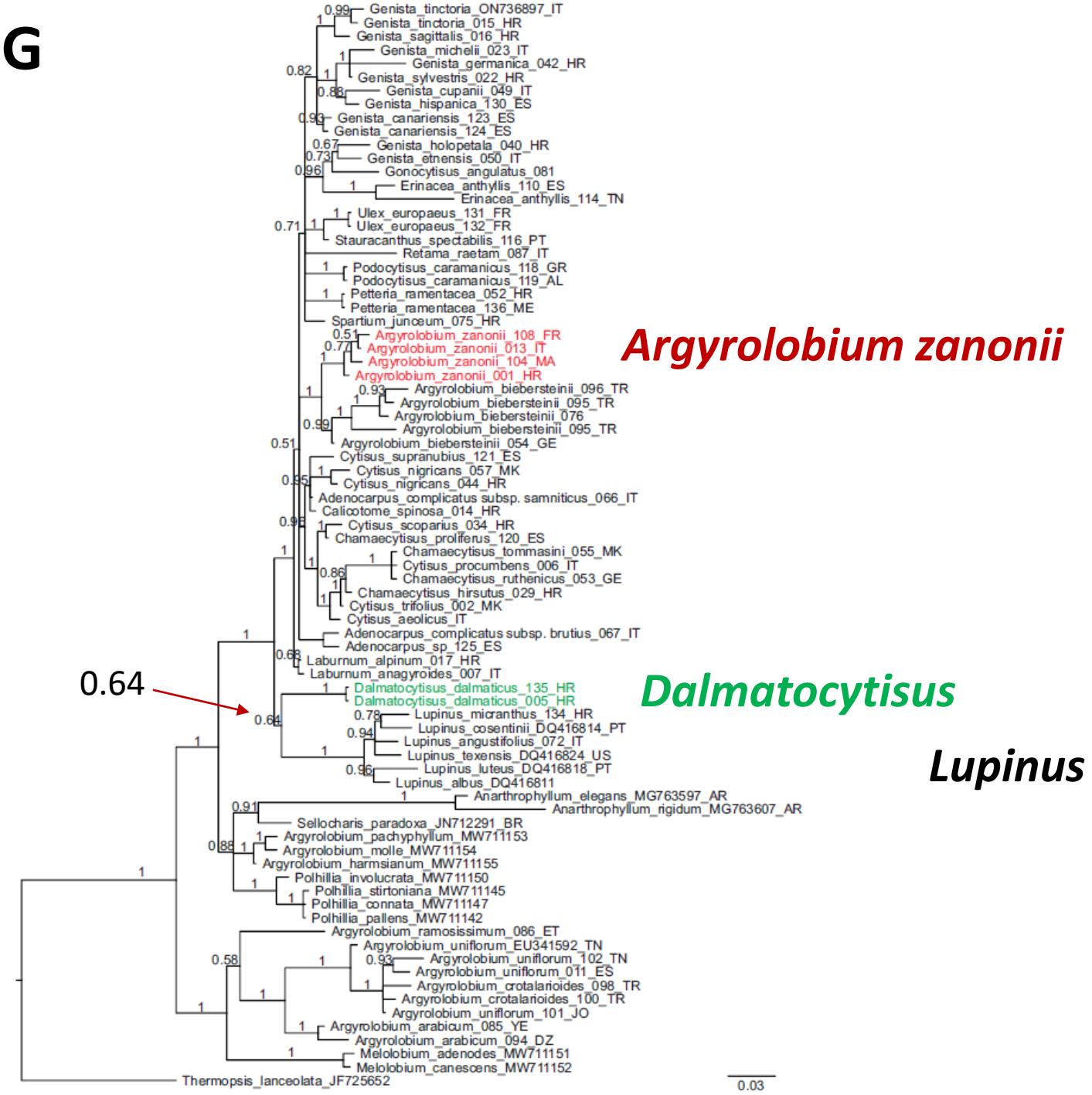
clade 3 – S Africa (type clade!)

