

**TRAVNIKI - ZELENE POVRŠINE ALI
PISANI VRTOVI?
MEADOWS - GREEN SURFACES OR
COLORFUL GARDENS?**

HORTUS BOTANICUS UNIVERSITATIS LABACENSIS, SLOVENIA
INDEX SEMINUM ANNO 2015 COLLECTORUM

Travniki - zelene površine ali pisani vrtovi?

Meadows - Green Surfaces or Colorful gardens?

Recenzenti / Reviewers:

viš. znan. sod./ senior scientific collaborator/ dr. Igor Dakskobler

muz. svet./ museum councilor/ dr. Nada Praprotnik

Dr. sc. Sanja Kovačić, stručna savjetnica Botanički vrt Biološkog odsjeka Prirodoslovno-matematički fakultet, Sveučilište u Zagrebu

Naslovnica / Front cover: Dry Meadow Foto / Photo: J. Bavcon

Oblikovanje in prelom / Designed by: Pancopy

Foto / Photo: Jože Bavcon

Urednika / Editors: Jože Bavcon, Blanka Ravnjak

Prevod / Translation: GRENS-TIM d.o.o.

E version

Leto izdaje / Year of publication: 2016

Kraj izdaje / Place of publication: Ljubljana

Izdal / Published by:

Botanični vrt, Oddelek za biologijo, Biotehniška fakulteta UL

Ižanska cesta 15, SI-1000 Ljubljana, Slovenija

tel.: +386(0) 1 427-12-80, www.botanicni-vrt.si, info@botanicni-vrt.si

Zanj: viš. znan. sod. dr. Jože Bavcon

© Botanični vrt Univerze v Ljubljani / University Botanic Gardens Ljubljana

CIP - Kataložni zapis o publikaciji

Narodna in univerzitetna knjižnica, Ljubljana

574.1:633.2.03 (497.4) (0.034.2)

TRAVNIKI - zelene površine ali pisani vrtovi? [Elektronski vir] = Meadows - green surfaces or colorful gardens? / [urednika, editors Jože Bavcon, Blanka Ravnjak ; foto, photo Jože Bavcon ; prevod, translation Grens-tim]. - E version. - El. knjiga. - Ljubljana : Botanični vrt, Oddelek za biologijo, Biotehniška fakulteta, 2016

Način dostopa (URL): <http://www.botanicni-vrt.si/o-botanicnem-vrtu/publikacije>

ISBN 978-961-6822-37-4 (pdf)

1. Vzp. stv. nasl. 2. Bavcon, Jože 3. Index seminum anno 2015
collectorum

284829696

Jože Bavcon, Blanka Ravnjak

TRAVNIKI - ZELENE POVRŠINE ALI PISANI VRTOVI?

Izvleček

V delu obravnavamo raznolikost slovenskih travnikov, ki se izgublja zaradi spremenjenega načina gospodarjenja. Tradicionalna raba površin je privedla do današnje podobe kulturne krajine, ki se z intenzivno pridelavo krme in opuščanjem površin spreminja v zelene monokulture ali pa prehaja nazaj v gozd. Rastlinska raznolikost se s tem siromaši kar vpliva na podobo naše krajine. Tako se spreminja tudi pisana hortikulturna podoba teh skozi stoletja sonaravno oblikovanih površin.

Ključne besede: **Zaraščanje, biodiverziteta, travniki, upravljanje**

UVOD

Travniki so nastajali na različne načine. Po poledenitvah in ponovnih otoplitvah so najprej nastale travnate površine in nato se je tam, kjer so bile razmere ugodne, razvila vršna vegetacija. V zmernih klimatih, kjer je padavin dovolj, je to večinoma gozd (Seliškar & Wraber 1986). Z razvojem civilizacij je človek gozd vse bolj izkrčil in s tem pridobil dovolj površin za pašo živine ali za obdelavo polj. Boj med gozdom in travniki se je tako s pomočjo človeka marsikje spremenil v prid travnikov in marsikje po Evropi so gozdovi izginili. Na njihovem mestu so sedaj le travnate površine, ki bi jih radi ponovno pogozdili (<http://www.reforestingscotland.org/annual-gathering-2016>).

V Sloveniji takšnih težav zdaj nimamo. Še ne tako dolgo nazaj, pred dobrimi 150 leti (Fleischmann 1850), pa so bili pri nas v nekaterih delih podobni problemi. Vendar ti niso izvirali iz tega, da bi v deželi imeli premalo gozda, šlo je že za povsem ekološke probleme, ki se predvsem

danes zdijo tako aktualni (Komisija za pogozdenje 1891, Perko 2016). Ljudje na Krasu so spoznali, da z vse večjo odprtostjo terena okolje postaja vse bolj kamnito in veter (burja) postaja vse močnejši. V preteklosti so namreč gozd na Krasu intenzivno izsekavali zaradi gradnje ladij, mest in pridobivanja površin za pašnike, travnike in njive (Gabrovec 2008, Perko 2016). Mesta v lagunah so morala biti grajena na lesenih pilotih, ki so preprečevali posedanje hiš. Na otokih pa je gozd izginil zaradi intenzivne paše. Poleg tega sta h goloti sredozemskih otokov pripomogli še vetrna in vodna erozija. V Sloveniji so se travnate površine povečevale predvsem z naseljevanjem ljudi v srednjem veku. Takrat so namreč oblasti podeljevale mnoge olajšave tistim, ki so bili pripravljeni poseliti strma pobočja in težko prehodne grape: na primer Baška grapa v začetku 13. stoletja (Štucin 1987) in Kočevsko v začetku 14. stoletja. (Šumrada 1991, Ferenc & Zupan 2013). Z naraščanjem prebivalstva je začelo primanjkovati zemlje primerne za obdelovanje. Težnja po še več obdelovalnih površinah pa se je povečala z migracijami med turškimi vpadi. Zaradi tega so ponovno krčili gozdove in pridobljene površine uporabili za polja.



Slovenija je zaradi lege na stičišču štirih biogeografskih regij (Alpe, Panonska kotlina, Dinaridi, Sredozemlje, Wraber M. 1969) zelo raznolika dežela, kar se odraža v veliki vrstni pestrosti organizmov, pestrosti habitatnih tipov, ekosistemov (Mršić 1997). Že na razdalji 100 km lahko doživimo izrazito spremembo v reliefu in vplivih podnebja. Prav zaradi tega, upravljanja z okoljem ne smemo posploševati na celotno deželo, ampak ga je potrebno prilagoditi posameznim regijam in mikrookoljem (Altobelli et al. 2014).

Slovenija je v primerjavi z drugimi evropskimi deželami še vedno precej gozdnata. Od sedemdesetih let prejšnjega stoletja se gozdnatost le še povečuje (http://web.bf.uni-lj.si/katedre/clanki/Travinje_Slovenije.pdf) Takrat se je namreč pričelo opuščanje senožeti, ki se je potem sredi osemdesetih let zaradi sredstev za urejanje pašnikov nekoliko zaustavilo. Po osamosvojitvi pa je zaraščanje površin zelo napredovalo.



V notranjosti Slovenije na opuščenih travnatih površinah že po treh letih lahko pričnejo poganjati grmovne vrste, tako da je ponekod že po treh, zanesljivo pa po petih letih, potrebno uporabiti žago ali sekiro za odstranitev grmovnih in drevesnih vrst. Le-te se namreč zaradi dovolj velike količine padavin in ugodnih temperatur zelo hitro razvijajo (<http://www.arso.gov.si/vreme/zanimivosti/>). Na mnogih ravninskih površinah pa so se na nekdanjih travnikih zaradi neustreznega upravljanja z okoljem začele pojavljati invazivne rastlinske vrste kot so *Solidago canadensis* L., *S. gigantea* Aiton ali *Fallopia japonica* (Houtt.) Ronse Decraene, na bolj vlažnih pa *Rudbeckia laciniata* L. in *Impatiens glandulifera* Royle. Na odprtih gozdnatih površinah sta se začeli pojavljati *Phytolacca americana* L. in *P. clavigera* W.W.Sm. Vse to je posledica opuščanja rabe travnatih površin. Večina nekdanjih senožetij je od srede osemdesetih let do danes postala že povsem strnjen gozd. V njem so prisotne tako avtohtone drevesne vrste kot tudi neavtohtone. Nekatere vrste, ki so bile v Sloveniji nekoč manj razširjene npr. *Picea abies* (L.) Karst. in *Pinus nigra* Aiton. (Wraber M. 1958, 1960, Zupančič 1980, 1999), pa so v načrtнем pogozdovanju nekdanje skupne države habsburške monarhije pospešeno sadili (Fleischmann 1850, http://freeweb.t-2.net/Vojastvo/dok/Josef_Ressel.pdf, Perko 2016). Tako so na Krasu sadili večinoma črni bor, ki je dokaj odporna vrsta in se zato na Krasu dandanes subspontano razširja. V notranjost dežele pa so na območja nekdanjih gozdov bukve in jelke (*Abieti-fagetum*) večinoma sadili smreko (Wraber M. 1960) Tako so cele planote kot so npr. Pokljuka, Jelovica in še katere, zasajene s smreko, ki se je potem prav tako subspontano razširjala. Zaradi učinkovitega raznosa semen z vetrom je postala skoraj pionirska vrsta, ki hitro zaseda odprte prazne površine. Velike zaloge semena in velik produkcijski potencial avtohtonih pionirskih vrst kot so *Betula pendula* Roth., *B. pubescens* Ehrh., *Populus tremula* L., *Prunus avium* (L.) L., *Pinus sylvestris* L., *Populus alba* L. in prišleki iz Amerike – *Robinia pseudoacacia* L. povzročajo, da odprte površine postanejo izredno hitro gozdnate. Danes se z vrhov hribov večinoma povsod še lepo vidi, kje so bile nekdanje senožetji, če le znamo brati sliko krajine. Zaraščanje

najlažje dokažemo s primerjavo fotografskih posnetkov nekoč in danes ali z lastnim izkustvom iz preteklosti. Nekatere današnje že gozdnate površine smo nekoč poznali kot senožeti, ki so jih vsako leto kosili. V Sloveniji tako ni potrebe po saditvi drevesnih vrst oz. po pogozdovanju, saj se gozd sam zelo hitro širi.



Ponekod v notranjosti Slovenije se predvsem gozdarji jezijo na srnjad in jelenjad, ki naj bi uničevala gozdno podrast in preprečevala hitrejše obnavljanje gozdov. V resnici je to le naravni proces, saj so bile v preteklosti prav divje živali tiste, ki so regulirale odprte in gozdne površine. Prav z iztrebitvijo velikih rastlinojedcev, kot posledico lova, se je potem Evropa začela zaraščati. Nato pa so gozdove zaradi potrebe po kmetijskih površinah pretirano izsekali. Tovrstnih težav v Sloveniji niti ni bilo prisotnih. Nikoli namreč ni imela tako razvitega intenzivnega kmetijstva, ker tega ne omogoča izoblikovanost terena. Po drugi strani

pa se je z razvojem drugačnega družbenega sistema po drugi vojni, ki je pospeševal predvsem industrializacijo (Vrišer 1976) relativno kmečke pokrajine, postopno začelo opuščanje kmetijskih površin in njihovo zaraščanje. Tudi v današnjem času je to splošen pojav.

V predelih Istre in Krasa je zaraščanje travnikov sicer počasnejše. Razlog so predvsem vroča in sušna poletja kot so bila npr. v letih 2010, 2011, 2012, 2013 (Kaligarič 1997a, b; Bavcon Makše 2013) in 2015. Leta 2013 je suša zelo izrazito prizadela tudi vrste najbolj prilagojene temu podnebju: *Juniperus communis* L., *Cotinus coggygria* Scop., *Fraxinus ornus* L., *Quercus pubescens* Willd. Predvsem mlade in manjše rastline so se v teh sušnih poletjih ponekod v celoti posušile. V mokrem poletju 2014 so tu in tam ponovno odgnale iz korenin. Večinoma je šlo predvsem za listopadne listnate vrste, medtem ko se iglavci kot je *J. communis* niso več obrasli. Taka ekstremna poletja nato za omenjene predele pomenijo zaustavitev zraščanja. V prvi polovici 19. stoletja so intenzivno začeli s pogozdovanjem Krasa (Fleischmann 1850), a dandanes potrebe po tem ni



več, saj se Kras spontano celo preveč zarašča (Kaligarič 1997a, b; Bavcon 2013). K temu je največ pripomogla sprememba načina gospodarjenja in dovolj velika prisotnost žive semenske banke (raznašanje z vetrom ali živalmi) ali speče semenske banke v tleh. S ponovno oživitvijo paše se je zaraščanje sicer upočasnilo. Vendar je paša učinkovita predvsem tam, kjer se pasejo različne živali. Samo ovce npr. niso dovolj, saj ne marajo suhe trave in tako le-ta ostaja. Najbolj učinkovita je kombinacija ovc, koz in oslov ali celo samo oslov. Goveja živila grmovnih vrst večinoma ne je. Seveda pa je pri paši pomembna dovolj velika površina čredink in tako ne pride do nevarnosti erozije.

V notranjosti Slovenije v nekaterih delih zaraščanje upočasnujejo različne ujme kot so vetrolomi, ki so značilni za posamezne dele Slovenije, ali žledolomi, pozni snegolomi, ki dajejo vtis male poledenitve ali pa napadi lubadarja (Zupančič 1969, Smukavec 1973, Kordiš 1985, 1986, Jakša 2007 a, b, Jakša et Kolšek 2009). V nekaterih delih, kjer se križata vpliv toplega morskega in hladnega celinskega zraka, pogosto pride do takšnih pojavov. Pogostost žleda je tako na Idrijskem v določenih delih večja in jo tam zaznavajo že več stoletij, ker so bili gozdovi dobro popisani (Kordiš 1985, 1986, 1993). Gozdovi so bil takrat izjemno pomembni, saj so bili vir lesa za rudniške jaške in vir lesa za žganje rude (Kordiš 1986). Pred letom 1492 so bili predeli okrog Idrije povsem prekriti z gozdom. Tudi na Kočevskem je žled prav tako pogost. (http://www.zgs.si/fileadmin/zgs/main/img/Novice2014/Naravne_ujme2014.pdf) Kljub temu, da so te površine po žledu videti prava katastrofa, si zaradi semenske banke v tleh in prenosa semen z vetrom ter živalmi zelo hitro opomorejo in že v naslednjem letu so tla zelena. Ponekod prevladujejo predvsem gozdne vrste, ponekod se naselijo rastline gozdnega roba, drugje pa se pojavijo tudi povsem travniške vrste. Vse pa je odvisno od tega, kje je donorski vir semen. Gozdne jase so vsekakor zelo izpostavljene površine, saj je sončno sevanje tam zelo močno. Nastane tako imenovani efekt "lonca", kjer je razlika v temperaturi senčnih robov in soncu izpostavljeni površini zelo velika. Rastline so na takšni sončni jasi že zgodaj zjutraj v rosi in

hladu izpostavljene močnemu sevanju. Mnogim vrstam to ne ustreza in zato prihaja do ožigov ali kloroz, ki so lahko posledica močnega UV-B sevanja (Bavcon 1996). Vsekakor pa tam prevladujejo vrste, ki so kos takšnih okoljskim dejavnikom.



Skozi celoten razvoj človeške civilizacije je potekal boj med človekom in gozdom. Ne le v Sloveniji ampak tudi drugje po svetu. Prav človek pa je tisti, ki je s svojo dejavnostjo v veliki meri vzdrževal travnate površine (Seliškar & Wraber 1986, Vreš s sod. 2014). Seveda pa ne smemo pozabiti, da samo pravo razmerje gozda ter odprtih travnatih in obdelovalnih površin lahko pomeni pravo ekološko ravnovesje. Le-to pa se seveda razlikuje glede na posamezna območja in fitogeografske regije.

Material in metodika

V Sloveniji so pod gozdno mejo travnate površine posledica naravnih nenadnih okoljskih sprememb (vetrolomi, žledolomi, požari) ali posledica človeškega vpliva oz. njegovega upravljanja z okoljem. Prav slednje je tisto, ki je dolga stoletja ohranjalo velike travnate površine. Vzdrževanje travnatih površin je bilo namreč za kmeta ključnega pomena (Turk 1924, 1925, Rustja 1929). Travniki so bili namreč vir hrane za živino. V Sloveniji so v preteklosti travnate površine ločili na pašnike in gmajne ter travnike in senožeti in celo na umetne travnike (Rustja 1929). Različna terminologija za travnate površine je prišla v uporabo predvsem zaradi različnih metod upravljanja s travnatimi površinami. Hkrati pa izraža tudi tesno povezanost travnikov s kmečkim življnjem, saj je vsak termin za travno površino opredeljeval točno določen tip travnika. Poleg tega so kmetje prav dobro vedeli, katera kombinacija travniških rastlinskih vrst daje kvalitetno mleko ali meso oz. živali dobro nasiti. A vse to so dognali z dolgoletnimi izkušnjami in opazovanjem narave. V nadaljevanju bomo tako poskušali orisati, kako je v preteklosti potekalo upravljanje s travniki, katerega rezultat je bilo preživetje kmata in hkrati ohranjanje narave. Nekoč je veljalo, da je pretežni del njiv namenjen za pridelavo hrane za človeka in v manjši meri za živali (Rustja 1929), danes je situacija v Sloveniji precej drugačna. Na njivah ne pridelamo dovolj hrane za svoje potrebe (<http://lokalna-kakovost.si/lokalna-samooskrba/>). Večina nekdanih njiv, vsaj v hribovitem svetu, so danes kosne ali pašne površine.

Pašniki in gmajne so bile tiste površine, ki so bile bodisi zelo strme bodisi zelo kamnite, ali pa so bile na plitvih tleh (Rustja 1929, Kaligarič 1997a, b; Čemažar 2009). Na strminah so tako pasli izključno drobnico, na plitvih tleh z malo trave pa je prevladovala paša govedi. Kjer je bila zemlja kvalitetna, so bile njive, in tam kjer je bila nekoliko slabša, so bili travniki. Le-te so delili v večkrat kosne in enkrat kosne. V preteklosti so v Sloveniji večkrat kosne kosili največ trikrat, običajno dvakrat. Enkrat

kosni so se nahajali v hribovitih delih, bili so najbolj odmaknjeni od hiš in so jih imenovali senožeti, rovti ter še kaj. Pogosto je bil v uporabi tudi pojem ledina. Gre za njivo, ki so jo opustili zaradi kolobarjenja. Prvo leto je bila običajno zasejana z deteljo, nato so počasi začele prevladovati trave in druge travniške rastline. Še po več letih od tedaj, ko so bile te njive zadnjič preorane, so takšne površine še vedno imenovali ledine.

Nekoč so najprej pričeli kositi ledine. V osrednjem delu Slovenije so pričeli s košnjo okrog 20. maja ali še kasneje bolj proti juniju. Te površine so potem trikrat kosili, če je le vreme dopuščalo. Nižinske travnike so začeli kositi konec maja in v začetku junija ali v drugi polovici junija, odvisno od nadmorske višine in od bližine toplih morskih vplivov. Dvakrat kosne travnike so kosili vse do konca junija. Julija so začeli s košnjo tistih prvih senožet, ki so jih nato kosili od sredine pa do konca julija. V prvi polovici julija so poželi njive in nato so delo nadaljevali v senožetih. Tiste najvišje ležeče senožeti so kosili še avgusta.



S košnjo so pričeli že zgodaj zjutraj, ko je bila trava še sočna in rosna. Vlažno travo je bilo namreč lažje odrezati. Ko je začelo pritiskati sonce, so kosci šli v senco in prišle so grabljice. Le-te so vse redi razmetale in potem po nekaj urah, če je bila trava že suha, so jo še isti dan prvič obrnili. Ponovno so jo obrnili še naslednji dan ter še tretji dan. Posušeno krmo so nato spravili v kozolce ali senike (Bavcon 2013). Kozolci so značilni za doline, seniki pa za senožeti. V Sloveniji so se kozolci razvili predvsem v tistih delih, kjer je relativno veliko padavin in se vreme hitro spreminja. Služili so za hrambo na pol posušenega sena predvsem ob večkrat kosnih travnikih, kajti vreme ob prvih košnjah še ni bilo tako ustaljeno in v primeru poslabšanja vremena so na pol posušeno seno hitro spravili pod streho. V obdobjih pogostega dežja krme niso uspeli posušiti v treh dneh. Takšno neposušeno krmo so namestili v late v kozolce, kjer se je posušila do konca. Nato so jo iz latov namestili na vrh kozolca. Poleg tega so v različnih pokrajinh uporabljali še druge načine spravila sena, kot so na primer kope ali kopice. Narejene so bile tako, da so na smrekov stožer (smrekova sušica) naredili veliko kopo sena in tam se je seno do konca posušilo (Prezelj 1997, Komac 2003, Čemažar 2009). Poleg smrekovih sušic so lahko uporabili tudi kakšne



druge. V velike kope je bilo potrebno dati suho seno, v manjše pa lahko ne povsem suho.

V senožetih potrebe po kozolcu ni bilo. Tedaj, ko so kosili senožeti, je bilo tudi vreme že bolj ustaljeno. Tudi sicer so se za košnjo v senožetih odločili le tedaj, ko je kazalo na lepo vreme, kar je bilo navadno sredi poletja. Pozen čas košnje senožeti ima več razlogov. Najprej je bilo v dolini potrebno poskrbeti za žetev pšenice, ki so jo v osrednjem delu Slovenije želi do srede julija. Nato je bilo potrebno hitro preorati njive (običajno okrog 26. julija) in posejati ajdo ter repo, s čimer so poskrbeli za drugo letino. Šele nato je prišla na vrsto košnja senožeti. Senožeti so bile v višjih predelih in ker so jih kosili le enkrat, se vanje ni mudilo posegati. Le tiste v nižjih predelih so lahko kosili tudi že prej sredi julija (Bavcon 2013). Seveda je bila košnja v toplejših predelih Slovenije (Istra in Kras) zgodnejša, saj tam trave prej dozorijo. Kakorkoli že pa je bilo pomembno, da je trava le dozorela, saj je bila med sušenjem zaradi manjše vsebnosti vode izguba biomase manjša. Tako so imeli pozimi na



voljo dovolj suhe snovi (krme). Če trave niso bile dovolj dozorele, je bilo suhe snovi bistveno manj. Nižinski deli z dovolj zemlje pa so bili vsi obdelani. Tam so bile njive, saj je bilo potrebno pridelati dovolj hrane za preskrbo ljudi in živali. S pozno košnjo so poskrbeli, da so se semena trav in zelišč v času sušenja in obračanja otresla. Zaloga semen v tleh (semenska banka) se je s tem ohranjala. Prav tako jih niso gnojili, ker so gnoj porabili za njive. Prav zaradi vseh naštetih načinov upravljanja so bili travniki v primerjavi z današnjimi mnogo bolj pisani, še posebej senožeti.

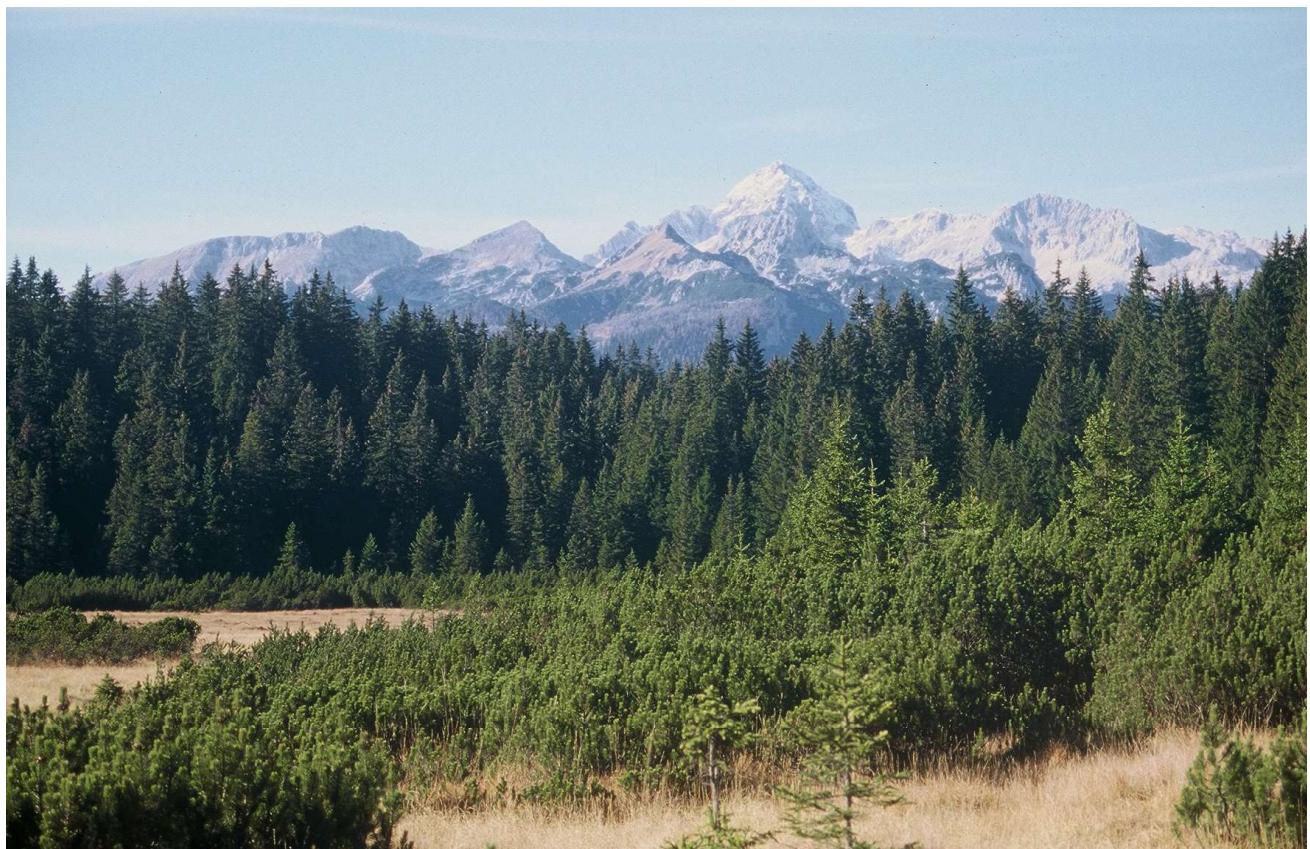
V današnjem času so travniki z bogato rastlinsko pestrostjo že kar redki, ker se je način gospodarjenja povsem spremenil. Že v sedemdesetih letih so pričeli s siliranjem krme v večjem obsegu. Tedaj so ta postopek izvajali le na velikih kmetijah, kjer so gradili betonske silose. Z uvedbo baliranja, ki se je v Sloveniji začelo v devetdesetih let prejšnjega stoletja (<http://www.daes.si/Konf07/Moljk%20DAES.pdf>) in se v večjem obsegu nadaljevalo v novem tisočletju, pa se je način gospodarjenja popolnoma



spremenil. Po podatkih Verbiča (2006) je le še 1/3 kmetij, kjer krmo sušijo, ostalo se silira na tak ali drugačen način, kar pomeni, da trave ne dozorijo. Tudi pri sušenju je košnja zgodnja in z zorenjem semen ni nič bolje. Zelo zgodaj pričnejo kositi celo v hribovitih predelih. Že za prvi maj ali takoj po njem so travne površine prvič pokošene. Nato jih gnojijo in kosijo vse do oktobra. V primeru, da ni suše, je potem košenj več. Spremenjeni način gospodarjenja je prisoten tako na velikih kot na majhnih kmetijah. Strojev je dovolj in le-ti delo opravijo zelo hitro. A s takšnim načinom gospodarjenja se manjša biodiverziteta okolja (Bavcon 2010, 2013).

Rezultati in diskusija

Slovenija leži na stičišču različnih geografskih regij: Alp, Dinarskega gorstva, Sredozemlja in Panonske nižine (Wraber M. 1969). Vsaka izmed njih z značilnimi klimatskimi dejavniki in matično podlago vpliva na rastlinstvo in živalstvo. To mešanje različnih klimatskih vplivov na



tako majhnem območju kot je Slovenija, je razlog bogate rastlinske biodiverzitete v primerjavi z nekaterimi mnogo večjimi državami. Slovenija je tako pravi raj za evropske ljubitelje rastlin. Pa vendar tega ne znamo dovolj ceniti, kaj šele to ponuditi tudi tujcem. Kar samoumevno se nam zdi, da imamo vsega v izobilju. Velikokrat želimo tako prekrasne pisane travniške površine zamenjati z zeleno angleško trato brez kakršnekoli cvetlice. A že v neposredni bližini so mnogo lepše pisane površine, ki uspevajo brez truda. Mnogi nam jih zavidajo (Gerritsen 2008), mi pa kljub temu vložimo veliko truda, stroškov, škropiv in gnojil v vzgojo dolgočasne zelene trate.

Slovenija je predvsem gozdnata dežela. Tako v okviru kmetijskih zemljišč, ki obsegajo 24 % površine, trajna travinja obsegajo 60 %. Pri tem je potrebno opozoriti, da je realna ocena verjetno drugačna, saj travnišča, ki so prešla v pašnike, po zakonu o gozdovih spadajo pod gozd (http://web.bf.uni-lj.si/katedre/clanki/Travinje_Slovenije.pdf). Travnišča lahko razdelimo v različne kategorije. Bodisi gre za delitev glede na uporabo v kmetijstvu, bodisi za delitev glede na njihovo lego in okoljske dejavnike ali za delitev v habitatne tipe. Za potrebe izkoriščanja travnišč v kmetijske namene, travnike delimo v štiri tipe: močvirsko, nižinsko-dolinsko, hribovsko-višinsko in planinsko-alpsko (http://web.bf.uni-lj.si/katedre/clanki/Travinje_Slovenije.pdf). Glede na območje v katerem se nahajajo in kateri okoljski dejavniki vplivajo nanje, jih v osnovi delimo v tri skupine: primarna, sekundarna ter suha in polsuha travnišča (Kalogarič 2004). Primarna travnišča so tista, ki so naravna in so nastala brez človeških posegov v okolje. Nahajajo se le nad gozdnino mejo v subalpinskem in alpinskem pasu. Sekundarna so že tista, ki so nastala pod človeškim vplivom. Razdelimo jih na gojene travnike in pašnike ter vlažna travnišča in visoko steblikovje. Med obojimi so najpogostejša prva. Intenzivno gojeni travniki se tako nahajajo vse od nižin do montanskega pasu, na tleh, ki so dovolj globoka in pognojena. Tudi vlažna travnišča in visoko steblikovje imajo antropogen nastanek. Razvita so na mokrih oz. vlažnih tleh in vključujejo obvodno steblikovje. Suha

in polsuha travišča delimo dalje v: suha in polsuha travišča ter resave pod gozdno mejo; submediteranska suha in polsuha travišča na bazični podlagi; kontinentalna suha travišča. V prvi skupino spadajo tista, ki se nahajajo na nekarbonatni podlagi, na suhih do polsuhih območjih. Druga skupina suhih travišč pa je, kot že pove ime, razvita na bazični podlagi in jih s skupnim imenom imenujemo tudi submediteransko-ilirska travišča. V tretjo skupino pa uvrščamo tista suha travišča, ki se nahajajo izven submediteranskega območja. Zanje je značilno, da tla sicer niso skrajno suha, ampak v njih primanjkuje hranilnih snovi. Poleg tega so tla srednje globoka, bazična, nevtralna ali rahlo kisla. Na njih uspevajo številne občutljive rastlinske vrste, ki ob dodajanju hranljivih snovi hitro izginejo (Kaligarič 1997b, 2004). Delitev travišč v habitatne tipe pa je seveda še obsežnejša in daljša ter za osnovo razvrščanja poleg okoljskih dejavnikov upošteva še rastlinske združbe (Council Directive 92, HTS 2001, HTS 2003, Evropska komisija 1999, Jogan s sod., 2004, Interpretation Manual - EUR28, 2013).