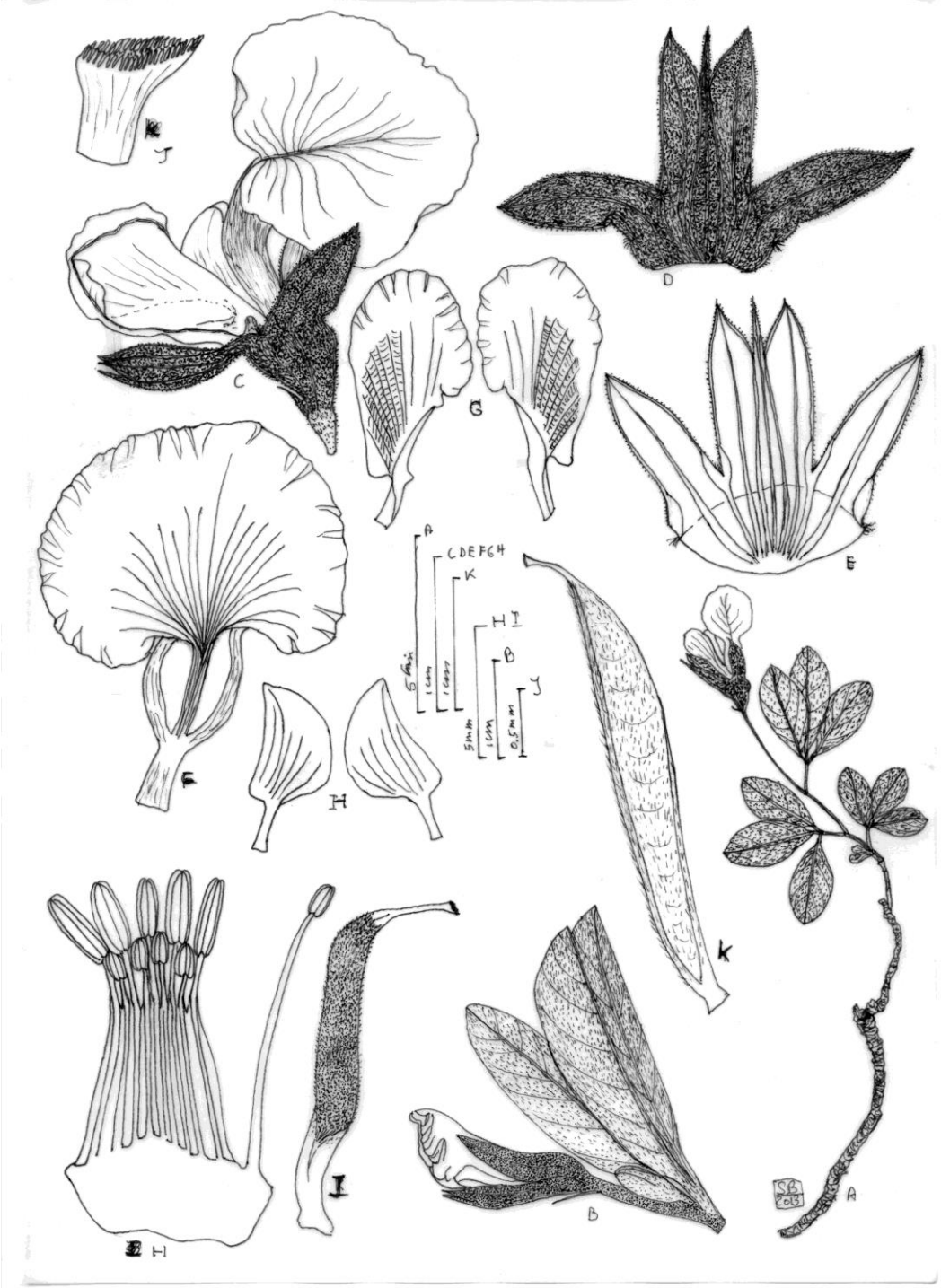
clade 2 - Canary Islands, Iberian Peninsula, Middle East, N Africa