A kakorkoli že, takšna ali drugačna delitev ne spremeni dejstva, da so travniki, v katere človek zelo malo posega, čudoviti v vsakem letnem času. Travnate površine v različnih delih različno hitro oživijo. Čeprav bi pričakovali, da se bodo prebudile v toplejših delih, do kamor sega morski vpliv, je pogosto ravno obratno. Tam travnate površine zaradi vetra in kraškega terena, kar posledično pomeni sušo, pozneje ozelenijo. Tako le te večinoma prej ozelenijo v notranjosti, najprej v subpanonskem delu Slovenije, kjer je tipična celinska klima in šele nato v drugih delih. Izjema so le najtoplejši in z vodo dovolj preskrbljeni nižinski deli v obmorskih predelih (Dragonja, Strunjan, koprsko zaledje, Komenski Kras, Goriška).

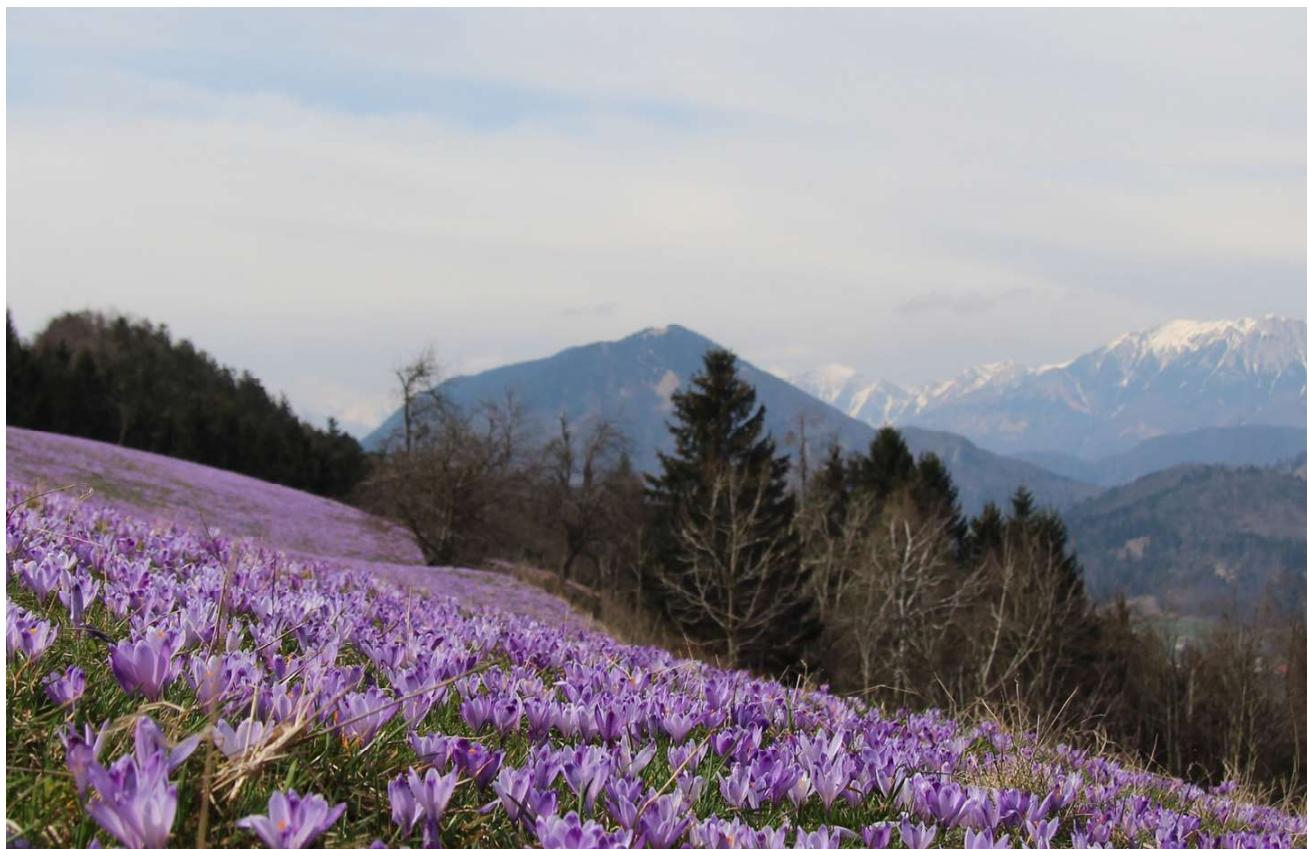




Mnoge travnike še v zimi, tako v Primorju kot Istri in Krasu, najprej prekrijejo zaplate navadnega malega zvončka (*Galanthus nivalis* L.). Vrsta se vedno širi z gozdnega roba, kar kaže na to, da so bile tam nekoč gozdne površine. Če travniki niso gnojeni, vsaj ne pretirano, potem vrsta lahko površine povsem pobeli. Rastlina je prisotna vse od obale do panonskega sveta v Prekmurju in predalpskih predelov. V alpskem svetu se razširja le po dolini Soče vse do osrčja Alp. Lahko raste v zelo različnih združbah (Bavcon 2008, 2010, 2014b, 2016c).



Drug zgodnje pomladanski rastlinski rod žafrani (*Crocus* L.) je že bolj specifičen. Žafrani so značilni za submediteransko območje. Na kraških košenicah prevladuje progasti žafran (*C. reticulatus* Steven ex Adam). V primeru, da so gmajne pašene ali košene, ga je več. Prav tako ga je več na plitkih tleh, saj globoke zemlje ne mara. V vrtačah ga zato običajno ni. Poleg tega je v vrtačah hladnejše in ga zato tam zamenja pomladanski žafran (*C. vernus* (L.) Hill subsp. *vernus*), progasti pa se nahaja na robovih vrtač in na košenicah nad njimi (Bavcon 2012). Pomladanski žafran se pojavlja bolj masovno kot ostale vrste. Ponekod površine povsem prekrije. Predvsem ima raje hladnejša, globlja in bolj zbita tla. Na Goriškem in na delih Komenskega Krasa je pogosto zelo veliko belih populacij znotraj modrine (Bavcon 2010). Vrsti pomladanski žafran in nunka (*C. vernus* subsp. *albiflorus* (Kit.) Acherson & Grabner) množično prekrivata površine v hribovitih delih Slovenije, kjer se ti dve vrsti tudi izmenjujeta. Tako je vse modro npr. na pašnikih Velike Planine, Cerkljanskem in Škofjeloškem hribovju in še marsikje v višjih predelih (Bavcon 2010, 2016a). Značilno za vsa ta območja je, da so tam globoka



rjava tla in zelo zbita. Prav pomladanski žafran (*C. vernus* subsp. *vernus*) je prisoten v vseh fitogeografskih območjih in v vseh se lahko zelo množično pojavlja. Zanj je značilno tudi, da je to vrsta gozdov, gozdnega roba, ki pa se je dobro prilagodila težkim tlom. Hkrati je to vrsta, ki se je na nekdanjih intenzivnih travnikih po več kot dveh desetletjih ponovno namnožila samo s spremenjenim načinom gospodarjenja. Veliko teh površin so spremenili v pašnike, kjer se pase drobnica. Pomladanskemu žafranu to ustreza in zato so tam nastale prave monokulture te vrste (Bavcon 2016a).

Drugje v teh višjih hribovitih predelih prevladuje nunka, ki lahko površine povsem pobeli. Tu in tam je med njimi možno najti modre populacije. Tam kjer so le-te prisotne, se nahajajo vsi možni barvni prehodi (Bavcon 2010). Tako so lahko te valovite površine zelo pisane. Nunka sicer zaradi svoje nizke rasti in nekoliko manjših cvetov ne obarva površin tako izrazito kot to naredi spomladanski žafrana. A tam kjer jo je veliko, je v soncu ravno tako vse bleščeče belo. Na daljavo zgleda ravno tako, kot



da bi površine nekdo poapnil. Včasih so na kisle površine, predvsem njive, potresali apno, da so jih izboljšali. Prav tako je tu in tam nunka prisotna v nižjih nadmorskih višinah. Vendar se tedaj vedno nahaja na hladnejših delih in severnih legah (Bavcon 2010, 2013, 2016a).

Trobentica ali navadni jeglič (*Primula vulgaris* Hudson), ki cveti ob času cvetenja žafranov, je ponekod na travnatih površinah prisotna zelo množično. Takšne površine so vedno obrnjene proti jugu, so sončne in tla so lahko globoka ali plitva. Vendar pa trobentica nikoli ne pokriva tako velikih površin kot prej omenjene pomladanske vrste. Še vedno jo lahko smatramo kot travniško vrsto, ki pa se je zelo prilagodila na človeško dejavnost. Zelo rada se pojavlja v hribovitih delih na obronkih, kjer so nekoč bile njive. Potrebuje več hranil, pojavlja se v visokodebelnih sadovnjakih, kjer so bile v preteklosti kosne površine (Bavcon 2013).

Telohi so sicer večinoma rastline gozdov in gozdnih robov, a se prav vse vrste pojavljajo tudi na travnikih. Kar kaže na to, da so bile to nekoč gozdne površine. Najzgodnejši je črni teloh (*Helleborus niger* L.), ki se pojavlja predvsem na senožetih in pašnikih, ki imajo apnenčasto podlago. Tu in tam te površine povsem pobeli. Pred cvetenjem in v času odcvitanja se obarva rahlo rožnato. Še posebej bogato se razrašča na pašnih površinah, ker ga živila ne je. Tam nastanejo prave monokulture teloha (Bavcon 2012). Iz alpskih dolin se dviga v višje predele in se množično pojavlja že na visokogorskih tratah, pogosto skupaj z blagodišečim telohom (*H. odorus* Waldst. & Kit.). Slednji je v nižjih predelih predvsem rastlina gozdnega roba in le tu in tam sega na travnike. Razširja se le do tja do koder sega poletna senca dreves. V slovenski Istri ti dve vrsti zamenja istrski teloh (*H. multifidus* Vis. subsp. *istriacus* (Schiffner) Merxm. & Podl.). Je prav tako rastlina presvetljenih toploljubnih gozdov malega jesena, puhastega hrasta in črnega gabra, ki pa je ravno tako s skrčitvijo teh površin ostala na sekundarnih nahajališčih, na kraških gmajnah in kraških košenicah. V velikih šopih se pojavlja še med suho travo predvsem tam, kjer je paša ali pa le občasna košnja. Kjer je košnja pogostejša,

so rastline manjše, a zato potem bolj kompaktne. Na Dolenjskem je na travnikih prisoten temnoškrlatni teloh (*H. atrorubens* Waldst. & Kit.). Travniške površine naredi bolj vpadljive, saj je barva njegovih cvetov izredno temna. Velikokrat raste skupaj z blagodišečim telohom in tako ponekod najdemo travnike povsem mešanih populacij. Poleg obeh vrst je tam navadno prisotna še cela paleta križancev (Bavcon 2016b). Tudi ta vrsta se je na travnike razširila iz gozdov in se je dobro prilagodila novemu načinu gospodarjenja.



Na Krasu in slovenski Istri se mestoma množično v spomladanskem času pojavljajo gorski kosmatinci (*Pulsatilla montana* Rchb.), običajno skupaj s Tommasinijevim petoprstnikom (*Potentilla tommasiniana* F.W.Schultz) in belim petoprstnikom (*Potentilla alba* L.). Kosmatici so na plitvi zemlji, pogosto na že zaraščajočih gmajnah. Tam kjer površine niso košene ali pašene, se v zavetju trav pojavijo nekoliko prej, na pokošenih površinah pa nekoliko kasneje. Vedno se nahajajo na travnikih

s plitvimi tlemi. Kosmatinci kraške travnike zaznamujejo dvakrat, takrat ko cvetijo in kasneje ob svojem plodenju (Bavcon 2013). Tovrstni travniki so seveda različnih združb. Kasneje se kosmatincem pridružijo predvsem gorske narcise (bedenice) (*Narcissus poeticus* L. subsp. *radiiflorus* (Salisb.) Baker). V subpanonskem svetu gorski kosmatinec zamenja črnikasti kosmatinec (*Pulsatilla nigricans* Störck.), ki se prav tako pojavlja na zelo plitvih tleh. Ker so tukaj površine bolj gnojene in intenzivneje obdelane kot v Istri in na Krasu, ga je manj. Množično se pojavlja tu in tam na prodnatih tleh ali na nekoliko naklonjenih sončnih predelih. V še suhi trati se mu pridružita Tommasinijev petoprstnik in navadna mračica (*Globularia punctata* Lapeyr.). Slednja je ponekod na Krasu in Istri, podobno tudi v subpanonskem ali predalpskem svetu tako pogosta, da površine povsem modroobarva. Redki pa so travniki, kjer se populacije prelivajo od modre do bele. Nekaj takih je na Podgorskem krasu, kjer je mračica pogosta tudi na pašnikih. Med mračico se ponekod dokaj množično pojavljajo še jagodaste hrušice (*Muscari botryoides* (L.) Mill.),



v subpanonskem svetu grozdaste hrušice (*M. neglectum* Guss. ex Ten.) (Bavcon 2014 a).

Kras in Istra se maja odeneta v belino gorskih narcis (*Narcissus poeticus* subsp. *radiiflorus*), ki se razširjajo v predalpski, dinarski in alpski svet. Podobno jih najdemo na zaraščajočih se travnikih na Kočevskem. Največje planjave narcis so v rovilih na pobočjih Golice, kjer so rovti povsem prekriti s ključavnicami, kakor jih imenujejo domačini. Na Krasu in Istri lahko opazujemo njihovo raznolikost. Le-ta je tam večja kot pa v bistveno gostejših in številčnejših populacijah na Golici (Bavcon 2010, 2013). Njih raznolikost se spreminja od drobnih in nizkih rastlin na Krasu in Istri do izredno velikih rastlin, tako po višini kot velikosti cvetov, na Kočevskem. Na Krasu se začnejo pojavljati najprej ob robovih grmovja, od koder se populacije širijo na travnike. V notranjosti Slovenije postajajo populacije gostejše in ponekod nastanejo že prave monokulture (Golica). Maja se narcisam na Krasu in v Istri pridružijo še perunike. Travniki perunik so lahko povsem nežno modri, čeprav perunike rade



uhajajo na strme skalne prehode, na kraški rob. Po Čičariji so raztresene po travnatih površinah in z že plodečimi kosmatinci dajejo prav nežno podobo.

Ilirske perunike (*Iris pallida* Lam. subsp. *illyrica* (Tommasini) T. Wraber) se v slovenski Istri pridruži še kojniška perunka (*I. sibirica* L. subsp. *erirrhiza* Pospichal) T. Wraber), ki ima tukaj tudi klasično nahajališče (Wraber 1990). Ta mestoma rada nastopa v velikih količinah. V slovenski Istri je pogosto prisotna v posameznih vrtačah. Že Nanos pa ima povsem strnjene travne površine perunk, ki se prelivajo v različnih barvah in le na redkih se najdejo tudi bele (Bavcon 2013, 2014a). Povsod se na teh površinah pojavljajo še travnolistna perunike (*I. graminea* L.), ki se razširjajo od Krasa in Istre globoko v notranjost. Kojniška perunka tja komaj seže, medtem ko se na nižinskih travnikih, ki so bolj zamočvirjeni, pojavlja njena osnovna vrsta sibirska perunka (*I. sibirica* L.). Le-ta se običajno ne razrašča šopasto, zato so te površine bistveno bolj razpršene in perunike med zelenino trav delujejo nežneje. Na še bolj vlažnih



površinah se poleg sibirske v že povsem zamočvirjenih delih pojavljajo vodne perunike (*I. pseudacorus* L.). Ta vrsta je značilna za presihajoča kraška polja, Ljubljansko barje in še druge močvirne površine.

V maju se po nekaterih vlažnejših delih kraških polj lahko razteza prava monokultura poletnega velikega zvončka (*Leucojum aestivum* L.), ki ni tako izrazit kot spomladanski. Nahaja se namreč med zelenino trav, a je zato višji in z več cvetovi in prav tako prevzame vodilno vlogo v tem času. V notranjosti Slovenije so vlažnejši travniki maja in junija odeti v vijolično rumeno barvo, ki jo dajeta prevladujoči vrsti: kukavičja lučca (*Lychnis flos-cuculi* L.) in ripeča zlatica (*Ranunculus acris* L.). Ponekod na Barju še julija najdemo povsem rdeče vijolične površine kukavičje lučce.



Potonike se perunikam in narcisam pridružijo samo v submediteranskem svetu, kjer uspeva množično le navadna potonika (*Paeonia officinalis* L.). Razrašča se mestoma po travnikih. Raje ima prisojna pobočja vrtač, kjer je lahko prevladujoča vrsta, ali pa jo najdemo na kraških gmajnah (Bavcon 2013, 2014a, Kaligarič 1997a), a nikoli površin ne prekrije. Mestoma se sicer pojavlja v dovolj veliki gostoti in tedaj daje kraškim košenicam ter slovenski Istri značilno podobo. Cvetenje potonike sovpada s cvetenjem zlatega korena (*Asphodelus albus* Willd.). Njegova dolga bela socvetja in ponekod še modrina perunik krajino čudovito popestijo.



Po odcvetu narcis in potonik se podoba travnikov hitro spremeni v valujočo mehkobo peresaste bodalice (*Stipa eriocalis* Borb.) in mehkodlakave jurjevke (*Jurinea mollis* Rchb.). Tvorita belo modrikaste površine, ki nežno valovijo v vetru. V tem času sta prevladujoči vrsti. Le nekoliko kasneje na teh površinah že zacveti navadni jesenček (*Dictamnus albus* L.), ki se ponekod raje drži grmov, drugje pa povsem prekrije tudi travne površine. Skupaj z njim se pojavljajo različni gritavci, med njimi poljski gritavec (*Scabiosa triandra* L.), ki podobo potem le še popestrijo. Poleg njega so prisotne še škrobotci (*Rhinanthus* sp.), gorska detelja (*Trifolium montanum* L.) in pravi ranjak (*Anthyllis vulneraria* L.).



Na drugih površinah v nižjih predelih se pojavljajo povsem rumeni travniki, ki jih najprej tvorijo vzhodne kozje brade (*Tragopogon pratensis* L. subsp. *orientalis* (L.) Čelak.). Omenjena vrsta naredi travnike čudovite tudi v času semenja, ko se odprejo semenske glavice.



Travniške kadulje (*Salvia pratensis* L.) so poleg že omenjenih ivanjščic, zlatic in kukavičjih lučic ena najpogostejših vrst na naših manj gnojenih travnikih. So prave krasotice. Sušnejše kot je leto, prej zacvetijo – prve že v začetka maja, potem pa vse tja do junija. Ker njihova modrina prav



močno obarva travnike, so zelo dobro vidne. Rade imajo tudi nekoliko bolj utrjena tla, zato so velikokrat prisotne sredi kolovozov, ali na njihovih robovih. Zasedajo tudi mesta ob cestah, kjer na bankine nasipavajo gramoz. Kadulje se s tem iz povsem travniške vrste hitro spremenijo v povsem ruderalne, saj so včasih prve, ki poseljujejo tovrstna mesta. Ker je rastlina zelo lepljiva, se čaše rade primejo na obleko. To lepljivost ohranja tudi kasneje, ko cvetovi odpadejo. S tem se kadulja hitro razširja naokrog. Je značilna travniška rastlina z večjimi listi in pritlehno rozeto. Preživi celo košnjo ter si nabere dovolj hranič za naslednje leto. Tedaj iz korenike ponovno najprej zraste rozeta, iz katere se šele nato dvigne po eno ali več olistanih stebel. Steblo je velikokrat vilasto razvejeno, vendar iz rozete rado lokasto izrašča, tako da se šele nato obrne navzgor. Na steblu so rahlo srčasto ovalni, včasih zašiljeni, grobo nazobčani listi. Navzgor po steblu postajajo vedno manjši ter z vse krajšimi peclji. Pri prvih cvetovih so listi že povsem brez pecljev in že skoraj tako veliki, kot je dolžina cveta. (Bavcon 2013, Bavcon & Ravnjak 2015).



Sredi junija se na suhih travnikih in prav tako na kraških poljih pojavi prekrasna barvitost, ki jo zelo popestri ilirski meček (*Gladiolus illyricus* Koch.). V času njegovega cvetenja je njegova barva prevladujoča med zelenino drugih rastlin. Tedaj so te površine prav tipično ilirske. Sega tudi v notranjost, le da ga že z malo bolj intenzivno obdelavo hitro redčimo. Zato ga predvsem na kraških poljih zaradi intenzivne košnje praktično ne vidimo več cveteti. Drži se le še mejic in kake zaplate, ki ostane nepokošena. Včasih pa so bila kraška polja povsem vijolična od njegove intenzivne barve (Bavcon 2013, 2014a). Predvsem po kraških poljih se med ilirski meček meša zdravilna strašnica (*Sanguisorba officinalis* L.), ki je prav tako izrazitih barv.



Le nekoliko kasneje na višjih predelih dinarskega sveta prevlada izredno močna strukturna vrsta košutnik ali bratinski košutnik (*Gentiana lutea* L. subsp. *sympyandra* Murbeck). S svojim cvetenjem se včasih prav razbohoti na pašnih površinah ali na pozno košenih senožetih. Na nekaj let množično zacveti, vmes pa prevladuje le sinje zelena obarvanost njegovih listov. Seveda brez kobulnic na suhih travnikih ne gre. Najpogostejsa vrst je gorski silj (*Peucedanum oreoselinum* (L.) Moench), ki daje suhim travnikom povsem rahlo strukturo in ostaja še dolgo v poletje. Na višjih legah se mu pridružijo še druge kobulnice kot sta gorski jelenovec (*Laserpitium siler* L.) in širokolistni jelenovec (*L. latifolium* L.). Ko postaneta prevladujoča, že pomenita začetek zaraščanja površin, a s svojo prisotnostjo hkrati zavirata hitrejšo rast drugih grmovnih vrst.



V najbolj vročem poletju cveti navadni kosmuljek (*Anthericum ramosum* L.). Takrat, ko vse usiha, ko trava popolnoma porumeni, se na zelenih, dokaj olesenelih in razvejenih stebelcih razpirajo latasta socvetja drobnih

zvezdastih cvetov z značilno enokaličniško števnostjo. Ker je tam, kjer običajno raste kosmuljek, bolj malo trave, tla pa so zelo plitva, pride ta rastlina še bolj do izraza. Prej ga ni nikjer opaziti – le kako bi namreč tako nežno rastlino v prvem delu poletja med zelenino trav opazili?! Povsem prosojna je. Šele ko trave in drugo rastlinje suša dodobra prizadene, prihaja čas za kosmuljek. Nič gostejši ni, še vedno ostaja prosojen, vendar je z vsakim dnem več rastlin in tedaj prosojna zavesa postaja iz dneva v dan vidnejša, dokler se ne spremeni v eno samo belino na porumeneli podlagi. Tudi kosmuljek suša kasneje nekoliko zdela, vendar le toliko, da ni več tako polnocveten in njegova belina nekoliko zbledi. Kraške gmajne, kjer se pase živina, za kosmuljkom pomodri predvsem ametistasta možina (*Eryngium amethystinum* L.). Paša vzpodbuja njen rast in tako se na pašnikih širi in ustvarja vedno večje modre zaplate.

Poleti nekatere gmajne na Krasu in v Istri obarvajo luki. Najprej je to oblasti luk (*Allium sphaerocephalon* L.) in kasneje za njim gorski luk (*A. senescens* L.). Ko se poletje preveša v jesen, se jima pridruži rumenkasti luk (*A. ericetorum* Thore). V višjih predelih se lukom pridruži liburnijski šetraj (*Satureja subspicata* Bartl. ex Vis. *subsp. liburnica* Šilić.), nižje pa gorski (*S. montana* L.). Tam kjer se obe vrsti nahajata skupaj, se pojavlja še endemičen križanec, kraški šetraj (*S. x karstiana*). Nekoliko bolj v notranjosti Slovenije prevladuje divji luk (*Allium scorodoprasum* L.) in gredljasti luk (*A. carinatum* L.). Oba sta prisotna na bolj suhih rastiščih. Na vlažnih kraških poljih ali na Barju pa prevladuje robati luk (*A. angulosum* L.), ki lahko površine povsem



prekrije in obarva modro vijolično. Razteza se lahko na velikih površinah (Bavcon 2014a).

Čeprav travnike večinoma uvrščamo v različne združbe (Tomažič 1941, Seliškar & Wraber 1986, Mišić & Lakušić 1990, Vreš s sod. 2014) pa je v tem delu poudarek na hortikulturnem pogledu na travnike in s tem je izpostavljena tudi njihova estetska vloga. Ustvarja jo prav biodiverziteta travniških rastlinskih vrst in tako ena združba tekom leta lahko pokaže več različnih prevladujočih podob v posameznem delu leta. Seveda to ne zmanjša pomena same združbe, ampak ga le veča in izpolni njen pestrost. V tem delu nas je zanimala predvsem ta podoba, ki je med hortikulturnimi navdušenci vedno bolj cenjena. Ta podoba pa se ravno s spremenjenim načinom gospodarjenja izgublja. V večjem delu Evrope je že skoraj izginila, sedaj pa se to dogaja tudi pred našimi očmi. Cilj tega dela je opozoriti na vsestranski pomen travnikov, ki imajo izredno veliko biotsko in prav tako hortikulturno vrednost. Slednjo lahko prenesemo tudi na področje ekološkega turizma in na ta način te dragocene površine ohranimo tako pisane tudi zanamcem. Prav



o teh pisanih površinah pišeta že Seliškar in Wraber 1986: »Najbolj barvite rastlinske prizore v naših krajih vidimo na travnikih.« Ali kot za naše kraške travnike zapiše Gerritsen (2008): »Kras je pravi paradiž za ljubitelje vrtov.« V hortikulturnem in ekoturističnem pogledu imajo pisani travniki bistveno višjo ceno. Postanejo lahko tržni produkti, če jih znamo razumeti v smislu naravnih cvetočih vrtov (Bavcon 2013), pa čeprav gre za naravo kot tako. Takočnih cvetočih travnikov v Evropi ni veliko, zato so te površine tudi v različnih direktivah opredeljen kot varovane površine (Council Directive 92/43/EEC, Dellivers & Dellivers Terschuren 1996, Čušin (2004), Interpretation Manual - EUR28, 2013). V Sloveniji so le te še večinoma v zadostni meri prisotne, zato so velika dragocenost, ki imajo naravovarstveno in ne nazadnje izredno veliko tržno vrednost. Če bi jih le znali izkoristi v ekoturistične namene, bi jih s tem lahko ohranili in največ prispevali k varstvu narave. Zato pa je potrebno imeti celovit pogled na naravo in njene vrednote. Da so slovenski travniki res



izredno zanimivi, kaže že to da jih že Gerritsen (2008) v svojem eseju o Vrtnarjenju posebej omenja in priporoča vsem, ki se ukvarjajo z vrtovi.

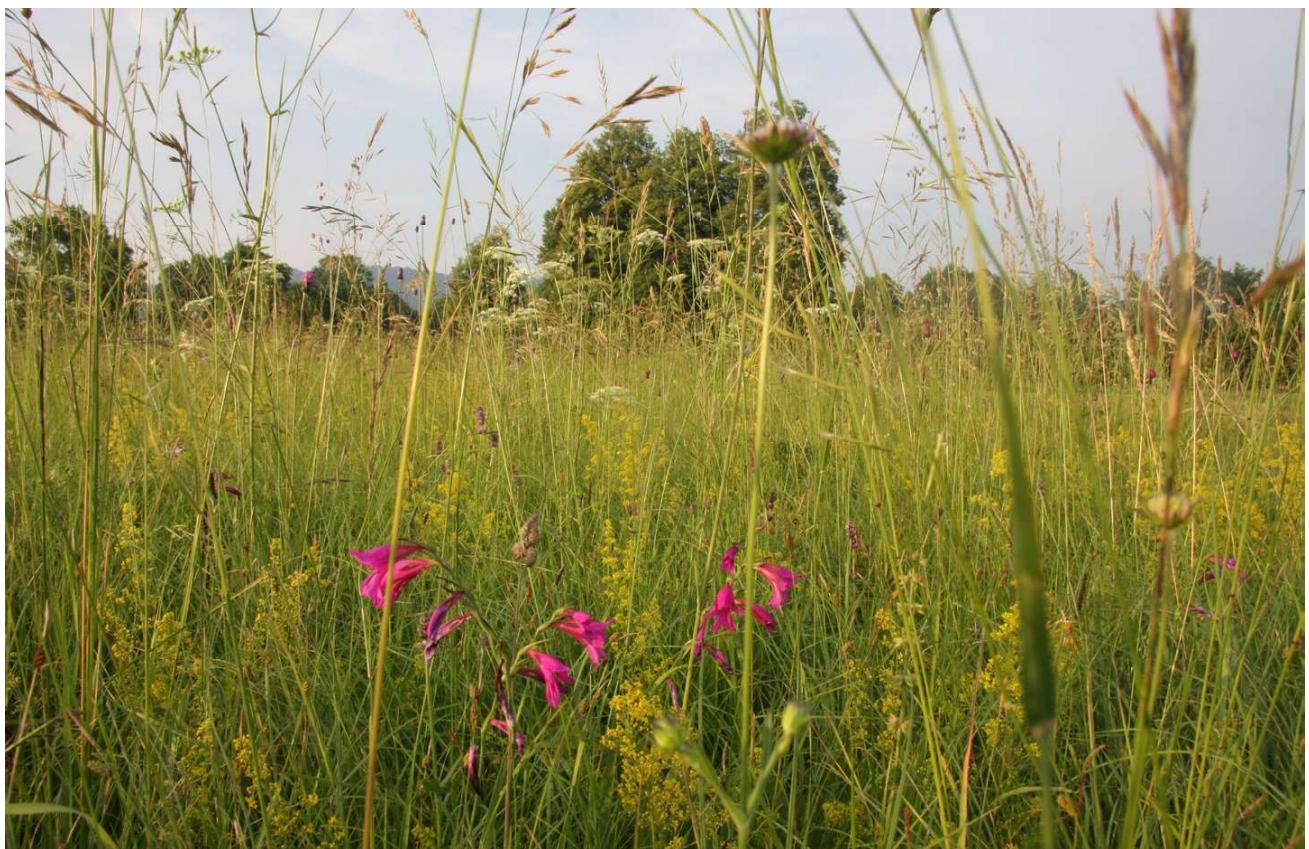
Travniki so vedno bolj zanimivi deli sodobnih vrtov, tako botaničnih kot privatnih. Nekateri skušajo travnike oblikovati čim bolj sonaravno (Carrick limited 2000, Lewis 2003) ali pa so umetno ustvarjeni in kažejo samo barvno raznolikost (Lord 1995, Lloyd & Hind 2007, Garret 2016). Poleg tega sodobnega oblikovanja vrtov praktično ni brez ustvarjanja podobnih motivov kot jih vidimo na travnikih. Lahko so čim bolj sonaravnii ali umetno ustvarjeni (Oudolf & Kingsbury 1999, Price 2016). Prav tako že veliko let pomembni botanični vrtovi v Evropi puščajo travnike kot izredno zanimive habitate dolgo časa nepokošene, s čimer ljudje lahko spoznavajo pisanost travniških rastlin (Bown 1992, Hagemann & Zepernick 1993, Monem 2007, Oldfield 2010). V današnjem času je tega vedno več in praktično ni več botaničnega vrta, ki tega ne bi prikazal v svojem vrtu.