clade 1 - E Africa (*A. ramosissimum*) + *Dichilus*

trnS-trnG

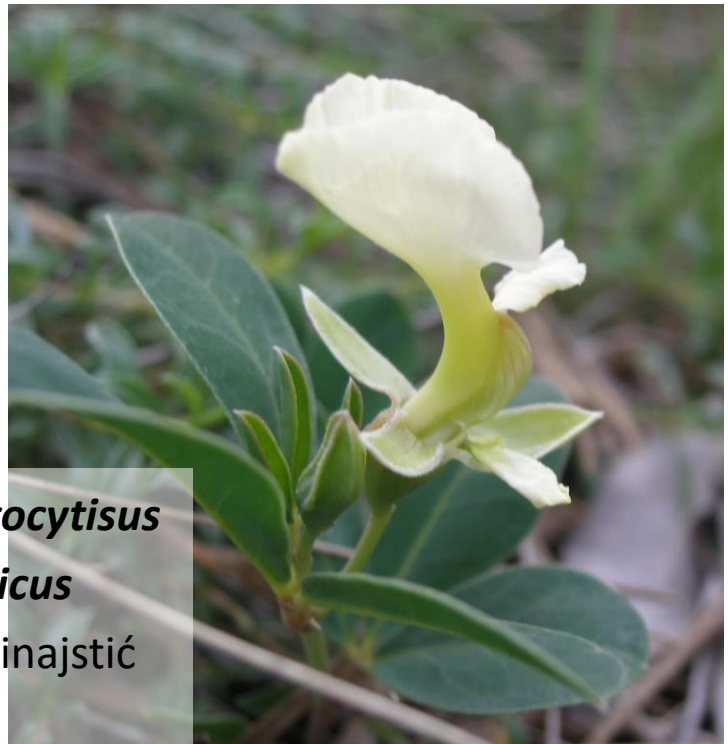
Bayesian phylogram




J
C
D
G
E
F
H
A
CDEFGH
K
H I
B
J
5mm
1cm
1cm
1cm
1mm
0.5mm
k
H
I
B
A
SB
2013

Conclusions

- *Dalmatocytisus* is a morphologically well defined and phylogenetically maximally supported monotypic stenoendemic genus
- Its single species *Dalmatocytisus dalmaticus* is not related to *Argyrolobium zanonii* or any other member of *Argyrolobium* genus
- Unique phylogenetic position in the tribe Genisteae -> old, tertiary (early Miocene) origin

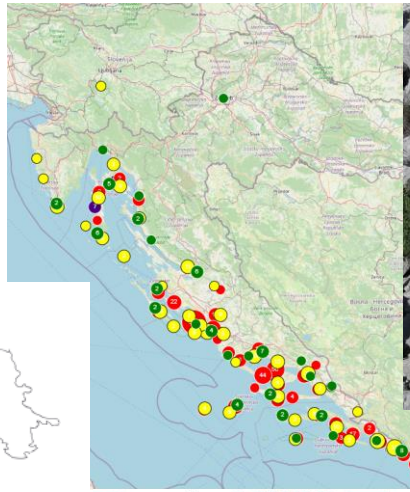


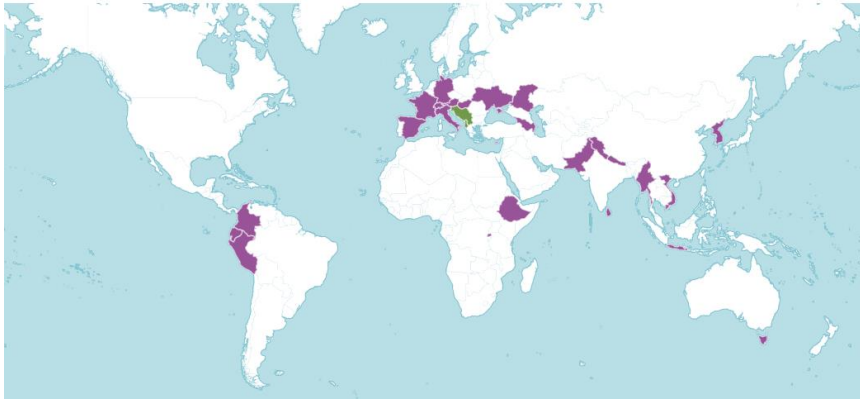
Dalmatocytisus dalmaticus
(Vis.) Trinajstić
Sinj

≠

Argyrolobium zanonii
(Turra) P.W.Ball
Brač

Tanacetum cinerariifolium (Trevir.) Sch. Bip.
dalmatinski buhač





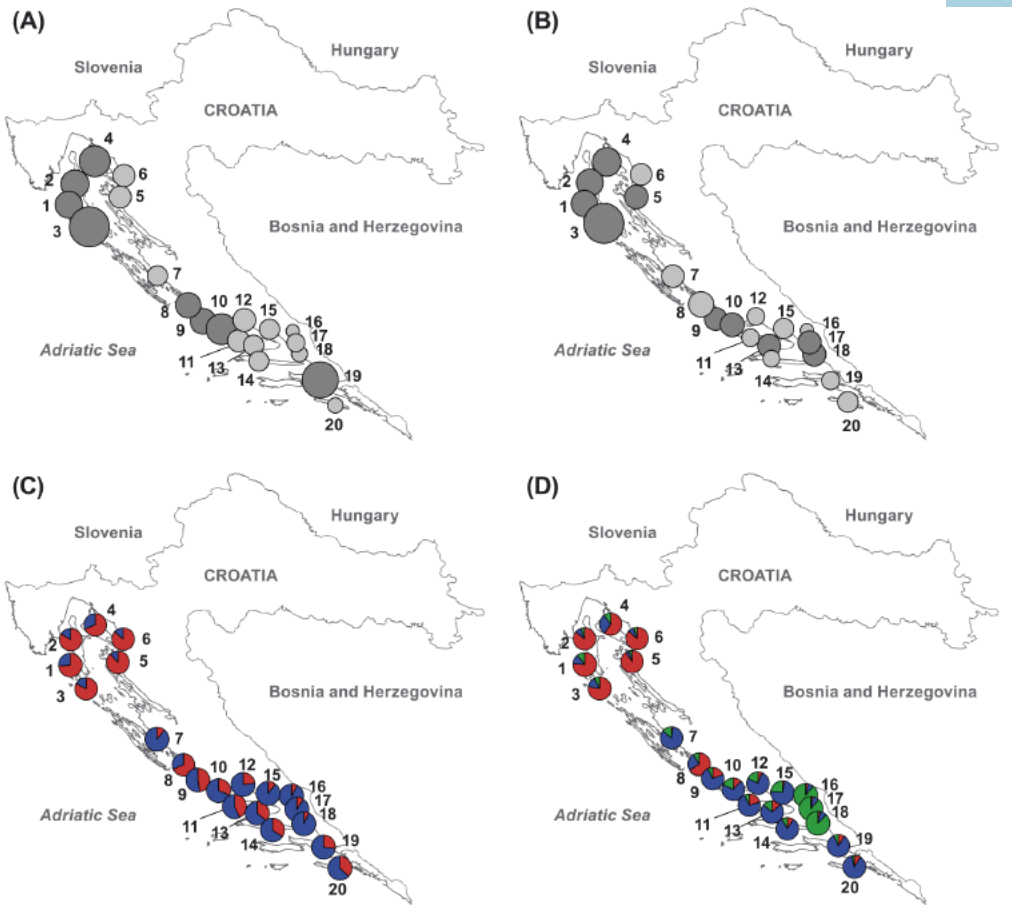


Figure 2. AFLP variation of *Tanacetum cinerariifolium*. A) Gene diversity (H_E), B) Frequency down-weighted marker values (*DW*). In (A) and (B), the size of the circles is proportional to the depicted values (dark gray color represents values above average across populations and light gray represents values below average). C) Bayesian analysis of the population structure using the software STRUCTURE assuming $K = 2$, D) Bayesian analysis of the population structure using the software STRUCTURE assuming $K = 3$. In (C) and (D), the proportions of the ancestry of each population in each of the defined gene pools are color-coded (gene pool A red; gene pool B-blue; and gene pool C-green).

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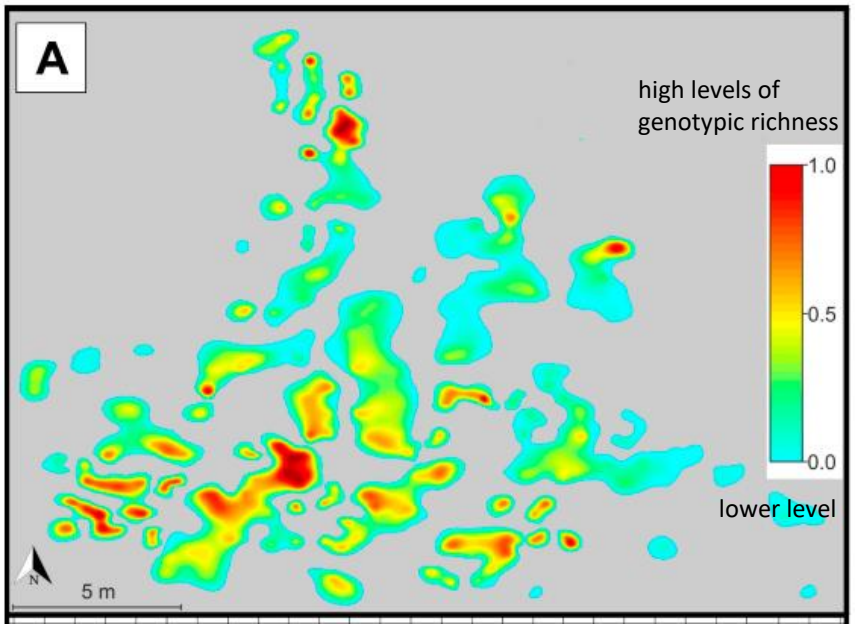
PLOS ONE