Botanični vrt Univerze v Ljubljani ima tudi pri tem že dolgo tradicijo (Strgar 1973). Nepokošene površine pa smo intenzivneje začeli puščati zadnjih 20 let, kar je pripomoglo k temu, da so se zgodnje pomladanske rastline razširile po celotni površini vrta (Bavcon 2000, 2010). Nekoč so nepokošene površine puščali le do začetka maja in še to samo v manjšem delu najstarejšega dela vrta. V vmesnem obdobju smo na predvidenem gradbišču novega rastlinjaka ustvarili celo umetni travnik (Bavcon et al. 2015). Poleg sonaravno oblikovanih travniških površin v vrtu, ki jih puščamo dolgo nepokošene, pa Botanični vrt Univerze v Ljubljani že od leta 1998 spremlja in ohranja tudi 2 ha velik travnik na robu Ljubljane. Kosimo ga le enkrat letno pozno poleti in vsako leto zbiramo semena tam rastočih rastlinskih vrst (Bavcon & Marinček 2004, Bavcon 2010). Del teh semen smo prispevali tudi za Milenijsko semensko banko v Kew (Ravnjak & Bavcon 2014, Bavcon & Ravnjak 2014). Že Tomažič ga je uvrščal v združbo, ki je nastala iz nekdanjih gozdnih združb Pineto-Genistetum januensis, ki so še vedno na obrobju tega dela. V današnji

spomladanski podobi travnika je namreč prevladujoča vrsta prav rdeča relika (*Chamaecytisus purpureus* Scop.), ki travnik povsem rožnato obarva. Tomažič (1941) v svojih vegetacijskih popisih senožeti in pašnikov na plitvih pustih in suhih tleh Slovenije pogosto opisuje reliko kot vrsto »izmed pionirjev borovja, ki se skušajo naseliti na razkosani ruši trav mahov in zelišč«. Tomažič (1940) vrsto navaja za asociacijo Pineto- Genistetum januensis. Prav tako zapiše: »Rdečkasti šemborec (*C. purpureus*) raste najbolj številno in stalno v normalno razvitih individuih asociacije. Tu uspeva najbolje. Zelo pogosten je še v nekaterih travniških združbah, v katerih so borovci le prav redko posajeni ali pa jih celo ni. Tako npr. na plitvih, pustih in suhih senožetih, ki rastejo na produ v Posavju v bližini borovih gozdičev in spadajo v asociacijo *Carex humilis-Centaurea rhenana*«. Omeni tudi, da je rdeča relika pionir nastajajočega gozda ali pa kaže na to, da so te košeničice nastale iz nekdanjih združb borovih gozdov (Tomažič 1940).



V današnjem času travnik uvrščamo v habitatni tip polsuhih travnikov bogatih z orhidejami (Devilers & Devilers Terschuren 1996, Jogan s sod. 2004) po združbi pa bi ga lahko uvrščali v Onobrychido viciifolie-Brometum (Bavcon & Marinček 2004).



Vendar pa se podoba tega travnika od pomladi do jeseni spreminja in kaže veliko različnih hortikulturnih estetskih vrednosti, ki so tako zanimive, da bi jo bilo skrčiti z vrednostnega stališča na eno samo zelo škoda. Travnik je bogat z orhidejami, ki prevladujejo konec aprila ali maja. Kasneje se na travniku pojavijo lepljivi lan (*Linum viscosum* L.), ilirski meček (*G. illyricus*) in barvilna košeničica (*Genista tinctoria* L.). Njihovo podobo v visokem poletju prevzamejo poljski glavinec (*Centaurea scabiosa* L.) in nato panonski osat (*Cirsium pannonicum* (L. f.) Link). V drugi polovici poletja pa glavno strukturo daje gorski silj (*P. oreoselinum*) in navadni kosmuljek (*A. ramosum*). Vse te različice enega in istega travnika so vrednostno tako cenjene, da s tem ta travnik dobi veliko dodano vrednost.

S tem je njegova utemeljitev za naravovarstveni in ekoturistični status dobil tolikšno ceno, da bi lahko z omenjenim travnikom ustvarili številne zanimive produkte, saj na njem uspeva preko 120 različnih vrst (Bavcon & Marinček 2004).



Kraške pašnike nizkega šaša in skalnega glavinca *Carici-Centauretum rupestris* Kaligarič (1997a) navaja kot ene izmed najbolj pisanih traviščnih združb v Evropi, čemur lahko s hortikulturnega vidika samo pritrdimo. Podobno namreč za te površine navaja Gerritsen (2008). O ogroženosti travišč v notranjosti Slovenije iz reda *Brometalia erecti* prav tako piše že Kaligarič (1996), Škornik & Kaligarič (1997), Škornik (1998, 2001). V Botaničnem vrtu Univerze v Ljubljani smo že v letu 1998 začeli bolj intenzivno spremljati biodiverziteto suhih travnikov za Savo. Tedaj smo problematiko predstavili na razstavi na Ljubljanskem Gradu. O pomenu senožeti kot naših najlepših pisanih vrtov, ki imajo izredno veliko hortikulturno vrednost, pa v vrtu poudarjamo že veliko let in omenjeno problematiko še posebej populariziramo v najširši javnosti (Bavcon 2010, 2013).



Prav tako kot suhi travniki tudi vlažni travniki niso prav nič manj ogroženi. Tam se odvijajo isti procesi, ki krčijo pisane travne površine (zaraščanje ali intenzivna košnja). Le v nekaterih bolj mokrih letih zgodnja košnja ni takoj možna, ker je mehanizacija pretežka. Tedaj tam cvetijo poletni veliki zvončki (*L. aestivum*), na teh istih mestih pa se kasneje na nekaterih kraških poljih pojavlja robati luk (*A. angulosum*). Slednji je že bolj ogrožen, saj so v času njegovega cvetenja košnje pogostejše. Zelnik (2012) travnike z robatim lukom (*A. angulosum*) uvršča v združbo plazečega petoprstnika in robatega luka (*Potentillo reptantis-Allietum angulosi*) vrsta pa je prisotna še v drugih združbah (Zelnik 2005, 2011). Omenjene združbe uspevajo na kraških poljih. Združbo plazečega petoprstnika in robatega luka (*Potentillo reptantis-Allietum angulosi*) najdemo jo v kotanjah in kraških požiralnikih ter na dnu nekaterih kraških presihajočih jezer (Petelinjsko, Palško jezero) (Zelnik s sod. 2012). Sestoji so v avgustu, ko cveti dominantna vrsta robati luk, izredno opazni in z značilnim uspevanjem v depresijah očitno kažejo na svojstven vegetacijski tip. Tudi ta združba se od pomlad do

jeseni spreminja in kaže različne podobe, a vedno zelo zanimive kot hortikulturno pisane travnate površine (Bavcon 2014a).

Navedeni primeri vrstno pestrih in hortikulturalnih travnikov pa so le eni izmed mnogih, ki jih imamo v Sloveniji. Prav ta sezonska raznolikost naših travnikov njihovo vrednost dviga na visoko evropsko raven z večih vidikov. Tako je to eden izmed glavnih argumentov, zakaj te površine s tradicionalnim načinom gospodarjenja ohraniti tudi za naše zanamce. S tem pa bi seveda ohranili tudi bogato biodiverziteto travniških površin. Pobuda za varovanje grbinastih travnikov je stara in je nanjo opozorila že Angela Piskernik (1961). Prav tako v novejšem času različne Evropske direktive govorijo o zaščiti teh habitatov (Council Directive 92/43/EEC, Dellivers & Dellivers Terschuren 1996, Čušin (2004), Evans 2005 Interpretation Manual - EUR28, 2013). V današnjem času pa bi se tem pobudam lahko pridružila še pobuda za varovanje senožeti, suhih in vlažnih travnikov. Na njih bi bilo potrebno uvesti pozno košnjo, tako kot je bila nekoč in prav tako tradicionalno spravilo suhega sena. Glede na



podatke se danes pokošeno travo večinoma silira in površine intenzivno gnoji ali pa so le-te prepuščene zaraščanju. S tem dejansko izgubljamo naravno semensko banko in posledično biodiverzitet slovenskih travnikov. Na izreden pomen travniških površin in na potrebo njihovega varovanja so opozorili tudi ob odprtju Milenijske semenske banke leta 2000 v Wake hurst place, kjer so prav pred njenimi objekti uredili grede s pisanim travnikom (Bavcon 2000).

V splošnem biodiverzitetu slovenskih travnikov ogroža predvsem zgodnja košnja in pretirano gnojenje površin. Rejci živine namreč večinoma prisegajo na zelo zgodno košnjo, ker jim je najpomembnejša kakovost krme, kar velja tudi za kraške travnike (Pornaro et al. 2014). Nekoč pa je veljalo, da se travnikov ne kosi prej kot se trave smukajo, kar pomeni, da morajo trave najprej dozoreti in njihovo seme potem pade na tla. Včasih je bilo travnikov manj, ker so bile večinoma njive, kjer se je pridelovalo hrano. Še pred manj kot sto leti so za Slovenijo zapisali, da je potrebno veliko njiv, ker je prebivalstvo v Sloveniji zelo gosto naseljeno (Rustja 1929), prav zato so trave na travnikih pustili, da je dozorela, da je bilo zato več suhe snovi, ki je bila sicer manj kakovostna, vendar pa je omogočala preživetje živine preko zime. Z intenzivno pridelavo krme pa se je začelo z zgodnjo košnjo, ki raznolikost travnikov zelo hitro zmanjšuje in prav zaradi tega je potreba po varovanju njihove raznolikosti toliko večja.

Zaključek

Ohranjanje velike biodiverzitete travnikov je izredno pomembno ne le zaradi velike estetske vrednosti, ampak tudi zaradi dodane vrednosti v kmetijstvu. Pisanost travnikov je tista, ki dela krajino tako čudovito in lahko predstavlja odličen turistični produkt. Velika rastlinska biodiverziteta travnikov prav tako zagotavlja kvalitetnejšo pašo. Ugotovili so namreč, da mleko živali, ki se pasejo na travnikih z velikim številom različnih rastlinskih vrst, vsebuje več maščob in antioksidantov



(Stypinski 2011). Bogata rastlinska pestrost travnikov prav tako vpliva na čebeljo pašo. Če so na travniku različne rastlinske vrste, ki imajo poleg tega še različno obdobje cvetenja, nudijo čebelam pašo vse od zgodnje pomladi do jeseni. Prav tako raznovrstna čebelja paša vpliva na boljšo kvaliteto medu in drugih čebeljih izdelkov. Velike travnate površine s pestrim rastlinstvom shranijo tudi mnogo več ogljika kot revnejše ali njive s poljščinami. So bolj produktivna in dajejo dom večjemu številu različnih organizmov. Hkrati pa preprečujejo erozijo in izhlapevanje vode (ZVRSN 2011). Izredno pomembno je torej, da travnike ohranjamo kar se da pisane. Botanični vrt Univerze v Ljubljani tako na robu Ljubljane v Rojah *in-situ* varuje suhi travnik. Na njem rastejo številne rastlinske vrste, med njimi tudi mnoge, ki so uvrščene na rdeči seznam ogroženih rastlinskih vrst (Bavcon & Marinček 2004). Travnik pokosimo pozno poleti, ko večina rastlin že odcveti in so njihova semena dovolj zrela. S pozno košnjo tako ohranjamo naravno semensko banko travnika. Prav tako sproti odstranjujejo vse invazivne vrste, ki se pojavijo tam zaradi bližnjih opuščenih njiv. Poleg tega ob vsakoletni košnji pridobimo tudi

nekaj senenega drobirja z omenjenega travnika in naberemo semena tamkajšnjih rastlinskih vrst za semensko banko v Botaničnem vrtu. Tako poskrbimo za zalogo in varovanje genskega materiala v obliki semen tudi za potrebe reintrodukcije rastlinskih vrst na kakšnih drugih rastiščih.

Jože Bavcon, Blanka Ravnjak

MEADOWS – GREEN SURFACES OR COLORFUL GARDENS?

Abstract

In the article dealing with the diversity of Slovenian meadows in the broadest sense it lost due to the new method of management. Traditional land use has led to today's image of the cultural landscape to the intensive production of feed and the abandonment of land turning into a green monoculture or passes back into the forest. Crop diversity thereby impoverishes which affects the image of our landscape. Thus, it is changing the image of those colorful horticultural centuries sustainable shaped surfaces

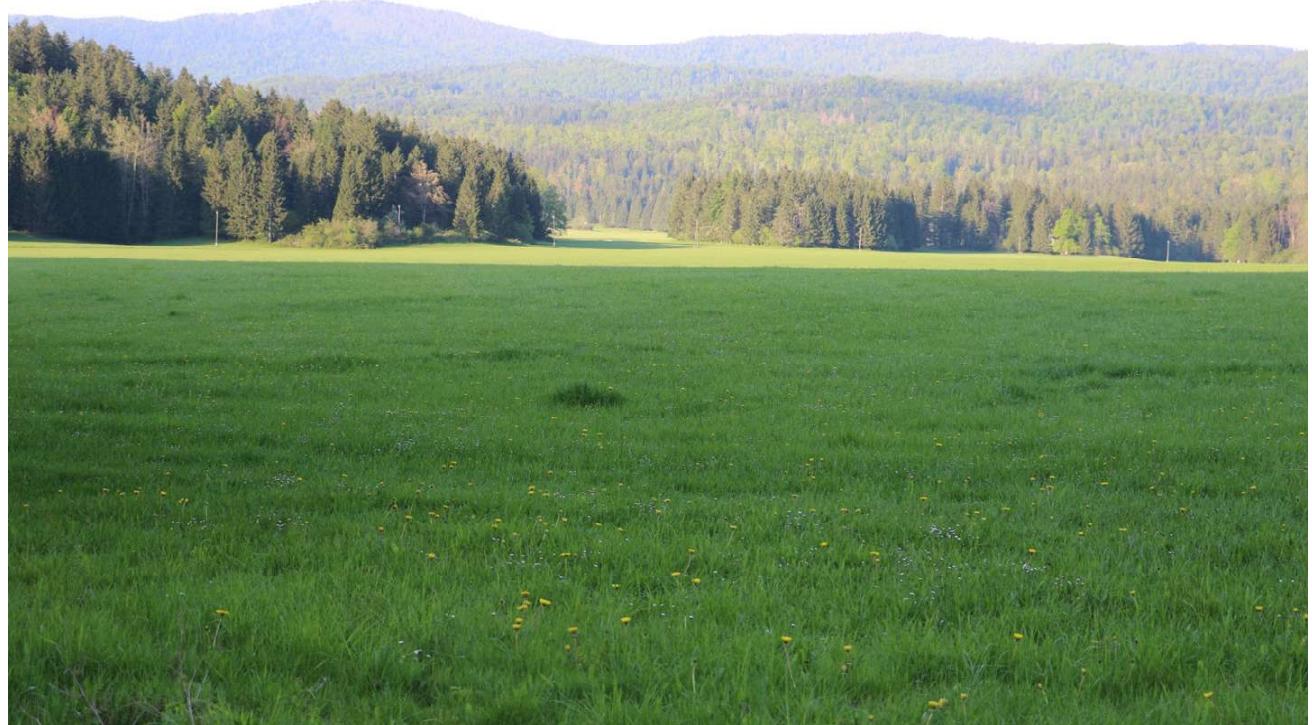
Key words: **Reforestation, biodiversity, grassland management**

INTRODUCTION

Meadows were formed in many different ways. After repeated glaciations and warm periods, first meadows were formed and then, where the conditions were favourable, crest vegetation developed. In moderate temperatures with enough rainfall, this is mostly forest (Seliškar and Wraber 1986). With the development of civilization, man increasingly grubbed up forests and thereby acquired enough land for grazing livestock or cultivation. With the help of people, the fight between forests and meadows in many places changed in favour of meadows, and in many parts of Europe forests disappeared. In their place now grow meadows that people would like to reforest (<http://www.reforestingscotland.org/annual-gathering-2016>).

At the moment, we do not have these problems in Slovenia. Not so long ago, 150 years ago (Fleischmann 1850), we had similar problems in some areas. However, they were not the result of not having enough forests, but

were mostly ecological issues, which today seem so current (Reforesting Commission 1891). People in Karst realized that with an increasing openness of the terrain, the environment is becoming increasingly rockier and the wind (Bora) is becoming stronger. In the past, the forest in the Karst was tinned due to make new pastures, meadows, fields and do to the construction of ships and cities, as the cities in lagoons had to be built on wooden stilts to prevent settlement of houses. On islands the forest disappeared due to intensive grazing. In addition, wind and water erosion also contributed to the bareness of Mediterranean islands. In Slovenia, meadow areas increased mainly by human settlements in the Middle Ages. At that time, the authorities awarded many concessions to those who were willing to populate steep slopes and ravines that were difficult to cross: e.g. Baška grapa ravine in the early 13th century (Štucin 1987) and Kočevsko in the early 14th century (Šumrada 1991, Ferenc & Zupan 2013). With the growing population there was a shortage of land suitable for cultivation. The tendency towards more arable land increased by migrations during Turkish raids. Because of this, they once



again encouraged deforestation and used the acquired surfaces for fields. Due to its location at the junction of four biographical regions (the Alps, the Pannonian Basin, the Dinarides, the Mediterranean, Wraber M. 1969), Slovenian is extremely diverse, which is reflected in a great variety of organisms, diversity of habitat types, ecosystems (Mršić 1997). Even at a distance of only 100km we can experience a drastic change in the terrain and climate impacts. For this reason, management of the environment should not be generalized to the entire country, but has to be tailored to individual regions and micro-environments (Altobelli et al. 2014).

Compared to other European countries, Slovenia is still quite forested. Since the seventies of the last century, the forest cover is only increasing (http://web.bf.uni-lj.si/katedre/clanki/Travinje_Slovenije.pdf). At that time, they began to abandon meadows, which somewhat stopped in the middle of the eighties due to elements for managing pastures. After independence, the overgrowing of land has advanced. In the interior of Slovenia, shrub species can begin to grow on abandoned meadows



already after three years, so in some places you have to use a saw or an axe to remove shrub and tree species already after three, but definitely after five years. They develop very rapidly due to a sufficient amount of rainfall and favourable temperatures (<http://www.ars.si/vreme/zanimivosti/>). In many lowland areas, invasive plant species, such as *Solidago canadensis* L., *S. gigantea* Aiton or *Fallopia japonica* (Houtt.) Ronse Decraene, have developed on former meadows due to inadequate environmental management, and *Rudbeckia laciniata* L. and *Impatiens glandulifera* Royle in more humid areas. In open forest areas, *Phytolacca americana* L. and *P. clavigera* W.W.Sm started to grow. All this is because of the abandonment of use of meadows. From the mid-eighties until today, most of former meadows have already become a completely dense forest. It also includes native as well as non-native tree species. Some species that were once less widespread in Slovenia, e.g. *Picea abies* (L.) Karst. and *Pinus nigra* Aiton. (Wraber M. 1958, 1960, Zupančič 1980, 1999), were increasingly planted during the systematic forestation of the former joint country of the Habsburg Monarchy (Fleischmann 1850, http://freeweb.t-2.net/Vojastvo/dok/Josef_Ressel.pdf, Perko 2016). Therefore, they planted mainly black pine in the Karst region, which is a relatively resistant species and is therefore subspontaneously spreading in this region today. In the interior of the country, they mainly planted spruce (Wraber M. 1960) in the area of former beech and fir forests (*Abieti-fagetum*). Thus, whole plains, like Pokljuka, Jelovica and others, are planted with spruce, which was then subspontaneously spread. Due to the effective transfer of seeds with the wind, it almost became a pioneer species which quickly occupies open, empty areas. Large amounts of seeds and great production potential of native pioneer species, such as *Betula pendula* Roth., *B. pubescens* Ehrh., *Populus tremula* L., *Prunus avium* (L.) L., *Pinus sylvestris* L., *Populus alba* L. and arrivals from America – *Robinia pseudoacacia* L. are causing fast forestation of open areas. Today, we can clearly see from tops of the hills almost everywhere where the meadows once were, if only we know how to read the image of the landscape. We can easily prove overgrowing by

comparing photographic images of past and today or by own experience of the past. Some of today's already forested areas were once known as meadows, which were annually mowed. In Slovenia, there is no need for planting tree species or forestation, as the forest is spreading very quickly by itself.



In some interior parts of Slovenia, foresters frown upon deer that is supposed to be destroying forest undergrowth and preventing faster forest regeneration. In fact, this is only a natural process, since in the past wild animals were the ones that regulated open and forest areas. Due to the extermination of large herbivores as a result of hunting, Europe began to overgrow. After that followed excessive deforestation, because of the need for farmland. Slovenian did not have such problems. It never had such a developed intensive agriculture, since this is not possible due to the morphology of the terrain. On the other hand, the development of a different social system after World War II, which primarily stimulated

industrialization (Vrišer 1976) of relatively rural landscape, gradually resulted in abandonment of agricultural areas and their overgrowing. Even today this is a general phenomenon.

In parts of Istria and the Karst, overgrowing of meadows is a slower process. The reasons are mainly hot and dry summers, as were in 2010, 2011, 2012, 2013 (Kaligarič 1997a, b; Bavcon, Makše 2012) and 2015. In 2013, the drought very markedly affected species that are the most adapted to this climate: *Juniperus communis* L., *Cotinus coggygria* Scop., *Fraxinus ornus* L., *Quercus pubescens* Willd. These dry summers completely dried especially young and small plants. During the wet summer of 2014, they again emerged from roots in some places. These were mainly leafy deciduous species, while conifers, such as *J. communis*, did not regrow. Such extreme summers then stopped the overgrowth of these areas. In the first half of the 19th century, they began with intensive forestation of the Karst (Fleischmann 1850), but today there is no need for this anymore, since the Karst is spontaneously overgrowing, even



too much (Kaligarič 1997a, b; Bavcon 2013). This is mainly the result of the change in the way of woodland management and big enough presence of live seed bank (transfer with the wind and animals) or dormant seed bank in the soil. Reactivation of grazing slowed down the overgrowth. However, grazing is particularly effective where different animals gaze. E.g., only sheep is not enough, because they do not like dry grass and so the latter remains. The most effective is a combination of sheep, goats and donkeys or even only donkeys. Beef cattle mainly do not eat shrub species. Nevertheless, grazing requires a big enough surface of paddocks, so there is no danger of erosion.

In some parts of the hinterland of Slovenia, overgrowth is slowed down by various disasters, such as windbreaks, which are characteristic for individual parts of Slovenia, or sleet, late avalanches, which give the impression of a small glaciation, or beetle attacks (Zupančič 1969, Smukavec 1973, Kordiš 1985, 1986, Jakša 2007 a, b, Jakša et Kolšek 2009). In some parts, where the impact of warm sea and cold continental air intersect, these phenomena are quite often. Frequency of sleet is thus greater in some parts of Idrija and is there detected for centuries, because the forests were well catalogued (Kordiš 1985, 1986, 1993). At that time, forests were very important, because they were a source of wood for mine shafts and a source of wood for burning of ore (Kordiš 1986). Prior to 1492, areas around Idrija were completely covered with forest. Sleet is also very common in Kočevsko. (http://www.zgs.si/fileadmin/zgs/main/img/Novice2014/Naravne_ujme2014.pdf) Despite the fact that these surfaces look like a disaster after the sleet, they recover very quickly due to the seed bank in the soil and transfer of seeds by wind and animals. Therefore, the ground is green again in the following year. Some places are dominated by forest species and somewhere we can find forest edge plants, but elsewhere mostly meadow species. All depends on the location of the donor source of seeds. Forest clearings are surfaces that are certainly very exposed to strong solar radiation. A so-called “pot” effect is formed, with a great difference in temperature between shaded

edges and surface that is exposed to sun. On such a sunny clearing, plants are exposed to strong radiation even in the early morning dew and cold. This does not correspond to many species and it causes scorching and chlorosis, which can be a result of strong UV-B radiation (Bavcon 1996). These areas are dominated by species that can cope with such an environmental factor.



Throughout the development of human civilization, there was a battle between men and the forest. Not only in Slovenia, but also elsewhere in the world. And people were the ones that to a large extent maintained meadows with their activity (Seliškar & Wraber 1986, Vreš s sod. 2014). However, we cannot forget that only the right balance between forests and open meadow and arable land can mean the right ecological balance. The latter vary depending on the individual area and phytogeographical region.

Material and methods

In Slovenia, grass surfaces below the treeline are a result of natural and sudden environmental changes (windbreaks, sleet, and fires) or a result of human influence or their environmental management. The latter is the one that maintained large meadows for centuries. Maintaining grassland was in fact crucial for farmers (Turk 1924, 1925, Rustja 1929). Meadows were in fact a source of food for livestock. In the past, meadow surfaces in Slovenia were separated to pastures, commons, meadows, and even artificial meadows (Rustja 1929). Different terminology for grass lands came into use mainly due to different methods of their management. At the same time it also reflects a close relationship between meadows and rural life, as each term for the grass surface defined a specific type of meadow. Moreover, farmers knew very well what combination of meadow flora gives quality milk or meat or keeps animals well-fed. However, they figured this out with many years of experience and by observing nature. Below we will try to outline meadow management in the past, which affected the survival of farmers and at the same time the preservation of nature. Once it was considered that major part of arable land is for growing food for people and to a lesser extent for animals (Rustja 1929), today the situation in Slovenia is quite different. We do not produce enough food on arable land for our needs (<http://lokalnakakovost.si/lokalna-samooskrba/>). Most of the former arable land, at least in the hilly terrain, is now mowing or grazing land.

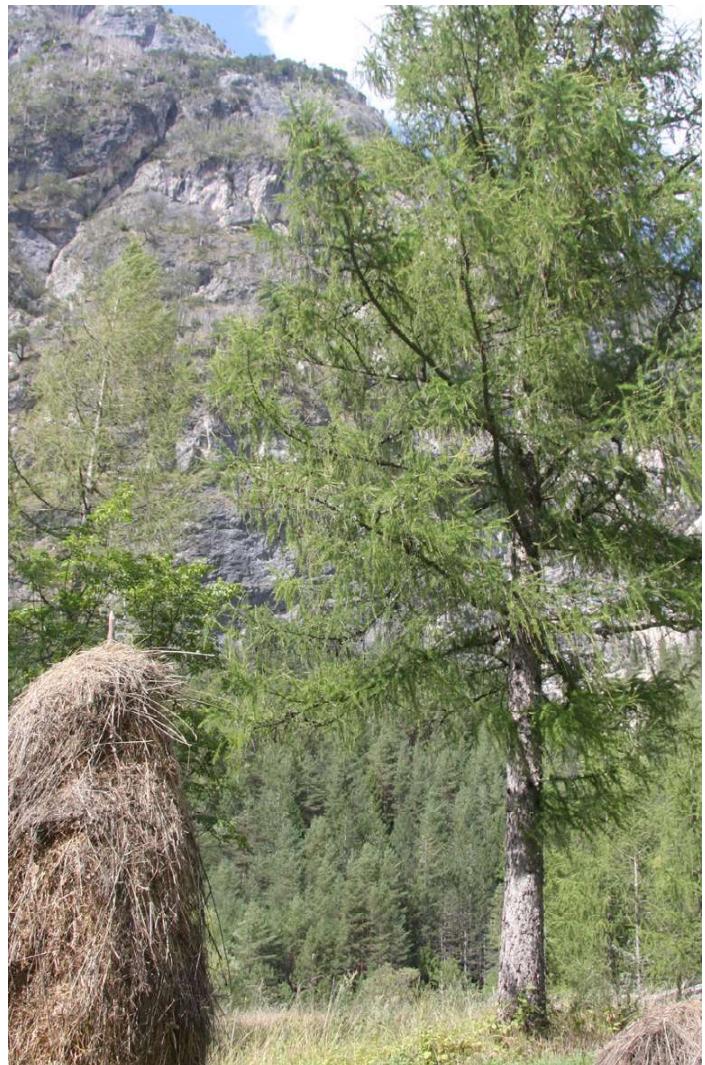
Pastures and meadows were areas that were either very steep or very rocky, or they were on shallow soil (Rustja 1929, Kaligarič 1997a, b; Čemažar 2009). On the slopes, they grazed only small cattle, and shallow soil with little grass was dominated by grazing cattle. Arable land was on quality land, and meadows were on slightly poorer land. Meadows were divided into several-times and one-time mowing land. In the past, several-time mowing meadows in Slovenia were mown up to three, usually two times. One-time mowing meadows were located in hilly

areas, they were the most distant from houses and were called “senožeti, rovti” (meadows, backwater) and other things. Also often used was the concept of the follow. This is an arable land that was abandoned due to crop rotation. The first year, it was usually planted with clover and then grasses and other meadow plants slowly began to dominate. Even after several years after these fields were plowed, such areas were still called fallows.

In the past, they first started to mow fallows. In the central part of Slovenia, the mowing started approx. on 20th of May or even later, in June. These areas were then mowed three times, if the weather allowed. Lowland meadows were mowed in late May and early June or in the second half of June, depending on the altitude and proximity of warm sea influences. Two-times mowing meadows were mowed until the end of June. In July, they started mowing the first meadows, which were then mown from mid to the end of July. In the first half of July, they harvested fields and then continued with their work in meadows. The highest lying meadows were mown until August.