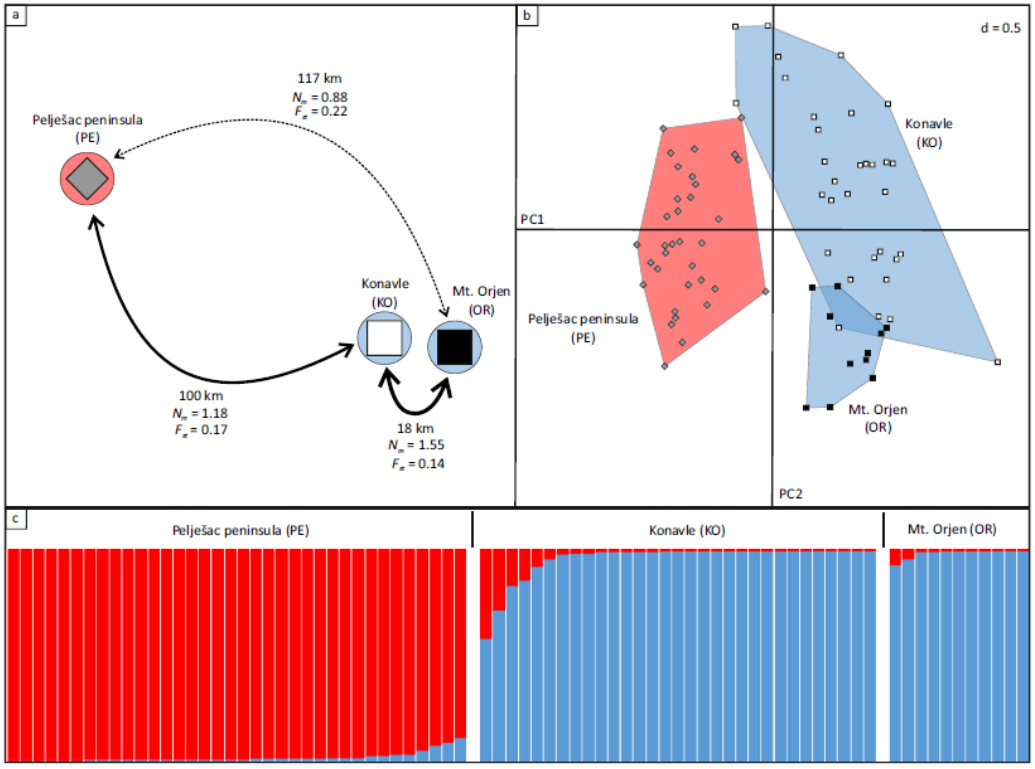
Genetic Diversity and Structure of Dalmatian Pyrethrum (*Tanacetum cinerariifolium* Trevir. /Sch./ Bip., Asteraceae) within the Balkan Refugium

Martina Grdiša[1]*, Zlatko Liber[2], Ivan Radosavljević[2], Klaudija Carović-Stanko[1], Ivan Kolak[1], Zlatko Satovic[1]

Salvia brachyodon Vandas (EN)
kratkozuba kadulja



Density map showing the spatial distribution of genotypic richness



plants

MDPI

Article

The Influence of a Seedling Recruitment Strategy and a Clonal Architecture on a Spatial Genetic Structure of a *Salvia brachyodon* (Lamiaceae) Population

Ivan Radosavljević [1,2,*], Oleg Antonić [3], Dario Hruševar [1], Josip Križan [4], Zlatko Satovic [2,5], Doroteja Turković [1] and Zlatko Liber [1,2]

scientific reports

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Lack of pollinators selects for increased selfing, restricted gene flow and resource allocation in the rare Mediterranean sage *Salvia brachyodon*

Boštjan Surina [1,2✉], Manica Balant [2,3], Peter Glasnović [2], Andrej Gogala [4], Živa Fišer [2], Zlatko Satovic [5,6], Zlatko Liber [6,7], Ivan Radosavljević [6,7] & Regine Classen-Bockhoff [8]