They started mowing early in the morning, when the grass was juicy and dewy. Wet grass was easier to cut. When the sun started to burn, mowers went into the shade, and it was time for rakes. They used rakes to toss around the mowed grass and after a few hours, if the grass was already dry, they turned it for the first time on the same day. They again turned it on the next day and then again on the third day. Dried fodder was then put on hayracks or hay barns (Bavcon 2013). Hayracks are typical for valleys and hay barns for meadows. In Slovenia, hayracks developed mainly in areas with relatively large amount of rainfall and rapidly changing weather. They were used to store half-dried hay, especially at several-times mowing meadows, because weather at first mowing was not consistent and if the weather worsened, they quickly stored half-dried hay under the roof. During periods of frequent rainfalls, they were not able to dry the fodder in three days. Such half-dried feed was placed in battens in hayracks, where it dried completely. Then they moved it from the battens to the top of the hayrack. In addition, different regions used another ways of storing hay, e.g. hay stacks or piles. They were made so that they put a huge pile of hay on a pine pivot (pine poles) and let it dry there completely (Prezelj 1997, Komac 2003, Čemažar 2009). In addition to pine poles they also used others. They had to put dry hay in large piles and not completely dry hay in smaller ones.



There was no need for hayracks on meadows. When they mowed meadows, the weather was already consistent. They decided to mow meadows when it seemed that the weather will be nice, which was normally in the middle of summer. There are several reasons for late mowing of meadows. First, they had to take care of the wheat harvest in the valleys, which was harvested until mid-July in the central part of Slovenia. Then it was necessary to quickly plow fields (usually around 26th of July) and sow buckwheat and turnip, which provided for the second harvest. Then it was time for mowing meadows. Meadows were in higher areas and because they were only mowed once, there was no hurry. They were able to mow the ones in lower areas earlier, in the mid-July (Bavcon 2013). Of course, the mowing in warmer parts of Slovenia (Istria and Karst) was earlier, because grass there rips faster. However, it was important that the grass matured, because during the drying the loss of biomass was lower due to lower water content. Thus, they had enough dry substances (feed) during the winter. If the grass did not mature enough, there was significantly less dry matter. Lowland



parts with enough soil were all processed. These parts consisted of fields because they had to produce enough food for people and animals. By late mowing they made sure that seeds of grasses and herbs shed during drying and turning. Thereby, the stock of seeds in the soil (seed bank) was preserved. They did not fertilize them because manure was used for arable land. Because of all these methods of management, the meadows, compared to today, were much more colourful, especially on higher altitudes.

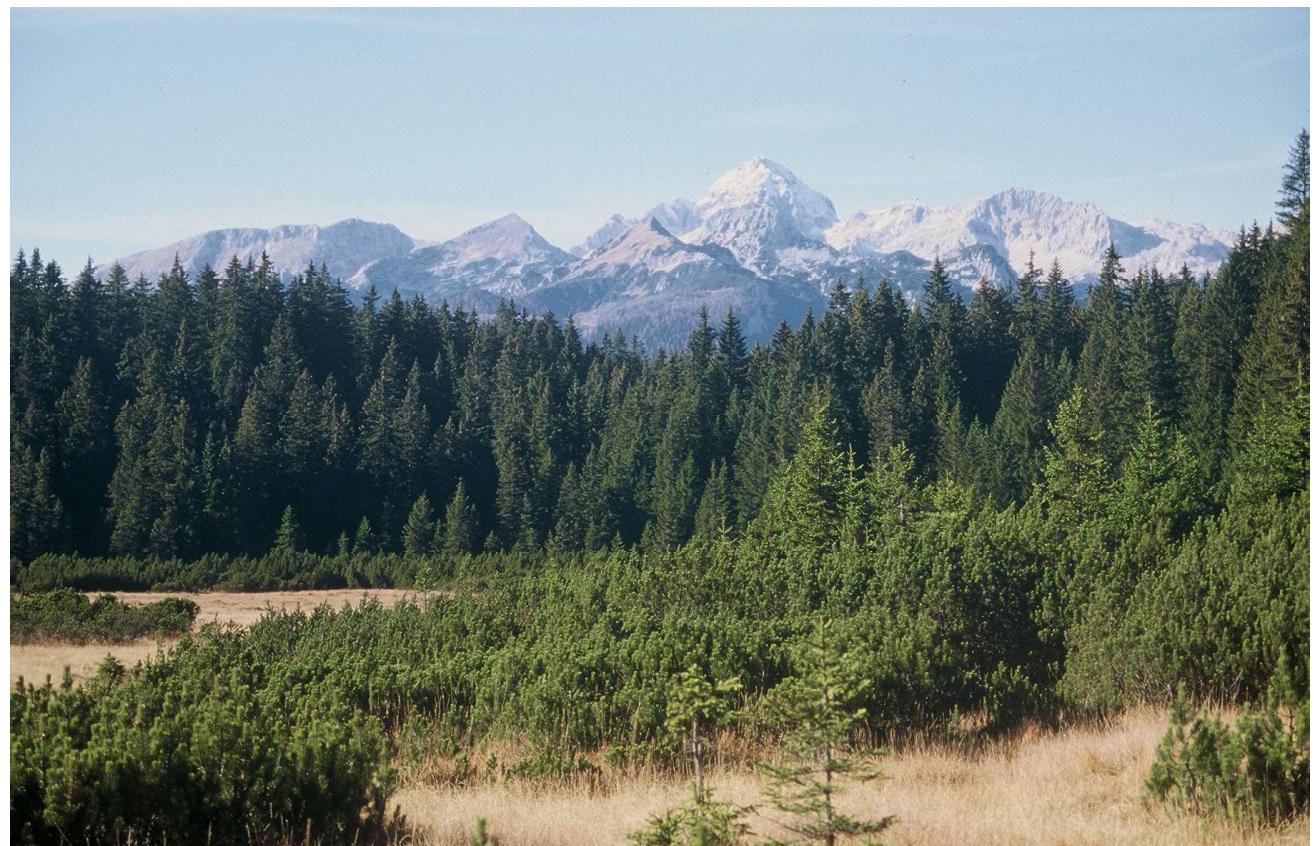
Nowadays, meadows with rich plant diversity are quite rare due to a completely changed way of management. In the seventies, they started ensiling feed to a large extent. Then they carried out this process only on large farms with concrete silos. With the introduction of baling, which started in Slovenia in the nineties (<http://www.daes.si/Konf07/Moljk%20DAES.pdf>) and continued to a greater extent in the new millennium, the method of management completely changed. According to Verbič (2006) only 1/3 of farms dry feed, the rest is ensiled in one way or another,



which means that the grass does not mature. Even in drying the mowing is early and there is not better with the ripening of seeds. They start mowing very early even in mountainous areas. Already on 1st of May or immediately after it, the grass surfaces are mowed for the first time. Then they are fertilized and mowed until October. If there is no drought, there is even more frequent mowing. Changed method of management is present both on large as on small farms. There are enough machines, which perform work very quickly. But this method of management results in a less biodiverse environment (Bavcon 2010, 2013).

Results and discussion

Slovenia lies at the crossroads of different geographical regions: the Alps, the Dinaric Alps, the Mediterranean and the Pannonian Plain (Wraber M. 1969). Each of them, with its distinctive climatic factors and parent basis, influences the flora and fauna. This mixing of different climatic influences in such a small area as Slovenia is the reason for



a rich plant biodiversity, compared to some much larger countries. Slovenia is a true paradise for European plant enthusiasts. But we do not know how to appreciate this enough, let along offer it to foreigners. We take for granted that we have everything in abundance. Often we want to replace beautiful colourful meadows with green English grass without any flowers. But in the immediate vicinity, there are more beautiful, colourful areas that grow effortlessly. Many envy us (Gerritsen 2008), but nevertheless, we put a lot of effort, costs, pesticides and fertilizers to grow dull green lawn.

Slovenia is mostly a forested land. In the context of agricultural land, which comprise of 24% of the area, permanent grassland comprises of 60%. It should be noted that the real assessment is probably different, since according to Forest Act the meadows which passed on to pastures are classified as forests (http://web.bf.uni-lj.si/katedre/clanki/Travinje_Slovenije.pdf). Meadows can be divided into different categories. Either it is a division according to the agricultural use or a division according to their location and environmental factors or a division into habitat types. For the purposes of exploiting meadows for agricultural purposes, we divide them into four types: wetland, lowland-valley, hill-high altitude and mountain-alpine (http://web.bf.uni-lj.si/katedre/clanki/Travinje_Slovenije.pdf). Depending on the area in which they are located and which environmental factors affect them, they are basically divided into three categories: primary, secondary and dry and semi-dry meadows (Kalogarič 2004). Primary meadows are those that are natural and were created without human intervention in the environment. They are located just above the treeline in sub-alpine and alpine zone. Secondary meadows are those that were created under human influence. They are divided into cultivated meadows and pastures and wet grasslands and tall herbs. The first are the most common among both. Intensively cultivated meadows can be found from lowlands to the mountain zone, on grounds that are sufficiently deep and fertilized. Wet grasslands and tall herbs also have anthropogenic emergence. They are developed on wet grounds and include

waterside tall herbs. Dry and semi-dry meadows are divided further into: dry and semi-dry meadows and heathlands below treeline; Submediterranean dry and semi-dry meadows on alkaline basis; continental dry meadows. The first group includes those that are located on non-carbonate basis, in dry to semi-dry areas. The second group of dry meadows is, as the name suggests, developed on a basic basis and is collectively referred to as Submediterranean and Illyrian meadows. The third group includes those dry meadows that are located outside Submediterranean area. They are characterized by not completely dry ground, but with not enough nutrients. Moreover, the ground is medium deep, alkaline, neutral or slightly acidic. On it grow many sensitive plant species, which quickly disappear when adding nutrients (Kaligarič 1997b, 2004). The division of meadows into habitat types is more extensive and longer and, in addition to environmental factors, considers plant groups as the basis for classification (Council Directive 92, HTS 2001, HTS 2003, Evropska komisija, 1999, Jogan s sod., 2004, Interpretation Manual - EUR28, 2013).



However, one or another division does not change the fact that meadows with very little human intervention are beautiful in any season. Grassy areas in different parts come to life at different paces. Although we might expect that they will awake in warmer parts, to where reaches the sea influences, it is often the opposite. Due to wind and karst terrains, resulting in drought, meadows there later become green. They turn green quicker in the interior, first in the sub-Pannonian part of Slovenian with typical continental climate and later in other parts. The only exceptions are the warmest lowland parts of the coastal areas with enough water (Dragonja, Strunjan, Koper hinterland, Komen Karst, Goriška).



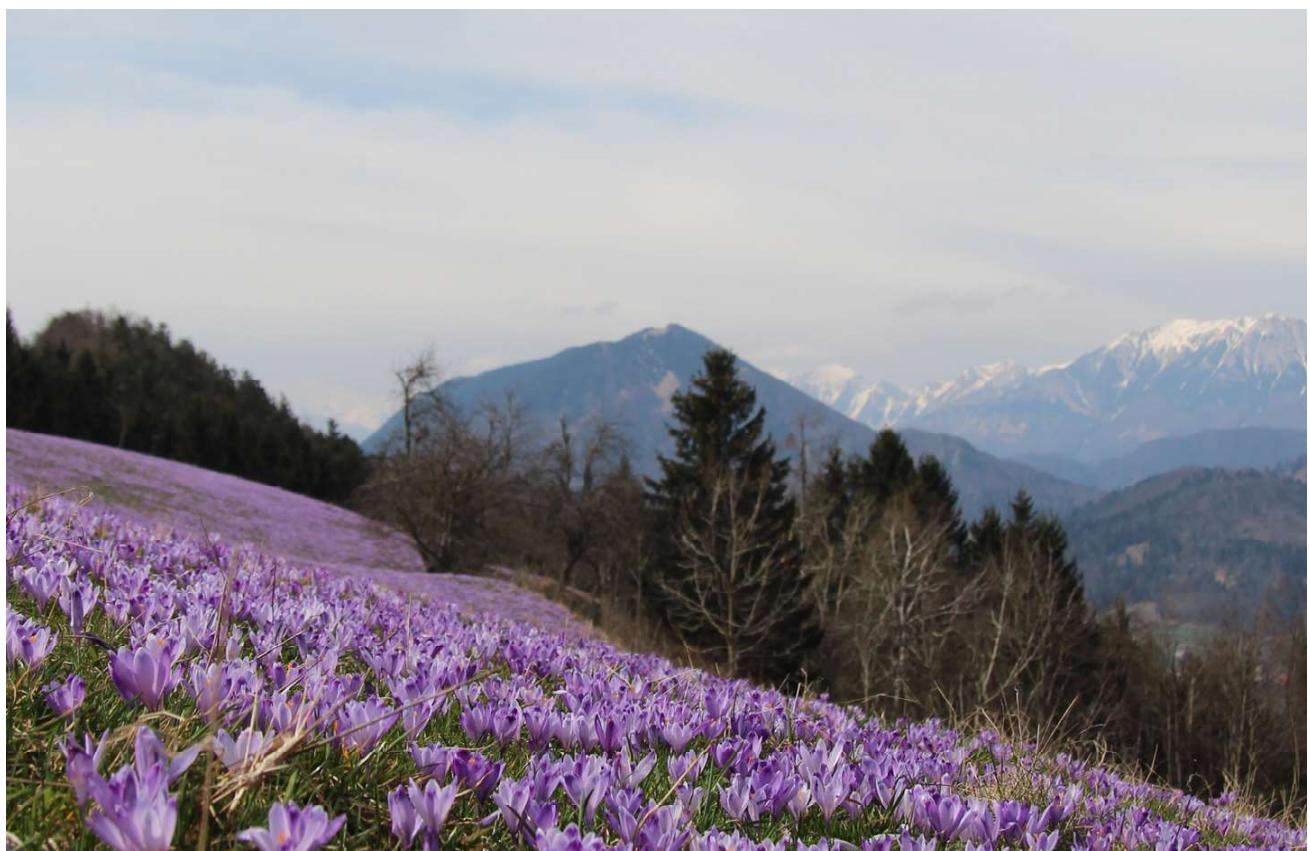
Even in the winter, many meadows, both in Primorje, Istria and Karst, are first covered with common snowdrops (*Galanthus nivalis* L.). This species is always expanding from the forest edge, which indicates that there were once forest areas. If pastures are not fertilized, at least not excessively, then this species can completely whiten the surfaces. This plant is present all the way from the coast to the Pannonian landscape in Prekmurje and subalpine areas. In the Alps, it spreads over Soča valley to the heart of the Alps. It can grow in very different groups (Bavcon 2008, 2010, 2014b, 2016c). Even more specific is another early



spring plant genus - crocuses (*Crocus* L.) Crocuses are typical for the Submediterranean area. Karst grasslands are dominated by striped crocus (*C. reticulatus* Steven ex Adam). In the event that commons are pastured or mowed, it is even more spread. Also it is more spread on shallow grounds, since it does not like deep soil. Therefore, we usually cannot find it in sinkholes. Moreover, sinkholes are colder and are therefore dominated by spring crocus (*C. vernus* (L.) Hill subsp. *vernus*), while stripe crocuses are located on edges of sinkholes and on grasslands above



them (Bavcon 2012). Spring crocus appears more massively than other types. In some parts it completely covers the surface. Mainly it prefers colder, deeper and more compact soil. In Goriško and parts of Komen Karst, there are often very large white populations within the blueness (Bavcon 2010). Spring crocus and white crocus (*C. vernus* subsp. *albiflorus* (Kit.) Acherson & Grabner) massively cover areas in hill parts of Slovenia, where these two types exchange. Thus, for example, everything is blue on pastures of Velika Planina, Cerkljansko and Škofa loka mountains and in many high-altitude places (Bavcon 2010, 2016a). Typical for all these areas is that they all have deep brown and very compact soil. Spring crocus (*C. vernus* subsp. *vernus*) is present in all phytogeographical areas, and it can be widely spread in all these areas. It is characterized by being a type of forest, forest edge, which adapted well to the difficult soil. At the same time, this is the type that spread again on former intensive meadows after more than two decades due to the changed method of management. Many of these areas were transformed into pastures for small cattle. These are suitable for spring crocus, which resulted in the development of true monocultures of this species (Bavcon 2016a)



Elsewhere in these high mountain areas dominate white crocus, which can completely whiten the surface. Among them we can here and there find blue populations. Where these populations are present, we can find all possible colour transitions (Bavcon 2010). Thus, these wavy surfaces can be very colourful. Due to its low growth and slightly smaller flowers, white crocus does not cover the surface as much as the spring crocus. But where there is a lot of it, it is all gleaming white in the sun. At a distance it looks like someone calcified the surface. In the past, they spread lime on acidic surfaces, especially on arable land, to improve them. White crocus is here and there present also in lower altitudes. But then it is located in colder parts and northern positions (Bavcon 2010, 2013, 2016a).

Primerose or common primula (*Primula vulgaris* Hudson), which blooms at the same time as crocuses, is very widely spread in some grassy areas. These surfaces are always facing south, are sunny and the ground can be deep or shallow. However, primerose never covers large areas as the aforementioned spring species. It can still be considered as a meadow species that is very adapted to the human activity. They often occur in mountainous areas on edges, where fields used to be. It needs



more nutrients, and it appears in tall orchards where mowing surfaces used to be (Bavcon 2013).

Hellebores are mostly plants of forests and forest edges, but all types can also be found on meadows. This indicated that these were once forest areas. The earliest is the black hellebore (*Helleborus niger* L.), which occurs mainly in meadows and pastures with calcareous base. Here and there these surfaces are completely whitened. Before flowering and during the time of blossoming, they become slightly pink. They are growing especially abundant on pastures, because they are not eaten by livestock. There arise true monocultures of hellebore (Bavcon 2012). It rises from Alpine valleys to higher areas and is widely spread in high meadows, often together with fragrant hellebore (*H. odorus* Waldst. & Kit.). In lower areas, the latter is mainly a plant of the forest edge and only here and there reaches meadows. It expands only to where reaches the summer shades of trees. In the Slovenian Istria, these two types are replaced by Istrian hellebore (*H. multifidus* Vis. subsp. *istriacus* (Schiffner) Merxm. & Podl.). It is also a plant of sunlit and warm forests of flowering ash, downy oak and Hop Hornbeam, which due to shrinkage of these surfaces also remained on secondary locations, on Karst commons and Karst grasslands. It appears in large bundles between dry grass, in particular, where it is grazed or only occasionally mowed. On places with frequent mowing, plants are smaller but more complex. In Dolenjska region, meadows include dark purple hellebore (*H. atrorubens* Waldst. & Kit.). They make grass surfaces more conspicuous, because the colour of their flowers is extremely dark. It often grows together with fragrant hellebore and so in some places meadows include completely mixed populations. In addition to these two types, we can also find a whole spectrum of hybrids (Bavcon 2016b). This type also spread to meadows from forests and has well adapted to the new method of management.

In the Karst and Slovenian Istria, some places are in spring abundantly overgrown with mountain pasque flower (*Pulsatilla montana* Rchb.), usually together with abbotswood cinquefoil (*Potentilla tommasiniana*

F.W.Schultz) and white cinquefoil (*Potentilla alba* L.). Pasque flowers are located in shallow soil, often in overgrown commons. They appear earlier in the middle of grasses on surfaces that are not mowed or grazed, and a bit later on mowed areas. They are always in meadows with shallow soil. Pasque flowers mark Karst meadows twice, when they bloom and



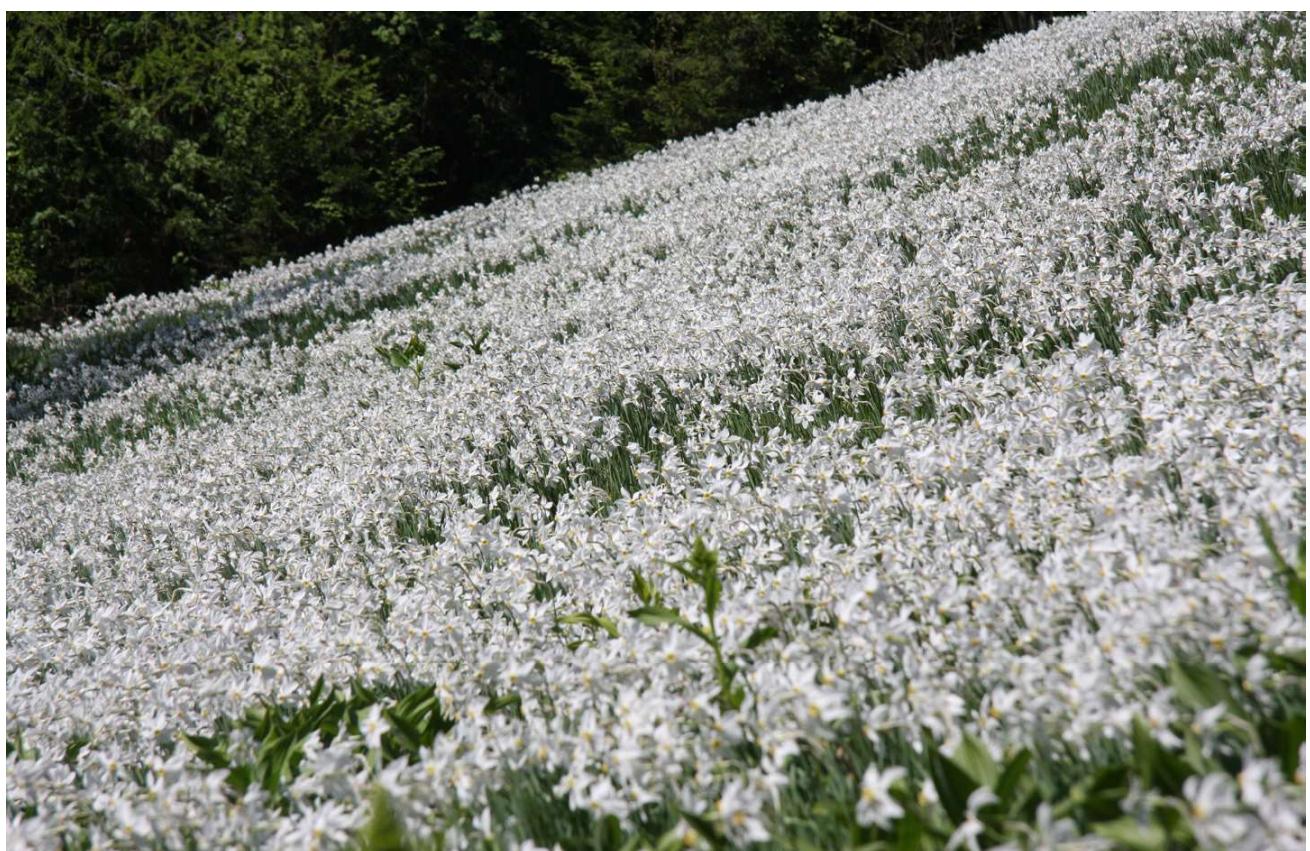
later during proliferation (Bavcon 2013). Such meadows are of course of different groups. Later pasque flowers are joined mainly by poet's daffodils (*Narcissus poeticus* L. subsp. *radiiflorus* (Salisb.) Baker). In the Sub-Pannonian landscape, mountain pasque flower is replaced by black pasque flower (*Pulsatilla nigricans* Störck.), which also occurs in very shallow soil. It is not so common here, because surfaces here are more intensively fertilized and treated than in Istria and Karst. Here and there, we can find a lot of it in sandy soil or somewhat favourable sunny areas. In dry grass, it is joined by the abbotswood cinquefoil and common ball flower (*Globularia punctata* Lapeyr.). The latter is in some places

of Kart and Istria, similar to Sub-Pannonian or Sub-Alpine landscape, so frequent that surfaces are completely covered in blue. Rare are meadows where populations overflow from blue to white. Few of them are on the Podgorje Karst, where ball flower often grows on pastures. Among ball flower quite widely occurs also compact grape hyacinth (*Muscari botryoides* (L.) Mill.), in Sub-Pannonian landscape also grape hyacinth (*M. neglectum* Guss. ex Ten.) (Bavcon 2014a).

In May, Karst and Istria are covered with whiteness of poet's daffodils (*Narcissus poeticus* subsp. *radiiflorus*), which spread into Sub-Alpine, Dinaric and Alpine landscape. Similarly, we find them on overgrown meadows in Kočevko. The largest plains of daffodils are in backwaters on the slopes of Golica, where backwaters are completely covered with daffodils or "ključavnice" as the locals call them. On Karst and in Istria, we can observe their diversity. It is there greater than in considerably denser and more numerous populations on Golica (Bavcon 2010, 2013).



Their diversity varies from tiny and low plants on Karst and Istria to extremely large plants, both in height and size of flowers, in Kočevsko. On Karst, they first start to appear at the edge of bushes, from where populations spread to meadows. In the interior of Slovenia, populations become denser and in some places real monocultures (Golica). In May, daffodils in Karst and Istria are joined by irises. Iris meadows can be gentle blue, although irises tend to escape on steep rocky transitions on the Karst edge. On Čičarija, they are scattered over grassy areas and together with already blooming pasque flowers give a true gentle image. Dalmatian iris (*Iris pallida* Lam. subsp. *illyrica* (Tommasini) T. Wraber) are in Slovenian Istria joined by “Kojniška” iris (*I. sibirica* L. subsp. *erirrhiza* Pospichal) T. Wraber), which here also has its typical locality (Wraber 1990). In places the latter occurs in large quantities. In Slovenian Istria, it is often present in individual sinkholes. However, Nanos already has completely dense grass surfaces of irises, which shade in various colours and only rarely we can find the white ones (Bavcon 2013, 2014a). Everywhere on these surfaces appears also grass-leaved iris (*I. graminea*



L.), which spreads from Karst and Istria deep into the inside. Subspecies of Siberian iris (“Kojniška iris”) barely reaches there, while in lowland meadows, which are swampier, its basic type Siberian iris (*I. sibirica* L.) appears. It normally does not grow in bunches, so these surfaces are much more scattered and iris among the green of grass acts more gently. On even more humid, completely marshy areas, we can find, in addition to Siberian iris, also water iris (*I. pseudacorus* L.). This type is typical for intermittent karst fields, Ljubljana Marshes and other marshy areas. In May, we can find in more humid parts of karst fields a true monoculture of summer snowflake (*Leucojum aestivum* L.), which is not as prominent as the spring snowflake. It can be found among the green of grasses, but is higher, has more flowers and can also take a leading role during this time. In the interior of Slovenia, more humid meadows in May and June are wrapped in purple and yellow colour, which is provided by the dominant types: Ragged-Robin (*Lychnis flos-cuculi* L.) and meadow buttercup (*Ranunculus acris* L.). In some places in the Marshes, we can find entirely purple surfaces of Ragged-Robin even in July.



Peonies join irises and daffodils only in Submediterranean landscape, where massively grows only common peony (*Paeonia officinalis* L.). It grows in places on meadows. It prefers sunny slopes of sinkholes, where it can be a dominant species, or we can find it on karst commons (Bavcon 2013, 2014a, Kaligarič 1997a), but it never covers surfaces. In places it appears in sufficient density and then gives a characteristic appearance of karst meadows and Slovenian Istria. Blooming of peonies coincides with the blooming of the white asphodel (*Asphodelus albus* Willd.). Its long white flower heads and in some places also the blue of the irises beautifully enrich the landscape.

After daffodils and peonies bloom, the image of meadows quickly changes to undulating softness of European feather grass (*Stipa pennata* L.) and Silver Giant Scabiose (*Jurinea mollis* Rchb.). They form bluish surfaces that gently wave in the wind. They are dominant species during this time. Slightly later, these areas are overgrown with white dittany (*Dictamnus albus* L.), which in some places prefers bushes, while elsewhere it



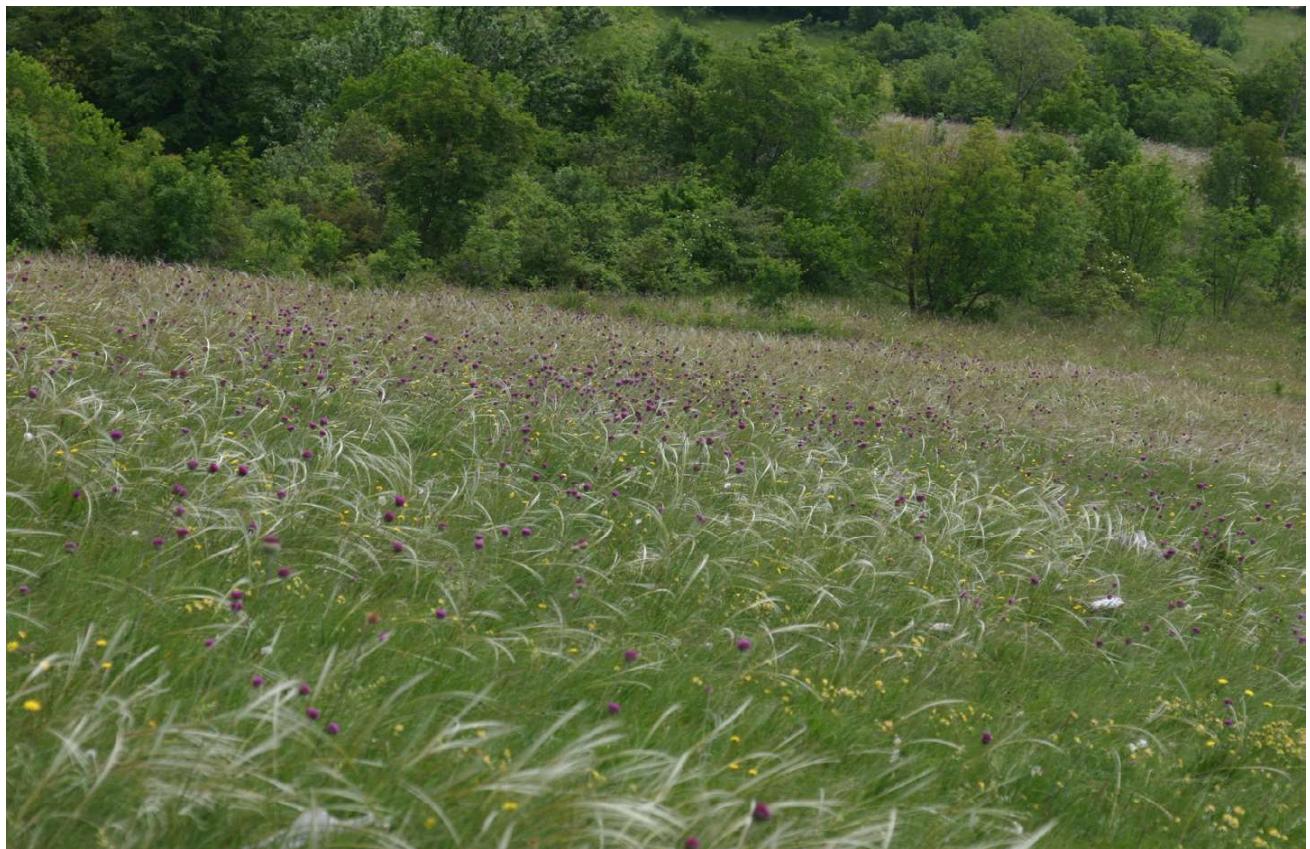
completely covers grass surfaces. Beside it also appear various Southern scabious (*Scabiosa triandra* L.), which only brighten up the image. Apart from it, we can also find yellow rattle (*Rhinanthus sp.*), mountain clover (*Trifolium montanum* L.) and kidney vetch (*Anthyllis vulneraria* L.).

In other areas in the lower parts occur completely yellow meadows, which are first formed by meadow salsify (*Tragopogon pratensis* L. *orientalis* (L.) Čelak.). This type makes meadows beautiful even during the time of seeds, when seed heads open.

In addition to oxeye daisies, meadow buttercup and Ragged-Robin, meadow clary (*Salvia pratensis* L.) is one of the most common species of our less-fertilized meadows. They are true beauties. The drier the year, the earlier the bloom - the first ones already in May and then all the way to June. They are very visible due to their strong blue that colours meadows. They prefer slightly more hardened soil, so they are often present in the middle of paths or at their edges. We can also find them



along the roads, where verges are surfaces by gravel. With this, clary turns from a completely meadow species into a completely ruderal one, as it is sometimes the first that inhabits this type of areas. Since the plant is very sticky, their corollas tend to stick to clothes. This adhesion is maintained also later, when the flowers fall off. With this clary rapidly spreads around. It is a typical meadow plant with large leaves and basal rosette. It survives even mowing and gathers enough nutrients for the next year. Then from the roots first grows a rosette, from which then raises one or more leaved stems. Stem is often branched, but grows from the rosette in an arch and is then turned upwards. Stem has slightly heart-shaped oval, sometimes pointed, roughly toothed leaves. Up the



stem the stalks are getting smaller and shorter. At first flowers, leaves are completely without stalks and are almost as big as the length of the flower. (Bavcon 2013, Bavcon & Ravnjak 2015)

In mid-June beautiful colours appear on dry meadows and in karst fields, which are enriched by Illyrian Gladiolus (*Gladiolus illyricus* Koch.).



During the time of its flowering, its colour is predominant among the green of other plants. At that time, these surfaces are typically Illyrian.



It expands into the interior, but is quickly reduced with a little more intensive cultivation. Therefore, we practically do not see it flower on karst fields anymore due to intensive mowing. It grows only on hedges and in patches that are not mowed. In the past, karst fields were completely purple from its intense colour (Bavcon 2013, 2014a). Mainly on karst fields, great burned (*Sanguisorba officinalis* L.), which also has expressive colours, blends among Illyrian Gladiolus.

Only slightly later, in higher parts of Dinaric landscape, prevails an extremely strong structural type, great yellow gentian (*Gentiana lutea* L. subsp. *sympyandra* Murbeck). It sometimes thrives with its blooms on pastures or late mown meadows. It flowers abundantly every few years, and in the meantime a blue green colouring of its leaves prevails. Of course, umbelifers on dry meadows are a regularity. The most common species is mountain parsley (*Peucedanum oreoselinum* (L.) Moench) which gives dry meadows a completely soft structure and persists long into the summer. At higher altitudes, it is joined by other umbelifers, such as laseworth (*Laserpitium siler* L.) and broad-leaved sermountain



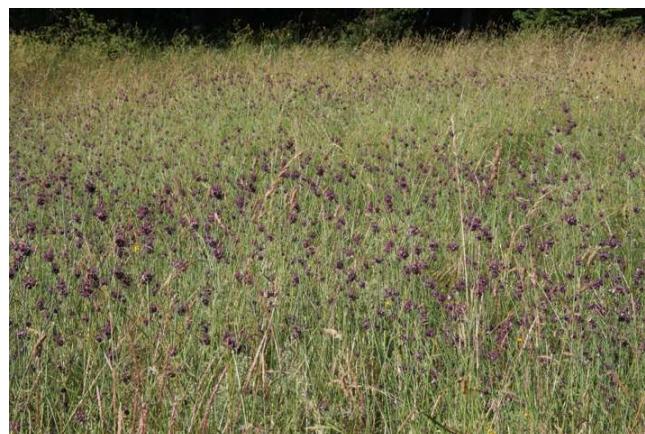
(*L. latifolium* L.). When they become dominant, they indicate the start of overgrowth of surfaces, but at the same time they inhibit rapid growth of other shrub species with their presence.

During the hottest summer blooms branched St Bernard's-lily (*Anthericum ramosum* L.). When everything dries up, when the grass turns yellow, paniculate inflorescence of small star-shape flowers with distinctive monocots opens up on green, fairly woody and branched stems. Because locations where branched St Bernard's-lily grows often have little grass and floors are very shallow, this plant is even more vivid. First, we cannot see it anywhere - how would it be possible to see such a delicate plant in the first part of the summer among the green of the grass?! It is completely transparent. Only after grass and other vegetation are affected by drought, it is time for the branched St Bernard's-lily. It is not denser, it remains transparent, but it overgrows more with each day and then translucent curtain becomes more and more visible, until it turns



into a complete whiteness on a yellow base. Branched St Bernard's-lily is also worn out by the drought, but only to the extent that it no longer has so much flowers and its whiteness fades a little. Karst commons with grazing cattle are after branched St Bernard's-lily completely blue mainly because of the amethyst eryngo (*Eryngium amethystinum* L.). Grazing promotes its growth and therefore it spreads over pastures and creates growing blue patches.

In summer, commons on Karst and in Istria are coloured by leeks. First, this is drumstick allium (*Allium sphaerocephalon* L.) and later ornamental onion (*A. senescens* L.). When summer is turning into autumn, they are joined by the yellow onion (*A. ericetorum* Thore). In higher parts, leeks are joined by summer savory (*Satureja subspicata* Bartl. ex Vis. subsp. *liburnica* Šilić.), and winter savory (*S. montana* L.) in lower parts. Where both species co-exist, we can also find an endemic hybrid - Karst savory (*S. x karstiana*). Slightly further inland of Slovenia dominate sand leek (*Allium scorodoprasum* L.) and keeled garlic (*A. carinatum* L.). Both are present on more dry locations. In wet karst fields or in Marshes prevails mouse garlic (*A. angulosum* L.), which can completely cover surfaces and colour them blue and purple. It can stretches in large areas (Bavcon 2014a).



Although meadows are mainly classified into different groups (Tomažič 1941, Seliškar & Wraber, 1986, Mišić & Lakušić, 1990, Vreš s sod 2014) this part emphasizes horticultural view of meadows and thus exposes their aesthetic role. It creates a true biodiversity of meadow plant species and during one year one group can show a variety of images prevailing in particular part of the year. Of course, this does not detract from the importance of the group itself, but it only increases and fulfils its diversity. In this part, we were interested mainly in this image, which is increasingly appreciated among horticultural enthusiasts. This image is losing due to the changed method of management. It almost disappeared in most parts of Europe, and now this is happening before our eyes. The aim of this thesis is to draw attention to the importance of meadows, which have extremely high biotic and horticultural value. The latter can be transferred to the field of eco-tourism and in this way we can preserve these colourful and valuable areas for the future generations. Seliškar and Wraber 1986 were writing about these colourful areas: “The most colourful plant scenes in our region can be seen on meadows.” Or, as it was written about our karst meadows by Gerritsen (2008): “Karst is a true paradise for garden lovers.”

In the respect of horticulture and eco-tourism, these vivid meadows have a significantly higher value. They can become market products, if we are able to understand them in terms of natural flowering gardens (Bavcon 2013). There is not a lot of such blossoming meadows in Europe, so



these areas are defined as protected areas in various directives (Council Directive 92/43/EEC, Dellivers & Dellivers Terschuren 1996, Čušin (2004), Interpretation Manual - EUR28, 2013). In Slovenia, these areas are mainly sufficiently present, and therefore, they are of great value and have nature protection and also high commercial value. If we would know how to exploit them in eco-tourism purposes, we would be able to preserve them and contribute the most to the protection of nature. Therefore, it is necessary to have a comprehensive view of nature and its values. The fact that Gerritsen (2008) specifically mentioned Slovenian meadows in his essay on gardening and recommended them to everyone who deals with gardens shows that they are extremely interesting.

Meadows are increasingly more interesting parts of modern gardens, both botanical as private. Some are trying to design as much sustainable meadows as possible (Carrick limited 2000, Lewis 2003) or they are artificially created and show colour variation (Lord 1995, Lloyd & Hind 2007, Garret 2016). Moreover, we practically do not have contemporary design of gardens without creating similar motives as seen in meadows.



They can be the sustainable or artificially created (Oudolf & Kingsbury 1999, Price 2016). For many years, important botanical gardens in Europe are leaving meadows unmowed for a long time as extremely interesting habitats, so people can learn about the colourful diversity of plants (Bown 1992, Hagemann & Zepernick 1993, Monem 2007, Oldfield 2010). Nowadays, this is a growing phenomenon and practically there is no botanical garden without a meadow. The Ljubljana Botanical Garden has long tradition in doing so (Strgar 1973). We intensively started to leave areas unmowed in the last 20 years, which has contributed to the fact that early spring plants spread over the entire surface of the garden (Bavcon 2000, 2010). In the past, they left surfaces unmowed only until the beginning of May and this only in a small area of the oldest part of the garden. In the meantime, we created artificial meadows on the provided construction site of a new greenhouse (Bavcon et al. 2015). In addition to sustainable meadow areas in the garden, which we leave unmowed for a long time, the Ljubljana Botanical Garden monitors and maintains 2ha large meadow on the edge of Ljubljana since 1998. We mow it only once



a year, late in the summer, and every year we collect seeds of plant species that grow there (Bavcon & Marinček 2004, Bavcon 2010). We contributed a part of these seeds to the Millennium seed bank in Kew (Ravnjak & Bavcon 2014, Bavcon & Ravnjak 2014). Tomažič already ranked it in the group that was formed from former forest groups *Pineto-Genistetum januensis*, which still remain on the outskirts of this part. In today's spring image of meadows, the dominant species is purple broom (*Chamaecytisus purpureus* Scop.) that colours the meadow completely pink. In his vegetation censuses of meadows and pastures on shallow and dry soil of Slovenia, Tomažič (1941) often describes the purple broom as a type of "pine pioneers that is trying to settle on a dismembered turf of moss and herbs grass". Tomažič (1940) lists the type as *Pineto- Genistetum januensis* association. He also writes: "Purple broom (*C. purpureus*) grows the most numerously and constantly in normally developed individual associations. It grows here the best. It is also very common in some meadow groups, where pine trees are very rarely planet or there are not any. Thus, e.g., in shallow, dull and dry meadows that grow on gravel in Posavje, near pine forests, and belong to the association of *Carex humilis- Centaurea rhenana*". He also mentions that the purple broom is a pioneer of the emerging forest or it indicates that these brooms were created from the former groups of pine forests (Tomažič 1940).

Today, we classify meadows as a habitat type of semi-dry meadows, rich with orchids (Devilers & Devilers Terschuren 1996, Jogan s sod. 2004), and we could classify it in the group of *Onobrychido viciifolie-Brometum* (Bavcon & Marinček 2004).

However, the image of this meadow changes from spring to autumn and shows many different horticultural aesthetic values that are so interesting that it would not be good in regards to value to reduce it to a single one. Meadow is rich with orchids, which dominate in the end of April or in May. Later appear pink flax (*Linum viscosum* L.), Illyrian Gladiolus (*G. illyricus*) and colourful dyer's greenweed (*Genista tinctoria* L.). In the summer, their image is dominated by Greater Knapweed (*Centaurea scabiosa* L.) and then Pannonian Tristle (*Cirsium pannonicum* (L. f.)



Link). In the second part of the summer, the main structure is provided by mountain parsley (*P. oreoselinum*) and branched St Bernard's-lily (*A. ramosum*). All these variations of one and the same meadow are so highly valued that they give added value to the meadow. With this, its justification for nature protection and ecotourism status gained such a value, so that we could use this meadow to create interesting products, since it includes over 120 different species (Bavcon & Marinček 2004). Kalgarič (1997a) states Karst pastures of dwarf sedge and rock knapweed *Carici-Centauretum rupestris* as one of the most colourful meadow groups in Europe, which we can only confirm from the horticultural point of view. Gerritsen (2008) states similar for these surfaces. Kalgarič (1996), Škornik & Kalgarič (1997), Škornik (1998, 2001) already wrote about endangered meadows of the *Brometalia erecti* order in the interior of Slovenia. In the Ljubljana Botanical Garden, they started more intensively monitor biodiversity of dry meadows near Sava in 1998. At that time, they presented the issue on an exhibition at the Ljubljana Castle. In the Garden, we are emphasizing the importance of meadows as our beautiful colourful

gardens with extremely high horticultural value for many years, and we popularize this issue in the general public (Bavcon 2010, 2013).



Just like dry meadows, wet meadows are noting less at risk. Wet meadows include the same processes that are shrinking meadow surfaces (overgrowth or invasive mowing). Only in some more wet years early mowing is not possible due to heavy machinery. There we can find summer snowflake (*L. aestivum*), and later on the same areas of some Karst fields grows mouse garlic (*A. angulosum*). The latter is more endangered, since mowing is more frequent during its flowering. Zelnik (2012) classifies meadows with mouse garlic (*A. angulosum*) in the group of creeping cinquefoil and mouse garlic (*Potentillo reptantis-Allietum angulosi*) (Zelnik et al 2012). This species is present also in other communities (Zelnik 2005, 2011). The said group grows on karst fields. It can be found in hallows and karst sinkholes and on the bottom of some intermittent karst lakes (Lake Petelinje, Lake Palčje) (Zelnik et al 2012).

In August, when dominant species - mouse garlic blooms, the stands are highly visible and with characteristic flourishing in depressions clearly show the unique vegetation type. From spring to autumn, this group is also changing and shows different images, but is always very interesting as horticultural, colourful meadow surface (Bavcon 2014a).

These examples of horticultural meadows with diverse species are just



one of many that we have in Slovenia. It is this seasonal diversity of our meadows that raises their value to a high European level in several aspects. This is one of the main arguments why to preserve these areas with traditional method of management for our future generations. This would also preserve the rich biodiversity of meadows. The initiative for the protection of rocky meadows is old and was already pointed out by Angela Piskernik (1961). In recent times, various European directives also address the protection of these habitats (Council Directive 92/43/



EEC, Dellivers & Dellivers Terschuren 1996, Čušin (2004), Evans 2005 Interpretation Manual - EUR28, 2013). Nowadays, these initiatives could be joined by the initiative for the protection of commons, dry and wet meadows. We should introduce late mowing, as it was in the past, and also traditional harvesting of dry hay. According to the data, today mown grass is mainly ensiled and surfaces are intensively fertilized or they are left to overgrowth. With this we are actually losing natural seed bank and consequently the biodiversity of Slovenian meadows. The crucial importance of meadows and the need for their protection was pointed out at the opening of the Millennium seed bank in 2000 in Wakehurst place, where they arranged beds with colourful meadows in front of facilities (Bavcon 2000).

Overall, biodiversity of Slovenian meadows is threatened especially due to early mowing and excessive fertilizing of surfaces. Cattle breeders usually prefer very early mowing, because the most important to them is the quality of the feed, which is also true for karst meadows (Pornaro et al. 2014). In

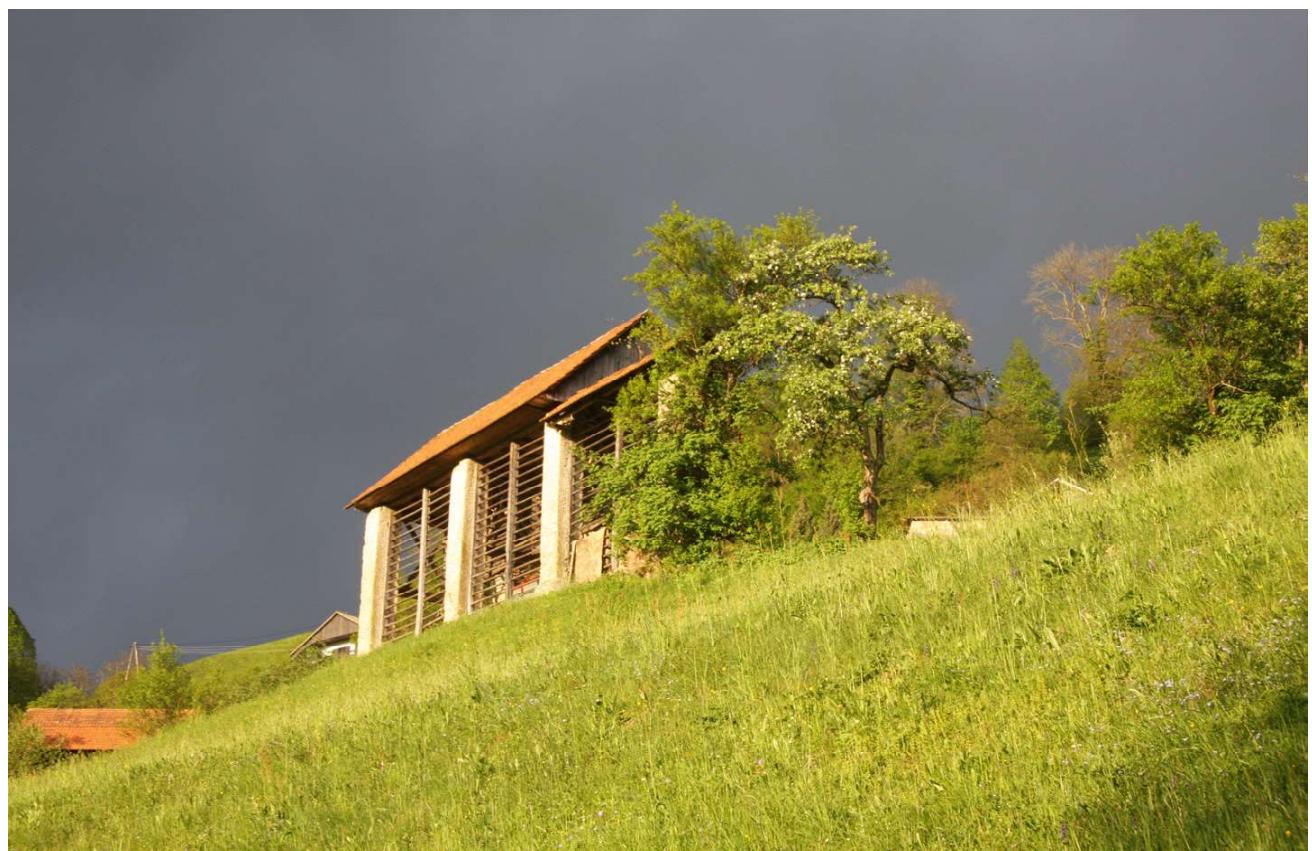
the past, it was considered that meadows are not mown before the grass is stripped, which means that grass must first mature and its seeds than fall to the ground. There used to be less meadows, because there was more arable land where they cultivated food. Less than hundred years ago, it was written that Slovenia requires a lot of arable land because it is very densely populated (Rustja 1929), which is why they left the grass on meadows to mature, so they had more dry matter, which was of poorer quality but allowed the survival of livestock through the winter. With intensive cultivation of feed started early mowing of meadows, which is rapidly decreasing the diversity of meadows and that is why the need to protect their diversity is so much bigger.



Conclusion

Maintaining high biodiversity of meadows is extremely important, not only because of the high aesthetic value but also because of the added value in agriculture. Colourful diversity of meadows is the one

that makes landscape beautiful and thus represent an excellent tourist product. High plant biodiversity of meadows also provides higher quality of pasture. Researchers have found that milk from animals grazing on pastures with a large number of different plant species contains more fat and antioxidants (Stypinski 2011). Rich diversity of meadow plants also affects bee pasture. If meadows include different plant species that also have different flowering periods, they provide bees pasture from early spring to autumn. Diverse bee pasture also influences better quality of honey and other bee products. Large meadow areas with diverse vegetation also store much more carbon than poorer grassland or fields with crops. They are more productive and give home to a large number of different organisms. At the same time they prevent erosion and water evaporation (ZVRSN 2011). It is vital that we preserve meadows as colourful as possible. On the edge of Ljubljana, in Roje, the Ljubljana Botanical Garden *in-situ* protects a dry meadow. On this meadow grow numerous plant species, including many that are listed on the red list of endangered plant species (Bavcon & Marinček 2004). Meadows are



mown in late summer when most plants have shed their blossoms and their seeds are mature enough. With late mowing we are preserving the natural seed bank of the meadow. We also regularly remove all invasive species that occur there because of nearby abandoned fields. In addition, with annual mowing we gain some hay debris from the mentioned meadow and gather seeds of its plant species for the seed bank in the Botanical Garden. This provides stock and protection of genetic material in the form of seeds for the reproduction needs of plant species on other sites.

LITRATURA / LITERATURE

- ALTOBELLIA, GANIS P., POLDINI L. ZANATTA K. 2014. The Technical and scientific mangement of the steppe grasslands of the Italian and Slovenian Karst for the conservation biodiversity and Habitats. In Buzan E. & Pallavicini A. BioDiNet. pp138-154.
- BAVCON J. & MARINČEK A. 2004. A dry meadow as a live seed bank and an object of research. Scripta Botanica Belgica, 29: 131-134.
- BAVCON J. & RAVNJAK B. 2014. Seed banks as a partnership for global plant conservation = Semenske banke kot oblika partnerstva za globalno varovanje rastlinskih vrst. Acta biologica slovenica, vol. 57, št. 1, pp. 3-13
- BAVCON J. 1996. Vpliv ultravijoličnega sevanja na smrekove presajenke (*Picea abies* (L.) Karst.) = Effects of UV-B radiation upon norway spruce seedlings (*Picea abies* (L.) Karst.). Ljubljana: Biotehniška fakulteta, Oddelek za biologijo, 1996. 110 pp.
- BAVCON J. 2000. »Vrt domovinske flore« Botanični vrt v Ljubljani / »Native Flora Garden« Botanical Garden in Ljubljana. Kmečki glas. 111 pp.
- BAVCON J. 2008. Navadni mali zvonček (*Galanthus nivalis* L.) in njegova raznolikost v Sloveniji = Common snowdrop (*Galanthus nivalis* L.) and its diversity in Slovenia. Ljubljana: Biotehniška fakulteta, Oddelek za biologijo, 94 pp.
- BAVCON J. 2010. Botanični vrt Univerze v Ljubljani / University Botanic Gardens Ljubljana, Ljubljana: Kmečki glas, 231 pp.
- BAVCON J. 2013. Naše rastline. 1. izd. Celovec: Mohorjeva, 2013. 256 pp.
- BAVCON J. 2014A. Belo cvetoče različice v slovenski flori = White-flowered varieties in Slovenian flora. Ljubljana: Botanični vrt, Oddelek za biologijo, Biotehniška fakulteta, 2014. 349 pp.

BAVCON J. 2012. *Crocus reticulatus* and its hybrids in Slovenia. V: WG2 Interim Meeting on Phytochemistry and Metabolics and WG2/WG4 Looking for Synergy and Dissemination Capacity Building, WG1 Interim Meeting on Genetics, Genomics & Transcriptomics and WG2/WG3/WG4 Looking for Synergy and Dissemination Capacity Building. SANTANA ORTEGA, Ana T. (ur.). Book of abstracts : COST action FA1101 - main questions and foreseen solutions in the frame of Saffronomics research. pp. 203-220, ilustr.

BAVCON J. 2014B. Navadni mali zvonček (*Galanthus nivalis* L.) v Sloveniji = Common snowdrop (*Galanthus nivalis* L.) in Slovenia. Ljubljana: Biotehniška fakulteta, Oddelek za biologijo, 308pp.

BAVCON J. 2016A. Žafrani (*Crocus* L.) - raznolikost v Sloveniji = *Crocus* (*Crocus* L.) - diversity in Slovenia. Ljubljana: Botanični vrt, Oddelek za biologijo, Biotehniška fakulteta, 177 pp.

BAVCON J. 2016B. Telohi (*Helleborus* L.) - raznolikost v Sloveniji = *Hellebore* (*Helleborus* L.) - diversity in Slovenia. Ljubljana:

BOTANIČNI VRT, Oddelek za biologijo, Biotehniška fakulteta, 2016. 235 pp.

BAVCON J. 2016C. Navadni mali zvončki (*Galanthus nivalis* L.) = Common snowdrops (*Galanthus nivalis* L.). Ljubljana: Botanični vrt, Oddelek za biologijo, Biotehniška fakulteta, 240 pp.

BAVCON J., ELER K., ŠUŠEK A. 2012. Telohi (*Helleborus* L.) v Sloveniji = *Helleborus* (*Helleborus* L.) in Slovenia. Ljubljana: Botanični vrt Univerze = University Botanic Gardens, 205 pp.

BAVCON J., MAKŠE J. 2013. Nabiranje semen v sušnem letu 2012. V: Bavcon, Jože (ur.). Nabiranje semen v sušnem letu 2012 = Seeds collecting in the dry year 2012. Ljubljana: Botanični vrt, Oddelek za biologijo, Biotehniška fakulteta, 2013. <http://www.botanicni-vrt.si/pdf/books/seeds-collecting-in-the-dry-year-2012.pdf>

BAVCON J., MARINČEK A., RAVNJAK B. 2015. Travniška kadulja (*Salvia pratensis* L.) v Sloveniji = Meadow clary (*Salvia pratensis* L.) in Slovenia. BAVCON J, Ravnjak B. & Bavcon D. (editors). Ljubljana: Botanični vrt, Oddelek za biologijo, Biotehniška fakulteta, pp. 70-100.

BAVCON J., RAVNJAK B. 2015. Travniška kadulja (*Salvia pratensis* L.) v Sloveniji = Meadow clary (*Salvia pratensis* L.) in Slovenia. Ljubljana: Botanični vrt, Oddelek za biologijo, Biotehniška fakulteta, 160 pp.

BOWN D. 1992. 4 Gardens in one. The Royal Botanic Garden Edinburgh. HMSO 211pp.

CARRICK A. G. LIMITED 2000. The Garden at Higrove. Weidnefield & Nicolson Wellington House 125 Strand London WC2R OBB. 176 pp.
Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora Official Journal L 206, 22/07/1992 P. 0007 – 0050.

ČEMAŽAR V. Z. 2009. Novaki, Novačani in »vaznkaš« skozi čas. Čemažar, 262 pp.

ČUŠIN B. 2004 (ur.), et al. Natura 2000 v Sloveniji, Rastline. Ljubljana: Založba ZRC, ZRC SAZU.

DEVILLERS P. & DEVILLERS TERSCHUREN J. 1996. A classification of Palearctic habitats. Nature and Environment, No.78. Strasbourg, Council of Europe Publishing.
Evans D. 2005. Natura 2000. Completing the EU's network of sites to conserve flora and fauna. Plant talk 39: 22-27.

EVROPSKA KOMISIJA, 1999 – Interpretation Manual of European Union Habitats

FERENC M. & ZUPAN G. 2013. Po sledeh Kočevarjev v Črmošnjiško-Poljanski dolini. Auf den Spuren der Gottscheer in der Mocshnitze. Dolenjske toplice; Društvo Kočevarjev staroselcev. 299pp.

FLEISCHMANN A. 1850: Goli in pusti Kras v 3 letih v mlade seženj visoke boršte spreoberniti. Novice 8 (44): 183, (45): 187-188, (46): 191-192, (47): 196, (49): 206-207, (50): 209-210, (51): 213-214, (52): 218.

GABROVEC M. 2008. Splošne značilnosti rabe tal. In: Hrvatin, M. in sod., kartografi Fridl, J. et al.. Kras- trajnostni razvoj kraške pokrajine. Ljubljana: ZRC SAZU, pp. 129-136.

GARRET F. 2016. Great Dixter. Garten praxis 1: 40-53.

GERRITSEN H. 2008 - Essay On Gardening Publisher Architectura & Natura, 396 pp.

HAGEMANN I., ZEPERNICK B. 1992. Der Botanische Garten Berlin-Dahlem. Botanischer Garten und das Botanische Museum Berlin-Dahlem. 112 pp.

HTS 2001 – HABITATNI TIPI SLOVENIJE, TIPOLOGIJA. MOP, UVN 2001. Izvajalec projekta: Triglavski narodni park s podizvajalci: Biološki inštitut ZRC-SAZU, Biotehniška fakulteta Univerze v Ljubljani, Center za kartografijo favne in flore, Pedagoška fakulteta Univerze v Mariboru.

HTS 2003 – HABITATNI TIPI SLOVENIJE, TIPOLOGIJA. MOP, ARSO 2003. Izvajalec projekta: Triglavski narodni park s podizvajalci: Agencija RS za okolje, Biološki inštitut ZRC-SAZU, Biotehniška fakulteta Univerze v Ljubljani, Pedagoška fakulteta Univerze v Mariboru.

http://freeweb.t-2.net/Vojastvo/dok/Josef_Ressel.pdf

<http://lokalna-kakovost.si/lokalna-samooskrba/>

http://web.bf.uni-lj.si/katedre/clanki/Travinje_Slovenije.pdf

http://web.bf.uni-lj.si/katedre/clanki/Travinje_Slovenije.pdf Razširjenost in prihodnost travinja v Sloveniji, 1-8

<http://www.arso.gov.si/vreme/zanimivosti/>

<http://www.daes.si/Konf07/Moljk%20DAES.pdf>

<http://www.reforestingscotland.org/annual-gathering-2016>

<http://www.reforestingscotland.org/>

http://www.zgs.si/fileadmin/zgs/main/img/Novice2014/Naravne_ujme2014.pdf

INTERPRETATION MANUAL OF EUROPEAN UNION HABITATS
EUR 28, 2013 EUROPEAN COMMISSION DG
ENVIRONMENT Nature ENV B.3 144pp

JAKŠA J. 2007A. Naravne ujme v gozdovih Slovenije. Gozd.
Vest. 3. Ljubljana

JAKŠA J. 2007B. Naravne ujme v gozdovih Slovenije. Gozd.
Vest. 4. Ljubljana

JAKŠA J., KOLŠEK M. 2009. Naravne ujem v slovenskih gozdovih.
Natural disaster in Slovenia Forest 4. Ujma 23:72-81

JOGAN N., KALIGARIČ M., LESKOVAR I., SELIŠKAR A. IN
DOBRAVEC J. 2004. Habitatni tipi Slovenije HTS.64 pp.

KALIGARIČ M. 1997B. Botanični in naravovarstveni pomen
travnikov združbe *Danthonio-Scorzoneretum villosae*
Ht. & H-ić (56)58 nad Rakitovcem v Čičariji (jugozahodna
Slovenija). *Annales, Series historia naturalis*, št. 11, pp. 33-38.