Salvia officinalis L.
ljekovita kadulja

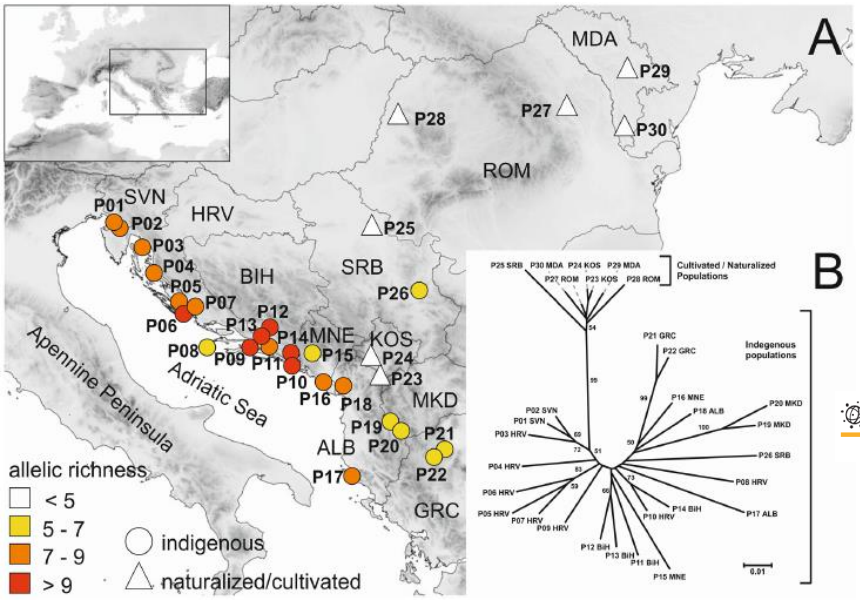
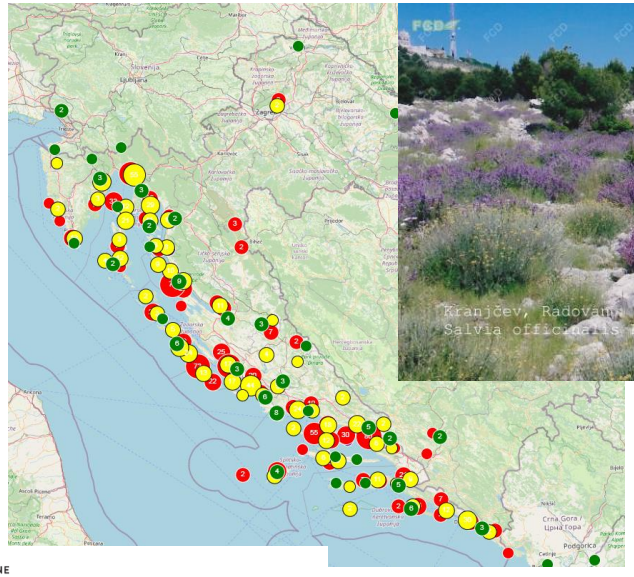


Fig 1. Within-population microsatellite diversity and genetic relationships of 30 Dalmatian sage populations. Populations are



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scientific reports

RESEARCH ARTICLE

Genetic Diversity and Demographic History of Wild and Cultivated/Naturalised Plant Populations: Evidence from Dalmatian Sage (*Salvia officinalis* L., Lamiaceae)

Ivana Rešetnik[1], Dea Baričević[2], Diana Batir Rusu[3], Klaudija Carović-Stanko[4], Paschalina Chatzopoulou[5], Zora Dajić-Stevanović[6], Maria Goncearuc[7], Martina Grdiša[4], Danijela Gregurašˇ[1], Alban Ibraliu[8], Marija Jug-Dujaković[9], Elez Krasniqi[10], Zlatko Liber[1], Senad Murtić[11], Dragana Pećanac[12], Ivan Radosavljević[1], Gjoshe Stefkov[13], Danijela Stešević[14], Ivan Šoštarić[6], Zlatko Šatović[4]*

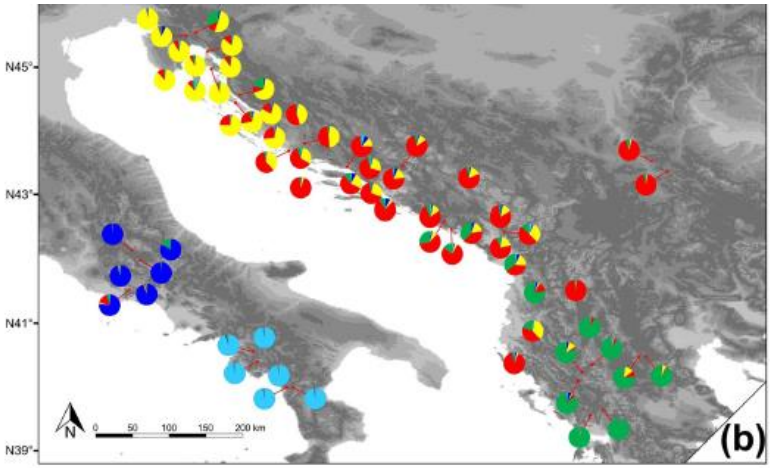

Figure 2. Microsatellite-based genetic structure of common sage (*Salvia officinalis* L.) derived from Bayesian