KALIGARIČ M. 1996. Ogrožena flora in vegetacija slovenske
tradicionalne krajine. V: Maher, Igor (ur.). *Zbornik seminarja*
Kmetijstvo, ki ohranja biološko raznovrstnost, Ljubljana, 22. - 23.
februar 1996. Ljubljana: Slovenski sklad za naravo, pp. 121- 123.

KALIGARIČ M. 1997A. Rastlinstvo Primorskega krasa in Slovenske
Istre: travniki in pašniki, (Knjižnica *Annales majora*). Koper:
Zgodovinsko društvo za južno Primorsko: Znanstveno-
raziskovalno središče Republike Slovenije. 111 pp.

KALIGARIČ M. 2004. Rastlinske združbe V: Narava Slovenije. Ljubljana, Mladinska knjiga, 183-197.

KOMAC V. T. 2003. Zakladnica bovške preteklosti. Založba Bogataj, Idrija. 176 pp.

Komisija za pogozdenje Krasa v pokneženi grofiji Goriški in Gradiški poroča o svojem delovanji v dobi od 30. septembra 1884 do konca l.1890 (1891). URN:NBN:SI:DOC-WW0NKPMC from <http://www.dlib.si>

Komisija za pogozdovanje Krasa. 1891 Komisija za pogozdenje Krasa v pokneženi grofiji Goriški in Gradiški poroča o svojem delovanji v dobi od 30. septembra 1884 do konca l.1890, pp 33.

KORDIŠ F. 1985. Ali idrijskemu gozdu grozi uničenje zaradi požleda.

KORDIŠ F. 1986. Idrijski gozdovi skozi stoletja 1986.

KORDIŠ F. 1993. Dinarski bukovi gozdovi v Sloveniji.

LEWIS P. 2003. Making Wildflower Meadows. Published by Frances Lincoln. Dorset

LLOYD & HIND 2007. A guide to Great Dixter. 26pp

LORD T. 1995. Gardening at Sissinghurst. Macmillan. USA. 168 pp.

MIŠIĆ L., LAKUŠIĆ R. 1990. Livadske biljke. Priroda Jugoslavije. Svjetlost. Sarajevo, Beograd. 227 pp.

MONEM N. K. 2007. Botanic Gardens a living history. Black dog publishing. London.

MRŠIĆ N. 1997. Biotska raznovrstnost v Sloveniji: Slovenija - »vroča točka« Evrope. Ljubljana: Ministrstvo za okolje in prostor, Uprava RS za varstvo narave. 129 pp.

OLDFIELD S. 2010. Botanic Gardens: Modern-day Arks. New Holland. 240 pp.

OUDOLF P., KINGSBURY N. 1999. Designing with plants. Conran Octopus. 160 pp.

PERKO F. 2016. Od ogolelega do gozdnatega krasa. Pogozdovanje krasa. Zveza Gozdarskih društev Slovenije. Gozdarska založba Založništvo Jutro. 269 pp.

PISKERNIK A. 1961. Grbinasti travniki. Proteus 23(7): 187.

PORNARO C., MACOLINO S IN ZILITO U. 2014 Productivity and forage quality of Karst Meadows under range of mowing management. In E. Bužan & A. Pallavacini BiDi Net. Pp181-194.

PREZELJ V. 1997. Cerkljanska skozi čas: prispevki za zgodovino Cerkljanske II / Bogataj, (Idrija: ABC Merkur). - 208 pp.

PRICE S. 2016. True colours. Garden Illustrated. 232: 86-89.

RAVNJAK B. & BAVCON J. 2014 Seeds Collecting for In Situ and Ex Situ Conservation in Seeds Collecting for In Situ And Ex Situ Conservation Purpose pp. 1-49.

RUSTJA J. 1929. Travništvo Goriška Mohorjeva družba, Gorica 1-102pp.

SELIŠKAR A. & WRABER T. 1986. Travniške rastline na Slovenskem. Sto pogostih vrst. Prešernova združba, Ljubljana 229 pp.

SMUKAVEC A. 1973. Snegolomi in vetrolomi na Jelovici. Bohinjska Bistrica

STRGAR V. 1973. Botanični vrt Univerze v Ljubljani. Zbirka vodnikov. Maribor, Založba Obzorje: 30 pp.

STYPINSKI P. 2011. The Effect of Grassland-based Forages on Milk Quality and Quantity. Agronomy Research 9: 479-488

ŠKORNIK S., KALIGARIČ M. 1997. Suha travnička (red Brometalia erecti Br.-Bl. 36) v SV Sloveniji in njihov naravovarstveni pomen: (strokovni elaborat). Maribor: Pedagoška fakulteta.

- ŠKORNIK S. 1998. Suha travišča (*Brometalia erecti* Br.-Bl. 1936) Slovenskih goric, Haloz, Kozjanskega in Goričkega : magistrska naloga = Dry grassland (*Brometalia erecti* Br.-Bl. 1936) of Slovenske gorice, Haloze, Kozjansko and Goričko : master of science thesis. Ljubljana: 86 pp.
- ŠKORNIK S. 2001. A contribution to the knowledge of dry grassland vegetation of the *Brometalia erecti* Koch 1926 order in Slovenia = Prispevek k poznavanju vegetacije suhih travnišč reda *Brometalia erecti* Koch 1926 v Sloveniji. *Acta biologica slovenica*, ISSN 1408-3671. 44 (4): 29-43.
- ŠTUCIN A. 1987. Baška grapa. Enciklopedija Slovenije In Javornik M Enciklopedija Slovenije, I zvezek pp. 204-205.
- ŠUMRADA J. 1991. Kočevje. In Javornik M Enciklopedija Slovenije, I zvezek 5 pp. 181.
- TOMAŽIČ G. 1940. Asociacije borovih gozdov v Sloveniji 1. Bazofilni borovi gozdovi. Razpr. Mat. prir. razr. AZU (Ljubljana) 1: 77-120.
- TOMAŽIČ G. 1941. Senožeti in Pašniki na plitvih pustih in suhih tleh Slovenije. Zbornik prirodoslovnega društva (Ljubljana) 2: 76-82.
- TURK J. 1924. Travništvo I Slovenskim živinorejcem v pouk. Družba sv. Mohorja na Prevaljah. 1-122 pp.
- TURK J. 1925. Travništvo II Slovenskim živinorejcem v pouk. Družba sv. Mohorja na Prevaljah. 113-270. pp.
- VERBIČ J. IN SOD. 2006. Navade rejcev pri krmljenju krav v Sloveniji in njihov vpliv na mlečnost, sestavo mleka in zdravstveno stanje. Zbornik predavanj 15 posvetovanje o prehrani domačih živali. Kmetijsko gozdarske zbornice Slovenije. Kmetijsko gozdarski zavod Murska sobota, Radenci pp.119-135.

- VREŠ B., GILČVERT BERDNIK D., SELIŠKAR A. 2014. Rastlinstvo življenjskih okolij v Sloveniji. Pipinova knjiga, 492 pp.
- VRIŠER I. 1976. Razvoj industrije v Sloveniji. Geo. Vest. XLVIII: 29-45.
- WRABER M. 1958. Ekološki in fitosociološki opisi gozdne vegetacije na Pokljuki. In V Trebuguv. Kompleksna raziskovanja smrekovih sestojev na Pokljuki 1948-1957.
- WRABER M. 1960. Fitocenološka razčlenitev gozdne vegetacije v Sloveniji Ad annum horti botanici Labacensis solemnem 49-96, Ljubljana.
- WRABER M. 1969. Pflanzengeographische stellung und Gliederung Sloweniens. Ljubljana: Vegetatio – Acta geobotanica, 176-199.
- WRABER T. 1990. Sto znamenitih rastlin na Slovenskem. Prešernova družba. Ljubljana
- ZELNIK ET AL. 2012. <http://www.razvojkrasa.si/si/narava/101/article.html>
- ZELNIK I. 2005. Meadows of the order Molinetalia caeruleae Koch 1926 in south-eastern Slovenia, Fitosociologia vol. 42 (1): 3-32.
- ZELNIK I. 2011. Wet meadows with Purple Moor-grass (*Molinia caerulea*) in Slovenia, Mokrotni travniki z modro stožko (*Molinia caerulea*) v Sloveniji. Acta biologica Slovenica, 54(2)53-71.
- ZUPANČIČ M. 1969. Vetrolomi in snegolomi v Sloveniji v povojni dobi. Gozd. Vest. 8-9
- ZUPANČIČ M. 1980. Smrekovi gozdovi v mraziščih dinarskega gorstva Slovenije. SAZU. Razred 4 (24): 1-262.
- ZUPANČIČ M. 1999. Smrekovi gozdovi Slovenije. SAZU. Razred za naravoslovne vede Ljubljana

Index seminum annis 2015 et 2014 collectorum

Jože Bavcon & Janja Makše

Abstract

The 2015 Index seminum includes the seeds of 449 species collected in the University Botanic Gardens Ljubljana. All are arranged per families and these are listed in alphabetic order. The alphabetic principles is followed also in listing species within families. The indeex of the seeds harvested in nature contain 334 units. The total number of units from the year 's Index amounts 783.

Key words: Index seminum, annis 2015 et 2014 collectorum

Material and methods

Seeds begin to be harvested from the garden plants at the end of April or beginning of May, depending on weather conditions. From then on single species in various parts of the Garden are regularly monitored and their seeds collected in due course. Each species is assigned a suitable label stating the date of harvesting and the name. The seeds of the same species are harvested several times as they mature, more than one bag of seeds of the same species is collected. We try to observe the rule to have minimally five plants of the same species in the Garden. The seeds are then left to dry in a dry room. They are dried with regard to their specific nature. Juicy fruit seeds are spread apart and arranged over newspaper sheets. The seeds requiring constant moisture are stored in fine sand immediately after harvesting.

The harvesting of seeds in nature likewise starts in spring and lasts till autumn and even winter. Seeds are collected in different parts of Slovenia. We always take care to remove them from a larger number of specimens, from five specimens of a species in the same habitat. Seeds from a particular habitat are stored in one bag. The habitat and the species, if already known, are put down; if the species is not identified, the whole plant is removed and the species subsequently determined in the Botanic Garden. The non-determined species are photographed on their growing site: plant as a whole and single details, flower, leaves. The bags used to store seeds are either made of paper or plastic material, the only difference being that the seeds are moved from plastic into paper bags if they are not properly dry yet.

Immediately after being brought to the Garden all seeds collected in nature are

examined, the non-determined species are determined according to the keys as known from literature or by comparing them with the collection of seed samples. Otherwise the bags are merely left open and put in a dry and naturally aired place. During winter the seeds are cleansed, determinations are reexamined, this time also by using the seed determination keys, and finally by comparing them with the reference collection.

Harvesting seeds in nature is an exacting task. One has to be familiar with the time single plants form mature seeds because some fall off very quickly, so it is difficult to get them at exactly the right moment. A particularly powerful factor in Slovenian Istria, Goriško and Vipavsko is the strong wind typical of those parts of Slovenia. It is essential to be familiar with the habitats of single plant species because numerous plants are well recognizable and visible during their blossoming period whereas they are later overgrown with other plants and are much harder to find and in consequence also more difficult to determine. It is therefore best to visit single habitats several times a year, which makes the harvesting easier and more reliable.

Index seminum annis 2015 et 2014 collectorum

Jože Bavcon, Janja Makše, Blanka Ravnjak

CONIFERO PHYTINA (Gymnospermae)

Pinaceae

1. *Pinus mugo* Turra
2. *Tsuga canadensis* (L.) Carriere

Taxaceae

3. *Taxus baccata* L.

Taxodiaceae

4. *Cryptomeria japonica* D. Don 2014
5. *Metasequoia glyptostroboides* Hu & Cheng

MAGNOLIOPHYTINA (Angiospermae)

Acanthaceae

6. *Acanthus balcanicus* Heywood & I.B.K. Richardson

Aceraceae

7. *Acer ginnala* Maxim.
8. *Acer griseum* (Franch.) Pax.
9. *Acer pseudoplatanus* L.
10. *Acer tataricum* L.

Actinidiaceae

11. *Actinidia melanandra* Franch.

Alismataceae

12. *Alisma plantago-aquatica* L.

Alliaceae

- * 13. *Agapanthus africanus* (L.) Hoffm.
- 14. *Allium angulosum* L. 2014
- 15. *Allium ericetorum* Thore
- 16. *Allium fistulosum* L. 2014
- 17. *Allium senescens* L.
- 18. *Allium sphaerocephalon* L.
- 19. *Allium tuberosum* Roxb.
- 20. *Allium ursinum* L.

Aloeaceae

- * 21. *Aloe saponaria* Haw.

Amaranthaceae

- 22. *Froelichia gracilis* Moq.
- 23. *Gomphrena globosa* L. 2014

Amaryllidaceae

- 24. *Galanthus nivalis* L.
- 25. *Leucojum vernum* L.

Anacardiaceae

- 26. *Rhus verniciflua* Stokes
- * 27. *Schinus lentiscifolius* March.
- 28. *Schinus terebinthifolius* Raddi 2014

Apiaceae

- 29. *Astrantia major* L.
- 30. *Athamanta haynaldii* Borb. & Uechtr. 2014
- 31. *Conium maculatum* L. 2014
- 32. *Eryngium amethystinum* L.
- 33. *Eryngium campestre* L.
- 34. *Hacquetia epipactis* (Scop.) DC.
- 35. *Libanotis sibirica* (L.) C. A. Mey 2014
- 36. *Libanotis sibirica* (L.) C. A. Mey subsp. *pyrenaica* (L.) O. Schwarz
- 37. *Peucedanum schottii* Besser ex DC.
- 38. *Smyrnium perfoliatum* L.

Apocynaceae

- 39. *Amsonia tabernaemontana* Walt.

Aquifoliaceae

40. *Ilex aquifolium* L.

Araceae

41. *Arum italicum* Mill.

42. *Calla palustris* L.

Araliaceae

43. *Acanthopanax sieboldianus* Mak.

44. *Hedera helix* L.

* 45. *Pseudopanax lessonii* K.Koch

Arecaceae

46. *Howea forsteriana* (F.Muell) Becc 2014

Asclepiadaceae

47. *Vincetoxicum fuscatum* (Hornem.) Reichenb. 2014

48. *Vincetoxicum hirundinaria* Medik.

Asphodelaceae

49. *Anthericum ramosum* L.

50. *Asphodeline liburnica* (Scop.) Rchb.

Asteraceae

51. *Achillea clypeolata* Sibth. & Sm.

52. *Ageratum houstonianum* Mill.

53. *Anthemis tinctoria* L.

54. *Arctium lappa* L. 2014

55. *Artemisia abrotanum* L. 2014

56. *Aster amellus* L.

57. *Bellis perennis* L.

58. *Bidens tripartita* L.

59. *Buphthalmum salicifolium* L.

60. *Calendula officinalis* L.

61. *Callistephus chinensis* (L.) Ness. cv.

62. *Carthamus tinctorius* L.

63. *Centaurea rhenana* Boreau 2014

64. *Chamomilla recutita* (L.) Rauschert

65. *Cirsium eriophorum* (L.) Scop.

66. *Cirsium oleraceum* (L.) Scop.

- 67. *Cirsium palustre* (L.) Scop. 2014
- 68. *Coreopsis grandiflora* Hogg.
- 69. *Coreopsis verticillata* L.
- 70. *Cosmos bipinnatus* L.
- 71. *Cosmos sulphureus* Cav.
- 72. *Echinacea purpurea* Moench
- 73. *Echinops exaltatus* Schrader
- 74. *Echinops sphaerocephalus* L.
- 75. *Eupatorium cannabinum* L.
- 76. *Gaillardia pulchella* Foug. 2014
- 77. *Inula hirta* L.
- 78. *Inula magnifica* L.
- 79. *Liatris graminifolia* (Walt.) Willd.
- 80. *Matricaria perforata* Merat 2014
- 81. *Pulicaria dysenterica* (L.) Bernh.
- 82. *Serratula lycopifolia* (Vill.) A.Kern.
- 83. *Silphium integrifolium* Michx.
- 84. *Silphium perfoliatum* L.
- 85. *Silybum marianum* (L.) Gaertner
- 86. *Solidago graminifolia* (L.) Salisb. 2014
- 87. *Solidago virgaurea* L.
- 88. *Tagetes erecta* L.
- 89. *Tagetes tenuifolia* Cav.
- 90. *Telekia speciosa* (Schreb.) Baumg.
- 91. *Xeranthemum cylindraceum* Sibth. & Smith
- 92. *Zinnia elegans* Jacq.
- 93. *Zinnia pauciflora* L.

Berberidaceae

- 94. *Berberis julianae* Schneid.
- 95. *Gymnospermium scipetarum* Paparisto & Qosja ex E.Mayer & Pulević

Betulaceae

- 96. *Alnus glutinosa* (L.) Gaertner
- 97. *Alnus glutinosa* (L.) Gaertner
- 98. *Betula alnoides* Buch.-Ham. ex Don.
- 99. *Betula platyphylla* Suk.

Bignoniaceae

* 100. *Jacaranda ovalifolia* R. Br.

Boraginaceae

- 101. *Anchusa officinalis* L.
- 102. *Cerinthe glabra* Mill.
- * 103. *Echium candicans* DC.
- 104. *Echium vulgare* L.
- 105. *Lithospermum officinale* L.
- 106. *Nonea lutea* (Desr.) DC. in Lam.& DC. 2014
- 107. *Solenanthus scardicus* Bornm. 2014
- 108. *Symphytum officinale* L.
- 109. *Symphytum tuberosum* L.

Brassicaceae

- 110. *Alyssoides sinuatum* Medik.
- 111. *Alyssoides utriculata* (L.) Medicus
- 112. *Alyssum idaeum* Boiss. & Heldr.
- 113. *Alyssum montanum* L. subsp. *pluscanescens* (Raim. ex J.Baumg.) Trpin
- 114. *Alyssum ovirens* Kerner
- 115. *Alyssum petraeum* Ard. 2014
- 116. *Arabis caucasica* Schlecht. 2014
- 117. *Berteroa incana* (L.) DC. 2014
- 118. *Bunias orientalis* L.
- 119. *Capsella bursa-pastoris* (L.) Medicus
- 120. *Cheiranthus cheiri* L. 2014
- 121. *Crambe cordifolia* Stev.
- 122. *Erysimum comatum* Pančić
- 123. *Fibigia clypeata* (L.) Medicus
- 124. *Isatis tinctoria* L.
- 125. *Lunaria annua* L.
- 126. *Lunaria rediviva* L.
- 127. *Peltaria alliacea* Jacq.
- 128. *Sisymbrium austriacum* Jacq. 2014

Bromeliaceae

- * 129. *Aechmea lueddemanniana* Brongn.ex E.Morr.

Buxaceae

- 130. *Buxus sempervirens* L.

131. *Sarcococca saligna* Müll. Arg.

Caesalpiniaceae

132. *Cercis siliquastrum* L.

133. *Gleditsia triacanthos* L.

* 134. *Parkinsonia aculeata* L.

Calycanthaceae

135. *Sinocalycanthus chinensis* Cheng & S.Y.Chang

Campanulaceae

136. *Campanula justiniana* Witasek

137. *Campanula patula* L.

138. *Campanula poscharskyana* Degen

139. *Campanula rapunculoides* L. 2014

140. *Campanula spicata* L.

141. *Lobelia siphilitica* L.

142. *Platycodon grandiflorum* DC. 'Glaucum'

Cannabaceae

143. *Humulus lupulus* L.

Carpinaceae

144. *Carpinus betulus* L. 2014

145. *Carpinus orientalis* Mill. 2014

Caryophyllaceae

146. *Agrostemma githago* L.

147. *Dianthus armeria* L.

148. *Dianthus barbatus* L. 'Hortensis'

149. *Dianthus deltoides* L.

150. *Dianthus diffusus* Sibth. & Sm. 2014

151. *Dianthus giganteus* D'uru

152. *Dianthus graniticus* Jord.

153. *Dianthus knappii* (Pant.) Ascherson & Kanitz

154. *Dianthus monspessulanus* L. 2014

155. *Dianthus petraeus* Waldst. & Kit. subsp. *petraeus*

156. *Dianthus sternbergii* Sieber

157. *Dianthus superbus* L. 2014

158. *Dianthus tergestinus* (Rchb.) Kerner

159. *Lychnis coronaria* (L.) Desr.
160. *Lychnis flos-cuculi* L.
161. *Petrorhagia prolifera* (L.) P.W.Ball & Heyw.
162. *Petrorhagia saxifraga* (L.) Link
163. *Scleranthus perennis* L.
164. *Silene alpestris* Jacq.
165. *Silene vulgaris* (Moench) Garcke 2014
166. *Silene vulgaris* (Moench) Garcke subsp. *glareosa* (Jordan) Marsden -Jones & Turrill
167. *Vaccaria pyramidata* Medic.

Celastraceae

168. *Celastrus orbiculatus* Thunb.
169. *Euonymus europaeus* L.

Cichoriaceae

170. *Crepis biennis* L. 2014
171. *Crepis pulchra* L.
172. *Hieracium aurantiacum* L.
173. *Hieracium glaucum* All.
174. *Hieracium lanatum* Vill.
175. *Hieracium pilosella* L.
176. *Leontodon hispidus* L. subsp. *brumatii* (Rchb.) T.Wraber
177. *Leontodon hispidus* L. subsp. *danubialis* (Jacq.) Simonkai
178. *Tragopogon balcanicus* Velen.
179. *Tragopogon pratensis* L.
180. *Tragopogon pratensis* L. subsp. *orientalis* (L.) Čelak
181. *Tragopogon pterodes* Pančić

Cistaceae

182. *Cistus salviifolius* L.
183. *Helianthemum apenninum* (L.) Mill.
184. *Helianthemum nummularium* (L.) Mill.

Convallariaceae

185. *Convallaria majalis* L.
186. *Danaë racemosa* (L.) Medicus
187. *Polygonatum latifolium* (Jacq.) Desf.

Convolvulaceae

188. *Ipomoea purpurea* (L.) Roh.

Cornaceae

189. *Cornus mas* L.

190. *Cornus sanguinea* L. subsp. *australis* (C. A. Meyer) Jav.

191. *Davidia involucrata* Baill.

Costaceae

* 192. *Costus speciosus* Sm.

Crassulaceae

193. *Sedum aizoon* L.

194. *Sedum maximum* Suter

Cucurbitaceae

195. *Bryonia dioica* Jacq.

196. *Ecballium elaterium* (L.) Rich.

Cyperaceae

197. *Carex limosa* L.

* 198. *Cyperus alternifolius* L.

199. *Schoenoplectus lacustris* (L.) Palla

200. *Scirpus sylvaticus* L.

Datiscaceae

201. *Datisca cannabina* L.

Dioscoreaceae

202. *Dioscorea balcanica* Košanin

203. *Dioscorea batatas* Decne.

Dipsacaceae

204. *Cephalaria gigantea* (Ledeb.) Bobrov

205. *Cephalaria leucantha* (L.) Roemer & Schultes

206. *Dipsacus fullonum* L. 2014

207. *Dipsacus laciniatus* L. 2014

208. *Scabiosa lucida* Vill.

209. *Succisa pratensis* Moench

Elaeagnaceae

210. *Elaeagnus multiflora* Thunb.

Ericaceae

211. *Erica terminalis* Salisb.

Euphorbiaceae

212. *Euphorbia lathyris* L. 2014

* 213. *Manihot palmata* Muell.

214. *Ricinus communis* L.

Fabaceae

215. *Anthyllis vulneraria* L.

216. *Astragalus falcatus* Lam.

217. *Desmodium canadense* (L.) DC.

218. *Genista tinctoria* L.

219. *Glycyrrhiza glabra* L.

220. *Laburnum alpinum* (Mill.) Presl.

221. *Laburnum alschingeri* (Vis.) K. Koch

222. *Laburnum anagyroides* Medik

* 223. *Leucaena leucocephala* (Lam.) de Wit

224. *Trifolium angustifolium* L.

225. *Trifolium aureum* Pollich

Fumariaceae

226. *Corydalis cava* (L.) Schweigg. & Körte

Geraniaceae

227. *Geranium macrorrhizum* L.

228. *Geranium phaeum* L.

229. *Geranium pratense* L.

230. *Geranium robertianum* L. 2014

Globulariaceae

231. *Globularia punctata* Hegetschw.

Grossulariaceae

232. *Ribes silvestre* (Lam.) Mertens & Koch.

Hamamelidaceae

233. *Hamamelis virginiana* L.

Hyacinthaceae

- 234. *Bellevalia romana* (L.) Reichenb.
- 235. *Muscati comosum* (L.) Miller
- 236. *Muscati neglectum* Guss. ex Ten.

Hydrangeaceae

- 237. *Hydrangea paniculata* Sieb.

Hypericaceae

- 238. *Hypericum kalmianum* L.
- 239. *Hypericum olympicum* L.
- 240. *Hypericum tetrapterum* Fries

Iridaceae

- 241. *Crocus vernus* (L.) Hill subsp. *vernus*
- 242. *Crocus weldenii* Hoppe
- 243. *Gladiolus palustris* Gaudin
- 244. *Iris graminea* L.
- 245. *Iris pontica* Zapal.
- 246. *Iris pseudacorus* L.
- 247. *Iris sibirica* L. subsp. *sibirica*
- 248. *Sisyrinchium bermudiana* L.

Juglandaceae

- 249. *Carya ovata* Koch.
- 250. *Juglans cinerea* L.
- 251. *Juglans nigra* L.
- 252. *Pterocarya fraxinifolia* (Lam.) Spach.

Lamiaceae

- 253. *Ajuga reptans* L.
- 254. *Ballota rupestris* (Biv.) Vis.
- 255. *Betonica officinalis* L.
- 256. *Betonica officinalis* L. subsp. *serotina* (Host) Hayek
- 257. *Horminum pyrenaicum* L.
- 258. *Lavandula angustifolia* Mill.
- 259. *Leonurus cardiaca* L. 2014
- 260. *Lycopus europaeus* L.
- 261. *Melissa officinalis* L.

262. *Mentha aquatica* L. 2014
263. *Mentha pulegium* L.
264. *Origanum rotundifolium* Boiss.
265. *Origanum vulgare* L. subsp. *vulgare*
266. *Phlomis tuberosa* L.
267. *Physostegia virginiana* L. 2014
268. *Salvia glutinosa* L.
269. *Salvia officinalis* L.
270. *Salvia sclarea* L.
271. *Salvia verticillata* L.
272. *Satureja montana* L. subsp. *variegata* (Host.) P.W.Ball
273. *Scutellaria altissima* L.
274. *Sideritis syriaca* L.
275. *Stachys germanica* L.
276. *Teucrium arduini* L.
277. *Teucrium chamaedrys* L.
278. *Teucrium hircanicum* L.

Lardizabalaceae

279. *Decaisnea fargesii* Franch.

Liliaceae

280. *Hosta ventricosa* (Salisb.) Stearn

Linaceae

281. *Linum flavum* L.
282. *Linum usitatissimum* L.

Lythraceae

283. *Lythrum salicaria* L.

Magnoliaceae

- * 284. *Magnolia champaca* (L.) Figlar
285. *Magnolia kobus* DC.

Malvaceae

286. *Abutilon theophrasti* Medik.
287. *Althaea armeniaca* Ten.
288. *Althaea officinalis* L.
* 289. *Gossypium arboreum* L.

* 290. *Gossypium hirsutum* L.

291. *Hibiscus trionum* L.

Martyniaceae

292. *Proboscidea louisianica* (Mill.) Thell.

Meliaceae

* 293. *Melia azedarach* L.

Mimosaceae

* 294. *Leucaena leucocephala* (Lam.) de Wit

Moraceae

295. *Maclura pomifera* (Raf.) Schneid.

Myrtaceae

* 296. *Callistemon speciosus* (Sims) DC.

* 297. *Myrtus communis* L.

* 298. *Psidium cattleianum* Sabine

* 299. *Psidium guajava* XX-GZU-YY-1102261 L.

Nyctaginaceae

300. *Mirabilis jalapa* L. 2014

301. *Oxybaphus floribundus* Choisy

Oleaceae

302. *Fraxinus ornus* L.

303. *Ligustrum ibota* Sieb. & Zucc.

Onagraceae

304. *Circaeа lutetiana* L.

305. *Epilobium hirsutum* L.

306. *Gaura biennis* L.

307. *Oenothera biennis* L.

Paeoniaceae

308. *Paeonia delavayi* Franch.

309. *Paeonia emodi* Wall.

310. *Paeonia lactiflora* Pall.

311. *Paeonia officinalis* L. subsp. *officinalis*

- 312. *Paeonia peregrina* Mill.
- 313. *Paeonia romanica* Brandz.
- 314. *Paeonia tenuifolia* L.
- 315. *Paeonia wittmanniana* Hartw.

Papaveraceae

- 316. *Chelidonium majus* L.
- 317. *Eschscholzia californica* Cham.
- 318. *Papaver rhoeas* L.

Passifloraceae

- 319. *Passiflora capsularis* L. 2014
- * 320. *Passiflora edulis* Sims
- 321. *Passiflora suberosa* L. 2014

Phytolaccaceae

- 322. *Rivina humilis* L. 2014

Pittosporaceae

- 323. *Pittosporum tobira* (Thunb.) Ait.

Plantaginaceae

- 324. *Plantago coronopus* L.

Poaceae

- 325. *Achnatherum calamagrostis* (L.) P.Beauv
- 326. *Andropogon gerardii* Vitman
- 327. *Festuca bosniaca* Kumm. & Sendt.
- 328. *Leersia oryzoides* (L.) Swartz
- 329. *Melica ciliata* L.
- 330. *Molinia caerulea* (L.) Moench subsp. *caerulea*
- 331. *Sesleria autumnalis* F. W. Schultz
- 332. *Sesleria wettsteinii* Dörfler & Hayek
- 333. *Sorghum halepense* (L.) Pers. 2014

Polemoniaceae

- 334. *Gilia multicaulis* Benth. 2014
- 335. *Phlox paniculata* L.

Polygonaceae

336. *Rumex salicifolius* Weinm. 2014

Portulacaceae

337. *Portulaca oleracea* L. subsp. *oleracea*

Primulaceae

338. *Anagallis arvensis* L.

339. *Cyclamen hederifolium* Ait.

340. *Hottonia palustris* L.

341. *Primula veris* L.

342. *Primula vulgaris* Hudson

Ranunculaceae

343. *Aconitum lycoctonum* L. em Koelle subsp. *lycoctonum*

344. *Anemone apennina* L.

345. *Anemone hortensis* L.

346. *Anemone hupehensis* Lemoine

347. *Anemone nemorosa* L.

348. *Anemone ranunculoides* L.

349. *Anemone sylvestris* L.

350. *Aquilegia vulgaris* L.

351. *Caltha palustris* L.

352. *Clematis integrifolia* L.

353. *Clematis recta* L.

354. *Consolida regalis* S.F. Gray

355. *Eranthis hyemalis* (L.) Salisb.

356. *Helleborus atrorubens* Waldst. & Kit.

357. *Isopyrum thalictroides* L.

358. *Nigella damascena* L.

359. *Pulsatilla halleri* (All.) Willd. subsp. *slavica* (G. Reuss) Zamels

360. *Ranunculus arvensis* L.

361. *Ranunculus millefoliatus* Vahl

362. *Thalictrum aquilegiifolium* L.

Resedaceae

363. *Reseda lutea* L.

Rosaceae

364. *Agrimonia eupatoria* L. 2014

365. *Agrimonia procera* Wallr.

366. *Alchemilla speciosa* Griseb.
367. *Aruncus dioicus* (Walter) Fernald 2014
368. *Cotoneaster affinis* Lindl. 2014
369. *Cotoneaster bullatus* Bois.
370. *Cotoneaster niger* (Thunb.) Fries
371. *Crataegus pedicellata* Sarg. 2014
372. *Filipendula ulmaria* (L.) Maxim.
373. *Fragaria vesca* L.
374. *Geum coccineum* Sibth. & Sm.
375. *Geum pallidum* Fisch. & Mey. 2014
376. *Geum rivale* L.
377. *Geum urbanum* L.
378. *Physocarpus malvaceus* (Greene) Kuntze
379. *Potentilla nivea* L.
380. *Potentilla recta* L.
381. *Potentilla rupestris* L.
382. *Potentilla thuringiaca* Bernh. ex Link.
383. *Rhodotypos scandens* (Thunb.) Mak.
384. *Rosa canina* L.
385. *Rosa centifolia* L.
386. *Rosa glauca* Pourr.
387. *Rosa multiflora* Thunb.
388. *Rosa pendulina* L.
389. *Rosa rugosa* Thunb.
390. *Rosa sempervirens* L.
391. *Sanguisorba officinalis* L.
392. *Sibiraea croatica* Degen
393. *Stephanandra tanakae* Franch. & Sav.
394. *Stranvaesia davidiana* Decne.

Rubiaceae

395. *Galium verum* L.
* 396. *Gardenia jasminoides* Ellis
* 397. *Psychotria bacteriophila* Valeton

Rutaceae

398. *Poncirus trifoliata* (L.) Raf.
399. *Zanthoxylum americanum* Mill.
400. *Zanthoxylum simulans* Hance

Sambucaceae

- 401. *Sambucus nigra* L. 2014
- 402. *Viburnum lantana* L.
- 403. *Viburnum sargentii* Koehne.

Sapindaceae

- 404. *Dodonaea viscosa* Jacq. 2014

Saxifragaceae

- 405. *Saxifraga cuneifolia* L.
- 406. *Saxifraga paniculata* Miller
- 407. *Saxifraga peltata* Torr.
- 408. *Saxifraga rotundifolia* L. 2014

Scrophulariaceae

- 409. *Cymbalaria muralis* Gaertner, Meyer & Scherbius
- 410. *Digitalis grandiflora* Miller
- 411. *Digitalis laevigata* Waldst. & Kit. 2014
- 412. *Erinus alpinus* L.
- 413. *Linaria vulgaris* Miller
- 414. *Verbascum densiflorum* Bertol.
- 415. *Verbascum austriacum* Schott ex Roem. & Schult. 2014
- 416. *Verbascum blattaria* L.
- 417. *Verbascum nigrum* L.
- 418. *Veronica austriaca* L. agg.
- 419. *Veronica sibirica* L.

Solanaceae

- * 420. *Cestrum nocturnum* L.
- * 421. *Cyphomandra betacea* Sendt.
- 422. *Datura metel* L.
- 423. *Datura metel* L. f. *inermis*
- 424. *Lycium chinense* Mill.
- 425. *Nicandra physalodes* (L.) Gaertner
- 426. *Nicotiana rustica* L.
- 427. *Nicotiana tabacum* L.
- 428. *Nicotiana viscosa* Lehm.
- 429. *Physalis ixocarpa* Brot.
- 430. *Scopolia carniolica* Jacq.
- 431. *Solanum sisymbriifolium* Lam. 2014

Staphyleaceae

432. *Staphylea pinnata* L.

Styracaceae

433. *Halesia carolina* L.

434. *Pterostyrax hispida* Sieb. & Zucc.

Taccaceae

435. *Tacca chantrieri* André 2014

Thymelaeaceae

* 436. *Phaleria octandra* (L.) Baill

Tiliaceae

437. *Tilia platyphyllos* Scop.

Typhaceae

438. *Typha latifolia* L.

Ulmaceae

439. *Celtis occidentalis* L.

440. *Zelkova carpinifolia* (Pall.) K. Koch

Urticaceae

441. *Parietaria officinalis* L.

Verbenaceae

442. *Callicarpa bodinieri* Levl. var. *giraldii* Rehd.

443. *Callicarpa japonica* Thunb. 2014

444. *Lantana camara* L. 2014

445. *Vitex agnus-castus* L.

Zingiberaceae

446. *Alpinia speciosa* K. Schum. 2014

* 447. *Alpinia speciosa* K. Schum.

* 448. *Hedychium horsfieldii* R. Br. ex Wall.

Zygophyllaceae

449. *Tribulus terrestris* L.

* Semina plantarum in caladariis cultarum.

Horti praefectus: dr. Jože Bavcon

Seminum Curator, hortulana: Janja Makše

Plantae Curator: Mag. Blanka Ravnjak

Semina e plantis spontaneis in loco natali annis 2015 et 2014 lecta

Jože Bavcon, Igor Dakskobler, Ljudmila Dakskobler, Branko Dolinar, Janja Makše, Blanka Ravnjak

450. *Actaea spicata* L. - Slivniško jezero, 2015, J. B., B. R.
451. *Adenostyles glabra* (Miller) DC. - pod Barnikom, 2015, J. B., B. R.
452. *Ajuga reptans* L. - Šentjurij, 2015, J. M.
453. *Allium angulosum* L. - Radensko polje, 2015, J. M.
454. *Allium carinatum* L. subsp. *pulchellum* - Rakitovec, 2014, J. B., B. R.
455. *Allium ericetorum* Thore - Kavčiče, 2015, J. B., B. R.
456. *Allium ericetorum* Thore - Rakitovec-Zazid, 2015, J. B.
457. *Allium ericetorum* Thore - Sočerga, 2015, J. B.
458. *Allium ericetorum* Thore - pod Muzcem nad Breginjem, 2014, L. & I. D.
459. *Allium senescens* L. - Podgorje, 2015, J. B., B. R.
460. *Allium senescens* L. - Rakitovec-Zazid, 2015, J. B.
461. *Allium senescens* L. - Senožeče, 2015, J. B., B. R.
462. *Allium senescens* L. - Štefan, 2015, J. B.
463. *Allium senescens* L. - Štefan/Dragonja, 2015, J. B.
464. *Alnus alnobetula* (Ehrh.) Hartig - Jezersko 1050 m, 2015, J. B.
465. *Anacamptis palustris* (Jacq.) R.M. Bateman - Lj. barje - Bevke, 2015, B. D.
466. *Anemone baldensis* Turra - Malo Špičje, 2015, L. & I. D.
467. *Anemone hortensis* L. - Dragonja, 2015, J. B.
468. *Angelica sylvestris* L. - Cerkno, 2015, J. B.
469. *Anthericum ramosum* L. - Čaven, 2015, J. B., B. R.
470. *Anthericum ramosum* L. - Lipnik, 2015, J. B.
471. *Anthericum ramosum* L. - Ljubljana-Šenvid-Roje, 2015, B. R.
472. *Anthericum ramosum* L. - Podgorje, 2015, J. B., B. R.
473. *Anthericum ramosum* L. - Rakitovec-Zazid, 2015, J. B.
474. *Anthyllis jacquinii* Kern. - Kucelj, 2015, J. B., B. R.
475. *Anthyllis jacquinii* Kern. - Čaven, 2014, J. B., B. R., S. B.
476. *Arabis sagittata* (Bertol.) DC. - Osp, 2015, J. B.
477. *Arabis turrita* L. - Gozd, 2014, J. B.
478. *Arctostaphylos uva-ursi* (L.) Spreng. - pod Sartom v Reziji, 2015, L.

& I. D.

479. *Artemisia alba* Turra - Osp, 2015, J. B.
480. *Artemisia alba* Turra - Rakitovec - Zazid, 2015, J. B.
481. *Artemisia vulgaris* L. - Kal, Hrastnik, 2014, J. B., B. R.
482. *Asarum europaeum* L. - Koreno, 700 m, 2015, J. M.
483. *Aster amellus* L. - Čaven, 2015, J. B., B. R.
484. *Aster amellus* L. - Sočerga, 2015, J. B.
485. *Aster linosyris* (L.) Bernh. - Štefan, 2015, J. B.
486. *Aster tripolium* L. - Izola, 2015, J. B.
487. *Astrantia major* L. - Roje - Šentvid, 2015, J. B., B. R.
488. *Atropa bella-donna* L. - Draga, 2015, J. B., B. R.
489. *Berberis vulgaris* L. - Knežak, 2015, J. B., B. R.
490. *Betonica officinalis* L. - Podgorje, 2015, J. B., B. R.
491. *Betonica officinalis* L. subsp. *serotina* - Senožeče, 2015, J. B., B. R.
492. *Buphthalmum salicifolium* L. - Šentjurij, 2015, J. M.
493. *Bupleurum falcatum* L. - Movraž, 2015, J. B., B. R.
494. *Calamintha einseleana* F.W.Schultz - Podbrdo, 2015, L. & I. D.
495. *Campanula barbata* L. - Rogla - Jurgovo, 2015, J. B., B. R.
496. *Campanula patula* L. - Ljubljana - Koseze, 2015, B. D.
497. *Campanula zoysii* Wulf. - Zadnjica, ob poti na Dolič, 2015, L. & I. D.
498. *Capparis spinosa* L. - Piran, 2015, J. B.
499. *Cardamine enneaphyllos* (L.) Crantz. - Kopa, 2015, J. B., B. R.
500. *Cardamine kitaibelii* Becherer - Kočevsko, 2015, J. B., B. R.
501. *Cardamine kitaibelii* Becherer - Medvedjek-Kočevsko, 2015, J. B., B. R.
502. *Carex flacca* Schreb. - nad Barnikom, 2015, J. B., B. R.
503. *Carlina vulgaris* L. subsp. *vulgaris* - Dragonja, 2015, J. B.
504. *Centaurea haynaldii* Borbás ex Vuk. subsp. *julica* - Breginjski Stol, 2015, L. & I. D.
505. *Centaurea jacea* L. - Mengeš, 2015, B. V.
506. *Centaurea rhenana* Boreau - Krško, 2015, B. V.
507. *Centaurea rupestris* L. - Rakitovec, 2015, J. B., B. R.
508. *Centaurium erythraea* Rafn - Trebnje, 2015, J. M.
509. *Chaerophyllum aureum* L. - Logarska dolina, 2014, J. B., B. R.
510. *Chenopodium bonus-henricus* L. - Jezersko, 2015, J. B.
511. *Cichorium intybus* L. - Dragonja, 2015, J. B.
512. *Cichorium intybus* L. - Prevoje, 2015, J. B.
513. *Cichorium intybus* L. - Štefan, 2015, J. B.
514. *Cirsium arvense* (L.) Scop. - Knežak, 2015, J. B., B. R.

515. *Cirsium oleraceum* (L.) Scop. - Prevoje, 2015, J. B.
516. *Cirsium pannonicum* (L.f.) Link - Ljubljana-Šenvid, 2015, J. B., B. R.
517. *Clematis vitalba* L. - Senožeče, 2015, J. B., B. R.
518. *Clematis vitalba* L. - Senuše, 2015, J. B.
519. *Clematis vitalba* L. - Vezovje, 2015, J. B., B. R.
520. *Colchicum autumnale* L. - Movraž, 2015, J. B., B. R.
521. *Colchicum autumnale* L. - Retje, 2015, J. B.
522. *Colutea arborescens* L. - Hrvaška - Hvar; Brusje, 2015, D. C.
523. *Colutea arborescens* L. - Rakitovec, 2015, J. B.
524. *Cornus sanguinea* L. - Šentjurij, 2015, J. M.
525. *Coronilla emeroides* Boiss. & Sprun. - Osp, 2015, J. B.
526. *Cotinus coggygria* Scop. - Cerje, 2015, L. & I. D.
527. *Cotinus coggygria* Scop. - Sočerga, 2015, J. B.
528. *Crataegus monogyna* Jacq. - Podgorje, 2015, J. B., B. R.
529. *Crataegus monogyna* Jacq. - Rakitovec-Zazid, 2015, J. B.
530. *Crepis pyrenaica* (L.) W. Greuter - dolina Bale, pod Prevalo, 2014, L. & I. D.
531. *Crithmum maritimum* L. - Fiesa, 2015, J. B.
532. *Crithmum maritimum* L. - Izola, 2015, J. B.
533. *Daucus carota* L. - Štefan, 2015, J. B.
534. *Dianthus armeria* L. - Bela krajina - Žuniči, 2015, B. D.
535. *Dianthus barbatus* L. - Podbrdo, 2015, L. & I. D.
536. *Dianthus sylvestris* Wulfen - Sočerga, 2015, J. B.
537. *Diplotaxis tenuifolia* (L.) DC. - Štefan, 2015, J. B.
538. *Dipsacus fullonum* L. - Dragonja, 2015, J. B.
539. *Dorycnium germanicum* (Greml) Rouy. - Knežak, 2015, J. B., B. R.
540. *Echinops ritro* L. - Čaven, 2015, J. B., B. R.
541. *Epimedium alpinum* L. - Poljane, 2015, J. M.
542. *Eryngium amethystinum* L. - Podgorje, 2015, J. B., B. R.
543. *Erysimum sylvestre* Scop. - Kucelj, 2015, J. B., B. R.
544. *Erythronium dens-canis* L. - Podsreda, 2015, J. B., B. R.
545. *Euonymus europaea* L. - Štajerska - Prekopa, 2015, B. D.
546. *Euonymus latifolius* (L.) Mill. - Podsreda, 2014, J. B.
547. *Euonymus verrucosa* Scop. - Šentjurij, 2015, J. M.
548. *Eupatorium cannabinum* L. - Jezersko 1050 m, 2015, J. B.
549. *Eupatorium cannabinum* L. - Smrekova glava pod Svinjakom, 2015, L. & I. D.
550. *Euphorbia nicaeensis* All. - Divača, 2015, J. B., B. R.
551. *Ferulago campestris* (Besser) Grecescu - Cvetrež (Banjšice), 2015,

L. & I. D.

552. *Ferulago campestris* (Besser) Grecescu - Lipnik, 2015, J. B.
553. *Filipendula ulmaria* (L.) Maxim. - Radensko polje, 2015, J. M.
554. *Filipendula vulgaris* Moench. - Roje - Šentvid, 2015, J. B., B. R.
555. *Fraxinus ornus* L. - Cerkno, 2015, J. B.
556. *Fraxinus ornus* L. - Osp, 2015, J. B.
557. *Fraxinus ornus* L. - Podpeč, 2015, J. B.
558. *Fraxinus ornus* L. - Rakitovec, 2015, J. B.
559. *Fraxinus ornus* L. - Šentjurij, 2015, J. M.
560. *Fraxinus ornus* L. - Sočerga, 2015, J. B.
561. *Galanthus nivalis* L. - Šentvid, 2015, J. B.
562. *Galium boreale* L. - Zakojca, 2015, L. & I. D.
563. *Galium purpureum* L. - Osp, 2015, J. B.
564. *Galium purpureum* L. - Rakitovec-Zazid, 2015, J. B.
565. *Galium verum* L. - Kavčiče, 2015, J. B., B. R.
566. *Galium verum* L. - Lipnik, 2015, J. B.
567. *Galium verum* L. - Ljubljana-Šenvid-Roje, 2015, B. R.
568. *Galium verum* L. - Sočerga, 2015, J. B.
569. *Genista tinctoria* L. - Roje - Šentvid, 2015, J. B., B. R.
570. *Gentiana asclepiadea* L. - Jezersko, 2015, J. B.
571. *Gentiana lutea* L. subsp. *symphyandra* - Čaven, 2015, J. B.
572. *Gentiana lutea* L. subsp. *symphyandra* - Lipnik, 2015, J. B.
573. *Geranium robertianum* L. - Koreno, 700 m, 2015, J. M.
574. *Geum rivale* L. - Bala, Veliki Razor, 2014, L. & I. D.
575. *Geum urbanum* L. - Šišenski hrib, 2015, B. D.
576. *Gladiolus illyricus* Koch - Šentvid, 2015, J. B., B. R.
577. *Gladiolus illyricus* Koch - Roje - Šentvid, 2015, B. R.
578. *Globularia cordifolia* L. - Kucelj, 2015, J. B., B. R.
579. *Globularia cordifolia* L. - pod Sartom v Reziji, 2015, L. & I. D.
580. *Globularia punctata* Hegetschw. - Rakitovec, 2015, J. B., B. R.
581. *Glyceria maxima* (Hartm.) Holomb. - Dragonja, 2015, J. B.
582. *Gymnadenia conopsea* (L.) R. Br. - planina Lom, 2015, L. & I. D.
583. *Hacquetia epipactis* (Scop.) DC. - Koreno, 700 m, 2015, J. M.
584. *Hedera helix* L. - Šentjurij pri Mirni Peči, 2015, J. M.
585. *Helleborus atrorubens* Waldst. & Kit. - Trebelno, 2015, J. M.
586. *Helleborus niger* L. - Podsreda, 2015, J. B., B. R.
587. *Heracleum sphondylium* L. - Gabrče, 2015, J. B.
588. *Homogyne sylvestris* Cass. - Kopa, 2015, J. B., B. R.
589. *Hypericum perforatum* L. - Čaven, 2015, J. B., B. R.
590. *Hypericum perforatum* L. - Jezersko, 2015, J. B.

591. *Hypericum perforatum* L. - Rakitovec, 2015, J. B.
592. *Hypericum perforatum* L. - Senožeče, 2015, J. B., B. R.
593. *Hypericum perforatum* L. - Šentjurij, 2015, J. M.
594. *Hyssopus officinalis* L. - Podpeč, 2015, J. B.
595. *Inula conyza* DC. - Podgorje, 2015, J. B., B. R.
596. *Inula conyza* DC. - Rakitovec- Zazid, 2015, J. B.
597. *Inula conyza* DC. - Sočerga, 2015, J. B.
598. *Inula ensifolia* L. - Kavčiče, 2015, J. B.
599. *Inula hirta* L. - Čaven, 2015, J. B., B. R.
600. *Inula hirta* L. - Podmelec - Podorobi, 2015, L. & I. D.
601. *Inula spiraeifolia* L. - Rakitovec, 2014, J. B., B. R.
602. *Iris foetidissima* L. - Prapetno, nad Sočo, 2015, L. & I. D.
603. *Iris pallida* Lam. subsp. *illyrica* (Tommasini) T.Wraber - Kavčiče, 2015, J. B., B. R.
604. *Iris pallida* Lam. subsp. *illyrica* (Tommasini) T.Wraber - Osp, 2014, J. B.
605. *Iris pallida* Lam. subsp. *illyrica* (Tommasini) T.Wraber - Slavnik, 2014, J. B.
606. *Iris pseudacorus* L. - Šmartinsko jezero, 2015, H. P.
607. *Iris sibirica* L. subsp. *erirrhiza* (Pospichal) T.Wraber - Kavčiče, 2015, J. B.
608. *Iris sibirica* L. subsp. *erirrhiza* (Pospichal) T.Wraber - Lipnik - Kavčiče, 2015, J. B.
609. *Juncus jacquinii* L. - Konjska škrbina pod Malim Bedinjim vrhom, 2015, L. & I. D.
610. *Jurinea mollis* (L.) Reichenb. - Rakitovec, 2015, J. B., B. R.
611. *Laserpitium latifolium* L. - Čaven, 2015, J. B., B. R.
612. *Laserpitium siler* L. - Kavčiče, 2015, J. B.
613. *Leontopodium alpinum* Cass. - Kucelj, 2015, J. B., B. R.
614. *Leucojum aestivum* L. - Cerkniško jezero, 2015, J. B., B. R.
615. *Libanotis sibirica* (L.) C. A. Mey - Kucelj, 2015, J. B., B. R.
616. *Ligusticum sequieri* (Jacq.) Koch - Čaven, 2015, J. B., B. R.
617. *Ligustrum vulgare* L. - Miren, 2015, J. B.
618. *Ligustrum vulgare* L. - Podgorje, 2015, J. B.
619. *Ligustrum vulgare* L. - Šentjurij, 2015, J. M.
620. *Ligustrum vulgare* L. - Senuše, 2015, J. B.
621. *Lilium carniolicum* Bernh. - Čaven, 2015, J. B., B. R.
622. *Limodorum abortivum* (L.) Sw. - Vipavsko brdo, 2015, B. D.
623. *Linaria vulgaris* Miller - Sočerga, 2015, J. B.
624. *Linum viscosum* L. - Roje - Šentvid, 2015, J. B., B. R.

625. *Lithospermum officinale* L. - Cerje, 2015, L. & I. D.
626. *Lonicera alpigena* L. - Čaven, 2014, J. B., B. R., S. B.
627. *Lunaria rediviva* L. - Čaven, 2015, J. B., B. R.
628. *Lunaria rediviva* L. - Tolminska korita, 2015, L. & I. D.
629. *Luzula nivea* (L.) DC. - Svinjak, 2015, L. & I. D.
630. *Luzula spicata* (L.) Lam. & DC. - Konjska škrbina pod Malim Bednjim vrhom, 2015, L. & I. D.
631. *Lychnis flos-cuculi* L. - Radensko polje, 2015, J. M.
632. *Lysimachia vulgaris* L. - Kavčiče, 2015, J. B., B. R.
633. *Lysimachia vulgaris* L. - Zakojca, 2015, L. & I. D.
634. *Malva alcea* L. - Kneža - Loje, 2015, L. & I. D.
635. *Malva alcea* L. - Znojile v Baški dolini, 2015, L. & I. D.
636. *Malva neglecta* Wallr. - Dolenjska - Zadnik, 2015, B. D.
637. *Marrubium incanum* Desr. - Sočerga, 2015, J. B.
638. *Micromeria thymifolia* (Scop.) Fritsch - Veliko Čelo pod Svinjakom, 2015, L. & I. D.
639. *Narcissus poeticus* L. - Komen, 2015, J. B., B. R.
640. *Omalotheca sylvatica* (L.) Schultz Bip. & F.W. Schultz - Otavnik, 2015, L. & I. D.
641. *Orlaya grandiflora* (L.) Hoffm. - Podpeč, 2014, J. B.
642. *Ornithogalum pyrenaicum* L. - Roje - Šentvid, 2015, J. B., B. R.
643. *Ornithogalum sphaerocarpum* A. Kerner - Kučar v Beli Krajini, 2015, D. C.
644. *Osyris alba* L. - Nabrežina pri Trstu, 2015, L. & I. D.
645. *Osyris alba* L. - Osp, 2015, J. B.
646. *Paederota lutea* Scop. - Zadnjica, ob poti na Dolič, 2015, L. & I. D.
647. *Paeonia officinalis* - Kavčiče, 2015, J. B.
648. *Paeonia officinalis* - Lipnik - Kavčiče, 2015, J. B.
649. *Paeonia officinalis* - Rakitovec-Zazid, 2015, J. B.
650. *Paliurus spina-christi* Mill. - Nabrežina pri Trstu, 2015, L. & I. D.
651. *Paliurus spina-christi* Mill. - Osp, 2015, J. B.
652. *Paris quadrifolia* L. - Zapuže, 2015, B. R.
653. *Pastinaca sativa* L. - Dragonja, 2015, J. B.
654. *Pedicularis hoermanniana* K. Maly - Breginsjki Stol, 2015, L. & I. D.
655. *Peucedanum austriacum* (Jacq.) Koch - Zakojska grapa, Mušč, 2015, L. & I. D.
656. *Peucedanum austriacum* (Jacq.) Koch - Zreče, 2015, J. B., B. R.
657. *Peucedanum cervaria* (L.) Lapeyr. - Dragonja, 2015, J. B.
658. *Peucedanum cervaria* (L.) Lapeyr. - Fiesa, 2015, J. B.

659. *Peucedanum oreoselinum* (L.) Moench - Roje - Šentvid, 2015, J. B., B. R.
660. *Peucedanum oreoselinum* (L.) Moench - Šentjurij, 2015, J. M.
661. *Peucedanum ostruthium* (L.) Koch - Razor, pod Bedinjim vrhom, 2015, L. & I. D.
662. *Peucedanum venetum* (Spr.) Koch - Podmelec - Podrobi, 2015, L. & I. D.
663. *Peucedanum verticillare* (L.) Koch - Čaven, 2015, J. B., B. R.
664. *Peucedanum verticillare* (L.) Koch - Drežnica, 2015, L. & I. D.
665. *Phillyrea latifolia* L. - Štefan, 2015, J. B.
666. *Phragmites australis* (Cav.) Trin. ex Steud. - Dragonja, 2015, J. B.
667. *Phyteuma scheuchzeri* All. subsp. *columnae* - Govška grapa, 2015, L. & I. D.
668. *Picea abies* (L.) Karsten - Polhov Gradec, 2015, J. M.
669. *Picea abies* (L.) Karsten - Strensko, 2015, H. P.
670. *Pistacia terebinthus* L. - Dragonja, 2015, J. B.
671. *Pistacia terebinthus* L. - Osp, 2015, J. B.
672. *Plantago cornuti* Gouan. - Primorska; Ankaran, zaliv sv. Nikolaj, 2014, B. V.
673. *Plantago holosteum* Scop. - Knežak, 2015, J. B., B. R.
674. *Plantago media* L. - Knežak, 2015, J. B., B. R.
675. *Platanthera bifolia* (L.) L.C.Rich. - Velike Lipljene, 2015, B. D.
676. *Polygonatum multiflorum* (L.) All. - Tuhinjsko sedlo, 2015, J. B., B. R.
677. *Polygonatum odoratum* (Mill.) Druce - Čaven, 2015, J. B., B. R.
678. *Potentilla caulescens* Torn. - planina Lom, 2015, L. & I. D.
679. *Potentilla caulescens* Torn. - pod Strmo pečjo (Monte Cimone) nad dolino Reklanice, 2014, L. & I. D.
680. *Potentilla clusiana* Jacq. - Zadnjica, ob poti na Dolič, 2015, L. & I. D.
681. *Prenanthes purpurea* L. - Jezersko 1050 m, 2015, J. B.
682. *Primula auricula* L. - Kucelj, 2015, J. B., B. R.
683. *Primula carniolica* Jacq. - Govška grapa, 2015, L. & I. D.
684. *Primula veris* L. - Kucelj - Čaven, 2014, J. B., B. R., S. B.
685. *Prospero elisae* Speta - Dragonja, 2015, J. B.
686. *Prospero elisae* Speta - Križ pri Trstu, 2015, L. & I. D.
687. *Prospero elisae* Speta - Štefan, 2015, J. B.
688. *Prunella vulgaris* L. - Ostrožno, 2015, B. R.
689. *Prunus padus* L. - Prevoje, 2015, J. B.
690. *Prunus spinosa* L. - Šentjurij, 2015, J. M.

691. *Pseudolysimachion barrelieri* (Schott ex Roem. & Schult.) Holub - Sočerga, 2015, J. B.
692. *Pseudolysimachion barrelieri* (Schott ex Roem. & Schult.) Holub - Štefan (Dragonja), 2015, J. B.
693. *Pulsatilla montana* (Hoppe) Rchb. - Divača, 2015, J. B., B. R.
694. *Pulsatilla montana* (Hoppe) Rchb. - Komen, 2015, J. B., B. R.
695. *Pulsatilla nigricans* Ströck. - Žadovinek, 2015, J. B.
696. *Rhododendron hirsutum* L. - Bedinji vrh, 2015, L. & I. D.
697. *Rhododendron luteum* Sweet - Boštanj, 2014, J. B.
698. *Rosa canina* L. - Dragonja, 2015, J. B.
699. *Rosa canina* L. - Koper, 2015, J. B.
700. *Rosa glauca* Pourr. - Čaven, 2015, J. B., B. R.
701. *Rosa pendulina* L. - Čaven, 2015, J. B., B. R.
702. *Rosa sempervirens* L. - Dragonja, 2015, J. B.
703. *Rumex crispus* L. - Dragonja, 2015, J. B.
704. *Ruscus aculeatus* L. - Dragonja, 2015, J. B.
705. *Ruscus aculeatus* L. - Miren, 2015, J. B.
706. *Ruta divaricata* Ten. - Cerje, 2015, L. & I. D.
707. *Ruta divaricata* Ten. - Podgorje, 2015, J. B., B. R.
708. *Ruta divaricata* Ten. - Senožeče, 2015, J. B., B. R.
709. *Ruta divaricata* Ten. - Sočerga, 2015, J. B.
710. *Salix waldsteiniana* Willd. - Kopa, 2015, J. B., B. R.
711. *Salvia glutinosa* L. - pod Barnikom, 2015, J. B., B. R.
712. *Salvia glutinosa* L. - Šentjurij, 2015, J. M.
713. *Salvia pratensis* L. - Retje, 2015, J. B., B. R.
714. *Sanicula europaea* L. - Draga, 2015, J. B., B. R.
715. *Satureja montana* L. subsp. *variegata* - Cerje, 2015, L. & I. D.
716. *Satureja montana* L. subsp. *variegata* - Kavčiče, 2015, J. B.
717. *Satureja montana* L. subsp. *variegata* - Osp, 2015, J. B.
718. *Satureja montana* L. subsp. *variegata* - Rakitovec-Zazid, 2015, J. B.
719. *Satureja montana* L. subsp. *variegata* - Senožeče, 2015, J. B., B. R.
720. *Satureja montana* L. subsp. *variegata* - Sočerga, 2015, J. B.
721. *Satureja montana* L. subsp. *variegata* - Stena, 2015, J. B.
722. *Satureja subspicata* Bartl. ex Vis. - Kavčiče, 2015, J. B.
723. *Satureja subspicata* Bartl. ex Vis. - Knežak, 2015, J. B.
724. *Satureja subspicata* Bartl. ex Vis. - Rakitovec - Zazid, 2015, J. B.
725. *Satureja subspicata* Bartl. ex Vis. subsp. *liburnica* Šilić - Podgorje, 2015, J. B., B. R.
726. *Saussurea pygmaea* (Jacq.) Sprengel - Malo Špičje, 2015, L. & I. D.
727. *Scabiosa graminifolia* L. - Čaven, 2015, J. B., B. R.