OPEN

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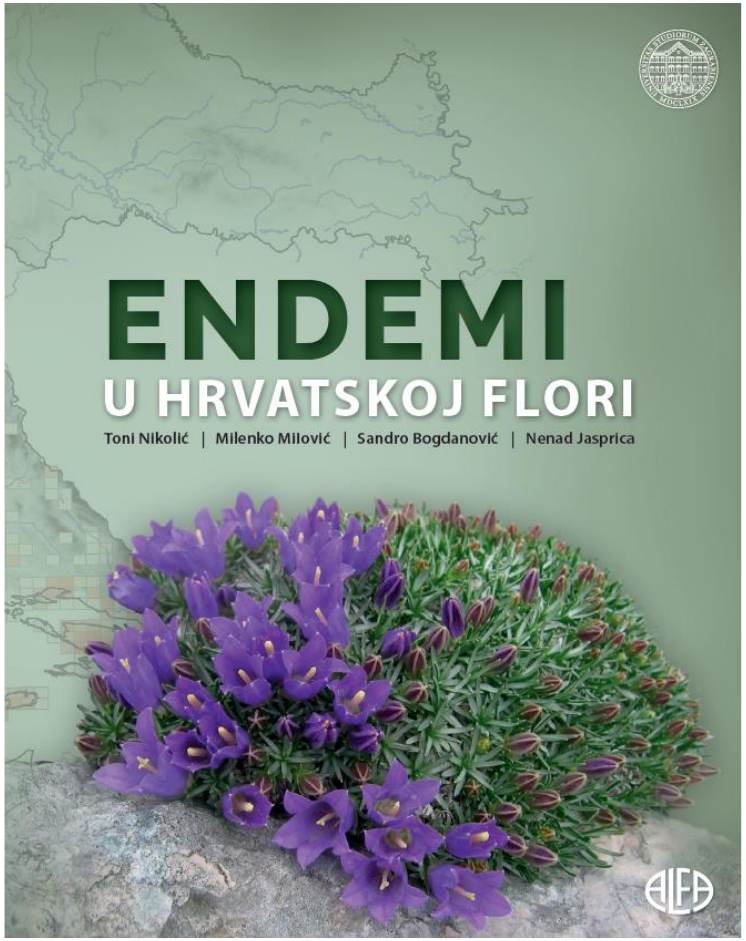
Phylogeographic structure of common sage (*Salvia officinalis* L.) reveals microrefugia throughout the Balkans and colonizations of the Apennines

Ivan Radosavljević[1,2✉], Zlatko Satovic[2,3], Romeo di Pietro[4], Marija Jug Dujaković[5], Filip Varga[2,3], Danijel Škrtić[2] & Zlatko Liber[1,2]



Nikolić T., Milović M., Bogdanović S., Jasprica N. (2015): Endemi u hrvatskoj flori. Alfa d.o.o., Zagreb, 3-492.

Campanula justiniana Witasek

Mjesto objavljivanja: Magyar Bot. Lapok 5: 245 (1906)
Locus classicus: Slovenija, Triglav
Sinonim: *Campanula linifolia* Scop. ssp. *justiniana* (Witasek) Hayek
Hrvatski i drugi nazivi: HR: Justinov zvončić, Justinijanov zvončić; TAL: Campanula di Justin; EN: Justin's bellflower; NJ: Justin Glockenblume; F: Campanule de Justin; SLO: Justinova zvončica

▲ **Slika 132.** Justinov zvončić (*Campanula justiniana*) (foto T. Schein, Notranjski regijski park, URL http://dinaricarcparks.blogspot.com/).

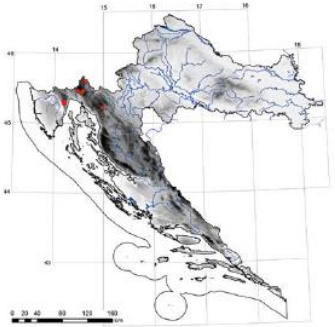
Opis vrste. Justinov zvončić malena je busenasta trajnica (hamefit) nježnog izgleda i razgranatog podanka (hemikriptofit) (Sl. 132). Stabljike su visoke 12 – 20 (– 25) cm, uspravne su i gole. Svi su listovi također goli. Oblikom su bazalno jajoliki ili srcoliko lancetasti, nazubljeni i sasvim nedostaju u vrijeme cvatnje. Donji su listovi stabljike jajoliko lancetasti do lancetasti, šiljasti, oštro jednostruko ili dvostruko nazubljeni, s peteljkama. Gornji su listovi stabljike linearno lancetasti, cjelovitih ili nazubljenih rubova. Cvat nosi mali broj cvjetova (nekoliko). Zupci čaške linearni su, dugi kao vjenčić ili malo kraći od vjenčića, već u pupu široko otklonjeni od cijevi vjenčića. Vjenčić ima promjer 12 – 18 mm. Plodnica je bradavičasta, a tobolac koji se iz nje razvija dug je 4 – 5 mm, zavojit, viseći i drvenast. Broj kromosoma: 2n = 34. Cvjeta od srpnja do rujna.

Rasprostranjenost. Slovenija (krš južnih Alpa, Snežnik, Kočevsko, Škocjanske jame) gdje je i opisana, te planine sjeverozapadne Hrvatske: Snježnik, Obruč, Risnjak, Burni Bitoraj, Bijele stijene, Suhi vrh te istočne padine Učke (Sl. 133).

Stanište i ekologija. Raste u pukotinama vapnenačkih stijena ili na kamenjarima u gorskom pojasu. Ulazi u sastav vegetacije ilirsko-dinarskih vapnenačkih stijena (NKS B.1.3.3., NATURA, sveza *Micromerion croaticae* Horvat 1931), a na Učkoj unutar vegetacije stijena Gorskog kotara i Istre (NKS B.1.3.2., NATURA, sveza *Moehringion muscosae* Horvat et Horvatić 1962). Populacije te vrste u pograničnom području u Sloveniji javljaju se unutar sveze *Cystopteridion fragilis* Richard 1972, također iz reda alpsko-karpatsko-balkanskih vapnenačkih stijena *Potentilletalia caulescentis* Braun-Blanquet 1926 (Accetto 1995).

Ugroženost. Gotovo ugrožena (NT), strogo zaštićena i rijetka biljka.

▼ **Slika 133.** Rasprostranjenost Justinova zvončića (*Campanula justiniana*) u Hrvatskoj.



Povijest. Justinov zvončić dobio je ime u čast Rajka Justina (1865. – 1938.) (Sl. 134), slovenskog prirodoslovca i konzervatora Herbarske zbirke u Ljubljani, koji je poginuo tijekom uspona na Triglav. Prema herbarskom materijalu ovog botaničara austrijska je botaničarka Johanna A. Witasek (1865. – 1910.) opisala vrstu i odabrala lektotip.

Autor: T. Nikolić

▶ **Slika 134.** Slovenski prirodoslovac Rajko Justin (1865. – 1938.) po kome je imenovan Justinov zvončić.

Campanula portenschlagiana Roem. et Schult.

Mjesto objavljivanja: Syst. Veg. 5: 93 (1819)
Locus classicus: Hrvatska, Dalmacija, Biokovo
Hrvatski i drugi nazivi: HR: Portenschlagov zvončić, Portenschlagova zvončika, zidni zvončić; TAL: Campanula di Portenschlag; EN: Dalmatian bellflower, Wall bellflower, Portenschlag bellflower; NJ: Portenschlag Glockenblume; F: Campanule de Portenschlag; SLO: Portenschlagova zvončica

1. 2.

▲ **Slika 135.** Portenschlagov zvončić (*Campanula portenschlagiana*): 1/ habitus i 2/ cvjetovi (foto S. Bogdanović).

Opis vrste. Portenschlagov zvončić busenasta je trajnica (hemikriptofit) (Sl. 135, 136). Podanak je razgranjen i dug do 10 cm, a u gornjem je dijelu pokriven starim, osušenim listovima. Cijela je biljka gola ili više ili manje jednoliko dlakava. Izdanci su brojni, stabljike su visoke 15 – 20 (- 40) cm, uspravne, penjajuće, puzeće ili viseće. Listovi su poluokrugli do okruglasto srcasti, promjera 2,5 – 3 cm, valovitih ili sitno nepravilno nazubljenih rubova plojke, s peteljkama dugim i do 10 cm. Cvjetovi su brojni, na stapkama dugim oko 2,5 cm i skupljeni u bogate, razgranate, rahle gronje ili metlice. Zupci čaške lancetasti su i puno kraći od vjenčića. Vjenčić je uspravno ljevkasto zvončast, promjera oko 2 cm i nikad preko polovice rascijepljen te upadljive plavoljubičaste boje. Plod je polukuglast tobolac promjera oko