728. *Scabiosa graminifolia* L. - Rezija, ob poti na Sart, 2015, L. & I. D.
729. *Scabiosa triandra* L. - Sočerga, 2015, J. B.
730. *Schoenus nigricans* L. - Govška grapa, 2015, L. & I. D.
731. *Scilla litardierei* Breistr. - Planinsko polje, 2014, J. B.
732. *Scrophularia nodosa* L. - nad Barnikom, 2015, J. B., B. R.
733. *Scrophularia nodosa* L. - pod Goteniškim Snežnikom, 2015, B. R.
734. *Scrophularia canina* L. - Sočerga, 2015, J. B.
735. *Scrophularia juratensis* Schleicher - Svinjak, 2015, L. & I. D.
736. *Sedum maximum* Suter - Dragonja/Štefan, 2015, J. B.
737. *Senecio doronicum* L. - Slavnik, 2014, J. B.
738. *Senecio fuchsii* C.C.Gmelin - Čaven, 2015, J. B., B. R.
739. *Senecio fuchsii* C.C.Gmelin - Kamen zid, 2015, J. B., B. R.
740. *Senecio ovatus* (G.M.&Sch.)Willd. - Črni dol pod Snežnikom, 2015, D. C.
741. *Serratula lycopifolia* (Vill.) A.Kern. - Rakitovec - Kavčiče, 2014, J. B., B. R.
742. *Serratula radiata* M. Bieb. - Rakitovec - Kavčiče, 2014, J. B., B. R.
743. *Serratula tinctoria* L. subsp. *macrocephala* (Bertol.) Rouy ex Hegi - Breginjski Stol, 2015, L. & I. D.
744. *Serratula tinctoria* L. subsp. *tinctoria* - Kavčiče, 2015, J. B.
745. *Sesleria autumnalis* F. W. Schultz - Kobilnik nad Zadlaz-Čadrgom, 2014, L. & I. D.
746. *Silaum silaus* Schinz.& Thell. - Kneža, Slatne, 2015, L. & I. D.
747. *Smilax aspera* L. - Hrvaška - Hvar; Stari grad, 2015, D. C.
748. *Smilax aspera* L. - Nabrežina pri Trstu, 2015, L. & I. D.
749. *Smyrnium perfoliatum* L. - Rakitovec, 2014, J. B.
750. *Solanum dulcamara* L. - Trebnje, 2015, J. M.
751. *Solanum dulcamara* L. - Radomlje, 2014, B. V.
752. *Solidago virgaurea* L. - Gabrče, 2015, J. B.
753. *Solidago virgaurea* L. - Jezersko 1050 m, 2015, J. B.
754. *Solidago virgaurea* L. - Senožeče, 2015, J. B.
755. *Sorbus aucuparia* L. subsp. *aucuparia* - Breginjski Stol, 2015, L. & I. D.
756. *Sorbus aucuparia* L. subsp. *aucuparia* - Čaven, 2015, J. B., B. R.
757. *Sorbus chamaemespilus* (L.) Crantz - spodnji Lepoč nad dolino Bale, 2015, L. & I. D.
758. *Spartium junceum* L. - Piran - Fiesa, 2015, J. B.
759. *Spiraea decumbens* Koch - Rezija, ob poti na Sart, 2015, L. & I. D.
760. *Stachys recta* L. - Podgorje, 2014, J. B.
761. *Stachys sylvatica* L. - pod Barnikom, 2015, J. B., B. R.

762. *Staphylea pinnata* L. - Vezovje, 2015, J. B., B. R.
763. *Stemmacantha rhabontica* (L.) Dittrich - Breginjski Stol, 2015, L. & I. D.
764. *Stipa eriocaulis* Borbás subsp. *austriaca* (Beck) Moraldo & Ricceri - Podgorje, 2014, J. B.
765. *Tamus communis* L. - Notranjska - Sv. Vid, 2015, B. D.
766. *Tamus communis* L. - Zreče, 2015, J. B., B. R.
767. *Thalictrum aquilegiifolium* L. - Čaven, 2015, J. B., B. R.
768. *Thalictrum aquilegiifolium* L. - Gabrče, 2015, J. B., B. R.
769. *Thalictrum minus* L. - Čaven, 2015, J. B., B. R.
770. *Thalictrum minus* L. - Sočerga, 2015, J. B.
771. *Thlaspi arvense* L. - Komen, 2015, J. B., B. R.
772. *Tilia cordata* Mill. - Šentjurij, 2015, J. M.
773. *Tussilago farfara* L. - Mirna Peč, 2015, J. M.
774. *Tussilago farfara* L. - Sleme, 2015, J. B., B. R.
775. *Urtica dioica* L. - Knežak, 2015, J. B., B. R.
776. *Veratrum album* L. - nad Barnikom, 2015, B. R.
777. *Veratrum nigrum* L. - Kavčiče, 2015, J. B.
778. *Veratrum nigrum* L. - Straža, Sovodenj, Otuška, 2015, L. & I. D.
779. *Verbascum austriacum* Schott ex Roem. & Schult. - Sočerga, 2015, J. B.
780. *Verbascum blattaria* L. - Vogrsko, 2014, L. & I. D.
781. *Verbascum thapsus* L. - Stena/Dragonja, 2015, J. B.
782. *Veronica urticifolia* Jacq. - Otavnik, 2015, L. & I. D.
783. *Viburnum opulus* L. - Ljubljana-Moste, 2015, J. M.

Collectors of the wild seeds:

dr. Jože Bavcon (J. B.)
dr. Igor Dakskobler (I. D.)
Ljudmila Dakskobler (L. D.)
Branko Dolinar (B. D.)
Janja Makše (J. M.)
mag. Blanka Ravnjak (B. R.)
Po nekaj semen rastlinskih vrst pa so prispevali še:
Sara Bavcon (S. B.)
Drago Cenčič (D. C.)
Helena Puh (H. P.)
dr. Branko Vreš (B. V.)

LITERATURA (citirana in uporabljena) / LITERATURE (cited and used)

- AESCHIMANN D., K. LAUBER, D.M. MOSER, J– P. THEURILLAT, 2004. Flora alpina. Haupt Verlag Bern–Stuttgart–Wien.
- ANDERBERG A–L, 1994. Atlas of seeds and small fruits of Northeast – European plant species with morphological descriptions Part 4, Resedaceae- Umbelliferae, 277 pp.
- BAILEY L. H. 1914. The standard cyclopedia of Horticulture. Vol I/ A–E, Vol II/F–O, Vol III/ P–Z, Macmillan New York Chicago, Dallas, Atlanta, San Francisco, Toronto.
- BAVCON J. 2009. *Common cyclamen (Cyclamen purpurascens Mill.) and its diversity in Slovenia*. Ljubljana: Botanic Garden, Department of Biology, Biotechnical Faculty, 163 pp.
- BAVCON J. 2010. *Botanični vrt Univerze v Ljubljani = University Botanic Gardens Ljubljana*. Ljubljana: Kmečki glas, 2010. 231 pp.
- BERTALANIČ R, DEMŠAR M., DOLINAR M., DVORŠEK D., NADBATH M., PAVČIČ B., ROETHEL-KOVAČ M., VERTAČNIK G, VIČAR Z. 2010. Spremenljivost podnebja v Sloveniji, Ed. M. Dolinar, Ministrstvo za okolje in prostor, Agencija RS za okolje, Ljubljana.
- BERGGREN G. 1969. Atlas of seeds. Part 2. Cyperaceae, 65 pp.
- BERGGREN G. 1981. Atlas of seeds and small fruits of Northwest-European plant species with morphological descriptions Part 3 Salicaceae – Cruciferae, 261 pp.
- BISBY F.A., Roskov Y.R., Orrell T.M., Nicolson D., Paglinawan L.E., Bailly N., Kirk P.M., Bourgoin T., Baillargeon G., Ouvrard D., eds (2011). Species 2000 & ITIS Catalogue of Life, 26th July 2011. Digital resource at www.catalogueoflife.org/col/. Species 2000: Reading, UK.
- BOWN D. 1995. Encyclopedia of Herbs & their uses. The Royal Horticulture Society Dorling Kindersley London, New York Stuttgart, Moscow, 424 pp.
- BRAMWEL, D. 1997 Flora de Las Islas Canarias, Ed. Rueda. Cabildo de Gran Canaria, 219 pp.
- BRICKEL C. 1996. A–Z Encyclopedia of Garden Plants. Dorling Kindersley London, New York, Stuttgart, Moscow, 1080 pp.
- BROUWER W. & A. STÄHLIN 1955. Handbuch der Samenkunde für Landwirtschaft. Gartenbau und Fortswirtschaft. DLG-Verlag-GMBH., Frankfurt am Main, 656 pp.
- BURNIE G., S. FORESTER D. GREIG et. all., 1999. Botanica: the illus-

- trated A–Z of over 10,000 garden plants and how to cultivate them. 3rd ed., revised ed., Könemann, Cologne, 1020 pp.
- ELLISON D. P. 1995. Cultivated Plants of the World Trees Shrubs Climbers. Flora Publication International PTY LTD. Brisbane, 598 pp.
- ENCKE F., 1961. Pareys Blumengärtnerei, Zwite AuflageVol 1, 2. Paul Parey in Berlin und Hamburg, 826 pp.
- GATES P & ARDLE J. 2002. Climate change The Garden 127 (12): 912-917.
- HACQUET B. 1782. Plantae alpinae carniolicae. Viennae. 16pp.
- HAEUPLER H. T. MUER 2000. Bildatlas der Farn-und Blüttenpflanzen Deutschlands.
- HAYEK A. 1927–1933. Prodromus Flora Peninsulae Balcanicae, Berlin – Dahlem, vol 1–3.
- HEGI 1906–1931: Illustrierte Flora von Mittel – Europa. Lehmanns Verlag. München.
- <http://www.botanicni-vrt.si/> 2015
- <http://ipni.org/> 2015
- <http://meteo.ars.si/met/sl/app/webmet/>
- <http://www.ars.si/> 2012
- KALIGARIČ M. 1997. *Rastlinstvo Primorskega krasa in Slovenske Istre : travniki in pašniki*, Annales. Koper: Zgodovinsko društvo za južno Primorsko: Znanstveno-raziskovalno središče Republike Slovenije, 1997. 111 pp.
- LAUBER K & G WAGNER 1998. Flora Helvetica. Verlag Paul Haupt, Bern–Stuttgart–Wien 1614 pp.
- MARTINČIČ A., T. WRABER T, N. JOGAN, A. PODOBNIK, B. TURK, B. VREŠ, V. RAVNIK, B. FRAJMAN, S. STRGULC KRAJŠEK, B. TRČAK, T. BAČIČ, M. FISHER, K. ELER., B. SURINA 2007. Mala flora Slovenije. Ključ za določanje praprotnic in semenk. Tehniška založba Slovenije, Ljubljana, 967 pp.
- PETKOVŠEK V. 1935. Blagayev volčin. Proteus 2: 181-188.
- POLUNIN O. 1980. Flowers of Greece and the Balkans a field guide. Oxford University Press. Reprinted 1997, 592 pp
- ROHWER J. G. 2000. Pflanzen der Tropen. BLV Verlagsgesellschaft mbH, Munchen Wien Zurich, 287 pp.
- SCHÖNFELDER P&I 1997. Die Kosmos Kanarenflora, Kosmos Naturführer Stuttgart, 319 pp.
- SCHÖNFELDER P&I 2000. Was blüht am Mittelmeer? Kosmos Naturführer, Stuttgart, 319 pp.
- TRPIN D. & B. VREŠ 1995. Register flore Slovenije. Praprotnice in

cvetnice. Znanstveno raziskovalni center SAZU Ljubljana, zbirka ZRC 7: 143.

TUTIN T. G. et AL., 1964–1980. *Flora europaea* 1–5 Cambridge, University Press.

Verlag Eugen Ulmer Stuttgart, 759 pp.

WRABER T. 1990. Sto znamenitih rastlin. Prešernova družba. Ljubljana 239 pp.

WRABER T. 1996. Rastlinstvo. In Enciklopedija Slovenije 10 Pt/Savn. Mladinska knjiga, Ljubljana pp. 85-93.

ALPSKI BOTANIČNI VRT JULIANA

Špela Novak

Alpski botanični vrt Juliana leži v dolini Trente (severozahodna Slovenija), nad cesto Kranjska Gora - Bovec, v bližini zaselka Pri Cerkvi. Nahaja se na nadmorski višini približno 800 m n. m. in pokriva 2.572 m². Vrt je leta 1926 ustanovil tržaški posestnik Albert Bois de Chasne. Pri tem mu je z nasveti pomagal tudi znameniti Julius Kugy. Juliana je zavarovana od leta 1951, danes velja za botanično naravno vrednoto državnega pomena, kot naravni spomenik pa je tudi del ožjega zavarovanega območja Triglavskega naravnega parka. Vrt je zanimiv predvsem zaradi pestre mešanice alpskih in kraških rastlin, ki jo omogočata nizka nadmorska višina in vpliv toplega sredozemskega podnebja, ki prihaja z juga. V Juliani uspeva okoli 600 vrst rastlin, med njimi so številne redke in endemične vrste, ki so edinstvene za Slovenijo in njeno okolico, npr. rebrinčevolistna hladnikija (*Hladnikia pastinacifolia*), Hladnikov volčič (*Scopolia carniolica* f. *hladnikiana*), kranjski jeglič (*Primula carniolica*), idrijski jeglič (*Primula x venusta*)... Vrt je odprt vsak dan od 1. maja do 30 septembra. Vabljeni!

»Juliana« Alpine Botanical Garden

Špela Novak

The Juliana Alpine Botanical Garden is situated in the Trenta Valley (NW Slovenia), above the Kranjska Gora - Bovec road near the hamlet of Pri Cerkvi. It is located at an altitude of about 800 m a.s.l. and it covers 2,572 m². Juliana was founded in 1926 by the Trieste proprietor and merchant Albert Bois de Chasne, who's adviser was Julius Kugy. In 1951 the garden was protected as a natural feature and today it is also included (as a nature monument) among the central protected areas in Triglav National Park. The relatively low altitude and the warm impact of the sea, that comes from the south, enable good growth of karst and pre-alpine species. There-

fore the garden is interesting because of its mixture of alpine and karst species. Among them you can find several endemic species, that are unique for Slovenia and its surroundings (for example *Hladnikia pastinacifolia*, *Scopolia carniolica* f. *hladnikiana*, *Primula carniolica*, *Primula x venusta*...). Today, there are about 600 species held in Juliana. The garden is opened from May 1 to September 30. Welcome!

Semina in horto alpino Juliana Mu-seum historiae naturalis Sloveniae anno 2015 lecta

Špela Novak, Marija Završnik, Klemen Završnik

- 784. *Achillea clavennae* L.
- 785. *Aconitum degenii* Gáyer subsp. *paniculatum* (Archang.) Mucher
- 786. *Actaea spicata* L.
- 787. *Adenostyles glabra* (Miller) DC.
- 788. *Aethionema saxatile* (L.) R. Br.
- 789. *Agrimonia eupatoria* L.
- 790. *Alchemilla vulgaris* L.
- 791. *Alisma plantago-aquatica* L.
- 792. *Allium ericetorum* Thore
- 793. *Allium senescens* L.
- 794. *Allium ursinum* L.
- 795. *Alyssum moellendorfianum* Asch.
- 796. *Alyssum montanum* L.
- 797. *Androsace lactea* L.
- 798. *Anemone ranunculoides* L.
- 799. *Anemone trifolia* L.
- 800. *Anthericum ramosum* L.
- 801. *Anthyllis jacquinii* A. Kern.
- 802. *Aposeris foetida* (L.) Less.
- 803. *Aquilegia einseleana* F. W. Schultz
- 804. *Aquilegia nigricans* Baumg.
- 805. *Arabis alpina* L. subsp. *alpina*
- 806. *Arabis hirsuta* agg.
- 807. *Arabis turrita* L.
- 808. *Arabis vochinensis* Sprengel
- 809. *Armeria alpina* (DC.) Willd.
- 810. *Aruncus dioicus* (Walter) Fernald
- 811. *Asarum europaeum* L.
- 812. *Asparagus tenuifolius* Lam.
- 813. *Asperula cynanchica* L.

814. *Asperula taurina* L.
815. *Aster alpinus* L.
816. *Aster amellus* L.
817. *Aster bellidiastrum* (L.) Scop.
818. *Astragalus glycyphyllos* L.
819. *Astrantia carniolica* Jacq.
820. *Astrantia major* L.
821. *Athamanta cretensis* L.
822. *Athamanta turbith* (L.) Brot. p. p., em. H. Karst.
823. *Aurinia petraea* (Ard.) Schur
824. *Betonica alopecuros* L.
825. *Betonica officinalis* L.
826. *Biscutella laevigata* L.
827. *Braya alpina* Sternb. & Hoppe
828. *Buphthalmum salicifolium* L.
829. *Bupleurum falcatum* L. subsp. *cernuum* (Ten.) Arcang.
830. *Bupleurum petraeum* L.
831. *Bupleurum ranunculoides* L. subsp. *ranunculoides*
832. *Calluna vulgaris* (L.) Hull.
833. *Caltha palustris* L.
834. *Campanula glomerata* L. subsp. *glomerata*
835. *Campanula persicifolia* L.
836. *Campanula rapunculoides* L.
837. *Campanula spicata* L.
838. *Campanula trachelium* L.
839. *Cardamine pentaphyllos* (L.) Crantz
840. *Carduus defloratus* L. sensu Kazmi
841. *Carex flava* L.
842. *Carex sylvatica* Huds.
843. *Carlina acaulis* L. subsp. *acaulis*
844. *Centaurea alpina* L.
845. *Centaurea dichroantha* A.Kern.
846. *Centaurea jacea* L.
847. *Centaurea scabiosa* L. subsp. *fritschii* (Hayek) Hayek
848. *Centaurea scabiosa* L. subsp. *scabiosa*
849. *Cephalanthera damasonium* Druce
850. *Cephalanthera longifolia* (L.) Fritsch
851. *Cephalanthera rubra* (L.) L. C. Rich.
852. *Cephalaria leucantha* (L.) Roemer & Schultes
853. *Cerastium carinthiacum* Vest subsp. *carinthiacum*

854. *Cerastium subtriflorum* (Rchb.) Pacher
855. *Cerinthe glabra* Miller
856. *Chaerophyllum hirsutum* L.
857. *Chamaecytisus hirsutus* Link
858. *Chamaecytisus purpureus* Scop.
859. *Chamaespartium sagittale* (L.) P. E. Gibbs
860. *Chenopodium bonus-henricus* L.
861. *Cirsium erisithales* (Jacq.) Scop.
862. *Cirsium oleraceum* (L.) Scop.
863. *Clematis recta* L.
864. *Convallaria majalis* L.
865. *Coronilla coronata* L.
866. *Coronilla emerus* L. subsp. *emerus*
867. *Corydalis cava* Schweigg. & Kort.
868. *Cotoneaster dielsianus* E. Pritz. ex Diels
869. *Cotoneaster integerrimus* Medik.
870. *Crepis aurea* Rchb.
871. *Crepis slovenica* Holub
872. *Crocus vernus* (L.) Hill
873. *Crocus vernus* (L.) Hill subsp. *albiflorus* (Kit.) Ascherson & Graebner
874. *Cypripedium calceolus* L.
875. *Dactylorhiza maculata* (L.) Soó subsp. *fuchsii* (Druce) Hyl.
876. *Daphne alpina* L.
877. *Daphne cneorum* L.
878. *Dianthus barbatus* L. subsp. *barbatus*
879. *Dianthus hyssopifolius* L.
880. *Dianthus sternbergii* Sieber
881. *Dictamnus albus* L.
882. *Digitalis grandiflora* Miller
883. *Digitalis laevigata* Waldst. & Kit.
884. *Dorycnium germanicum* (Greml) Rikli
885. *Draba aizoides* L.
886. *Dryas octopetala* L.
887. *Drypis spinosa* L. subsp. *jacquiniana* Murb. et Wettst.
888. *Echinops exaltatus* Schrader
889. *Echinops ritro* L. subsp. *ruthenicus* (Bieb.) Nyman.
890. *Epilobium montanum* L.
891. *Epilobium parviflorum* Schreb.
892. *Epimedium alpinum* L.

893. *Epipactis atrorubens* (Hoffm. ex Bernh.) Besser
894. *Epipactis helleborine* (L.) Crantz
895. *Epipactis palustris* (L.) Crantz
896. *Erigeron glabratus* Hoppe & Hornsch. ex Bluff & Fingerh.
897. *Erinus alpinus* L.
898. *Eryngium alpinum* L.
899. *Eryngium amethystinum* L.
900. *Erysimum sylvestre* Scop.
901. *Euonymus latifolius* (L.) Mill
902. *Eupatorium cannabinum* L.
903. *Euphorbia angulata* Jacq.
904. *Euphorbia nicaeensis* All.
905. *Euphorbia triflora* Schott, Nyman & Kotschy subsp. *triflora*
906. *Filipendula ulmaria* (L.) Maxim.
907. *Filipendula vulgaris* Moench
908. *Frangula rupestris* (Scop.) Schur
909. *Fumana procumbens* (Dunal) Gren. & Godr.
910. *Galanthus nivalis* L.
911. *Galium odoratum* (L.) Scop.
912. *Galium purpureum* L.
913. *Galium verum* L.
914. *Genista januensis* Viv.
915. *Genista radiata* (L.) Scop.
916. *Genista tinctoria* L.
917. *Gentiana angustifolia* Vill.
918. *Gentiana asclepiadea* L.
919. *Gentiana verna* L. subsp. *verna*
920. *Gentianella germanica* (Willd.) E. F. Warburg in Clapham, Tutin &
E. F. Warburg
921. *Geranium macrorrhizum* L.
922. *Geranium sanguineum* L.
923. *Geum molle* Vis. & Pančić
924. *Geum rivale* L.
925. *Geum speciosum* Albov
926. *Gladiolus illyricus* Koch
927. *Globularia cordifolia* L.
928. *Globularia nudicaulis* L.
929. *Globularia punctata* Lapeyr.
930. *Grafia golaka* (Hacq.) Rchb.
931. *Gymnadenia conopsea* (L.) R. Br.

932. *Hacquetia epipactis* (Scop.) DC.
933. *Helianthemum alpestre* (Jacq.) Griseb.
934. *Helianthemum nummularium* (L.) Mill. subsp. *grandiflorum* (Scop.) Schinz & Thell.
935. *Heliosperma alpestre* (Jacq.) Griseb.
936. *Heliosperma pusillum* (Waldst. & Kit.) Rchb. subsp. *pusillum*
937. *Helleborus niger* L.
938. *Helleborus odorus* Waldst. & Kit.
939. *Hemerocallis lilioasphodelus* L.
940. *Hesperis matronalis* L. subsp. *candida* (Kit.) Hegi & Em. Schmid
941. *Hieracium glaucinum* Jord.
942. *Hieracium gymnocephalum* Griseb. ex Pant.
943. *Hieracium pilosella* L.
944. *Hieracium piloselloides* Vill.
945. *Hieracium pilosum* Schleicher ex Froelich in DC.
946. *Hieracium porrifolium* L.
947. *Hieracium valdepilosum* Vill.
948. *Hieracium villosum* Jacq.
949. *Hippocratea comosa* L.
950. *Homogyne sylvestris* Cass.
951. *Horminum pyrenaicum* L.
952. *Hypericum montanum* L.
953. *Hypericum perforatum* L.
954. *Hypochaeris maculata* L.
955. *Inula spiraeifolia* L.
956. *Iris graminea* L.
957. *Iris pallida* Lam. subsp. *illyrica* (Tommasini) T. Wraber
958. *Iris sibirica* L. subsp. *sibirica*
959. *Kernera saxatilis* (L.) Reichenb.
960. *Knautia arvensis* (L.) Coulter
961. *Knautia drymeia* Heuffel subsp. *drymeia*
962. *Knautia fleischmannii* (Hladnik ex Reichenb.) Pacher
963. *Knautia illyrica* G. Beck
964. *Laserpitium archangelica* Wulfen
965. *Laserpitium latifolium* L.
966. *Laserpitium siler* L.
967. *Lathyrus occidentalis* (Fisch. & Meyer) Fritsch var. *montanus* (Scop.) Fritsch
968. *Lathyrus pannonicus* (Jacq.) Garcke subsp. *varius* (C. Koch) P. W. Ball

969. *Lathyrus pratensis* L.
970. *Lathyrus vernus* (L.) Bernh. subsp. *vernus*
971. *Lembotropis nigricans* (L.) Griseb. subsp. *nigricans*
972. *Leontodon incanus* Schrank subsp. *incanus*
973. *Leucanthemum ircutianum* (Turcz.) DC.
974. *Leucojum vernum* L.
975. *Libanotis sibirica* (L.) C. A. Mey.
976. *Ligusticum seguieri* (Jacq.) Koch
977. *Linum julicum* Hayek
978. *Listera ovata* (L.) R. Br.
979. *Lithospermum officinale* L.
980. *Lunaria rediviva* L.
981. *Luzula nivea* (L.) DC.
982. *Luzula sylvatica* (Huds.) Gaudin subsp. *sylvatica*
983. *Lycopus europaeus* L. subsp. *europaeus*
984. *Lysimachia vulgaris* L.
985. *Lythrum salicaria* L.
986. *Medicago lupulina* L.
987. *Medicago pironae* Vis.
988. *Mentha longifolia* (L.) Huds.
989. *Meum athamanticum* Jacq.
990. *Minuartia gerardii* (Willd.) Hayek
991. *Moehringia muscosa* L.
992. *Muscari botryoides* (L.) Miller
993. *Mycelis muralis* (L.) Dumort.
994. *Myrrhis odorata* (L.) Scop.
995. *Narcissus poeticus* L. subsp. *radiiflorus* (Salisb.) Baker
996. *Omalotheca sylvatica* (L.) Sch. Bip. & F. W. Schultz
997. *Omphalodes verna* Moench
998. *Orchis militaris* L.
999. *Origanum vulgare* L.
1000. *Paeonia officinalis* L.
1001. *Paris quadrifolia* L.
1002. *Parnassia palustris* L.
1003. *Peltaria alliacea* Jacq.
1004. *Petasites albus* (L.) Gaertner
1005. *Petrorhagia saxifraga* (L.) Link
1006. *Peucedanum austriacum* (Jacq.) Koch var. *rabilense* (Wulfen) Koch
1007. *Peucedanum oreoselinum* (L.) Moench
1008. *Peucedanum schottii* Besser.

1009. *Peucedanum verticillare* (L.) Koch
1010. *Phyteuma orbiculare* L.
1011. *Phyteuma scheuchzeri* All. subsp. *columnae* (Gaudin) Bech.
1012. *Phyteuma spicatum* L. subsp. *spicatum*
1013. *Pimpinella saxifraga* L.
1014. *Pinguicula alpina* L.
1015. *Platanthera bifolia* (L.) Rich.
1016. *Polemonium caeruleum* L.
1017. *Polygonatum multiflorum* (L.) All.
1018. *Polygonum bistorta* L.
1019. *Polygonum viviparum* L.
1020. *Potentilla alba* L.
1021. *Potentilla carniolica* A. Kern.
1022. *Potentilla caulescens* L.
1023. *Potentilla erecta* (L.) Raeusch.
1024. *Potentilla micrantha* Ramond. ex DC.
1025. *Potentilla rupestris* L.
1026. *Prenanthes purpurea* L.
1027. *Primula halleri* J. F. Gmelin
1028. *Primula veris* L. subsp. *columnae* (Ten.) Lüdi in Hegi
1029. *Pulmonaria officinalis* L.
1030. *Pulsatilla alpina* (L.) Delarbre subsp. *austroalpina* D. M. Moser
1031. *Pyrola rotundifolia* L.
1032. *Ranunculus lanuginosus* L.
1033. *Ranunculus platanifolius* L.
1034. *Ranunculus thora* L. f. *pseudoscutatus* E. Mayer
1035. *Reseda lutea* L.
1036. *Rhodiola rosea* L.
1037. *Rhododendron hirsutum* L.
1038. *Rhodothamnus chamaecistus* Rchb.
1039. *Rubus saxatilis* L.
1040. *Rumex scutatus* L.
1041. *Ruscus hypoglossum* L.
1042. *Ruta divaricata* Ten.
1043. *Salvia verticillata* L.
1044. *Sanguisorba minor* Scop.
1045. *Sanguisorba officinalis* L.
1046. *Saponaria officinalis* L.
1047. *Satureja montana* L. subsp. *variegata* (Host) P. W. Ball
1048. *Satureja subspicata* Bartl. ex Vis. subsp. *liburnica* Šilić

1049. *Saxifraga crustata* Vest
1050. *Saxifraga cuneifolia* L.
1051. *Saxifraga paniculata* Miller
1052. *Scabiosa graminifolia* L.
1053. *Scabiosa lucida* Vill. subsp. *stricta* (Waldst. & Kit.)
1054. *Scabiosa silenifolia* Waldst. & Kit.
1055. *Scrophularia juratensis* Schleicher
1056. *Sedum dasyphyllum* L.
1057. *Sedum maximum* (L.) Hoffm.
1058. *Senecio abrotanifolius* L.
1059. *Senecio doronicum* L.
1060. *Seseli gouanii* Koch
1061. *Sibiraea croatica* Degen
1062. *Silene dioica* (L. em Mill.) Clairv.
1063. *Silene hayekiana* Hand.-Mazz. & Janchen
1064. *Silene latifolia* Poiret
1065. *Silene nutans* L.
1066. *Silene vulgaris* (Moench) Garcke subsp. *antelopum* (Vest) Hayek
1067. *Silene vulgaris* (Moench) Garcke subsp. *vulgaris*
1068. *Soldanella minima* Hoppe
1069. *Spiraea decumbens* Koch subsp. *decumbens*
1070. *Stachys recta* L.
1071. *Succisa pratensis* Moench
1072. *Tanacetum corymbosum* (L.) Schultz Bip. subsp. *clusii* (Fischer ex Reichenb.) Heywood
1073. *Taraxacum officinale* agg.
1074. *Taxus baccata* L.
1075. *Telekia speciosa* (Schreber) Baumg.
1076. *Tephroseris pseudocrispa* (Fiori) Holub
1077. *Teucrium montanum* L.
1078. *Thalictrum minus* L.
1079. *Tofieldia calyculata* (L.) Wahlenb.
1080. *Trifolium badium* Schreb.
1081. *Trifolium montanum* L.
1082. *Trifolium rubens* L.
1083. *Trollius europaeus* L.
1084. *Tussilago farfara* L.
1085. *Valeriana montana* L.
1086. *Valeriana officinalis* L.
1087. *Valeriana tripteris* L.

1088. *Veratrum album* L. subsp. *lobelianum* (Bernh. in Schrader) Sues-senguth
1089. *Veratrum nigrum* L.
1090. *Verbascum alpinum* Turra
1091. *Veronica barrelieri* Schott ex Roem. & Schult. subsp. *barrelieri*
1092. *Veronica fruticans* Jacq.
1093. *Veronica fruticulosa* L.
1094. *Veronica maritima* L.
1095. *Veronica urticifolia* Jacq.
1096. *Vicia oroboides* Wulfen
1097. *Viola rupestris* F.W.Schmidt
1098. *Wulfenia carinthiaca* Jacq.

Curator: Špela Novak

Hortulaní: Marija Završnik & Klemen Završnik, dipl. inž. agr. in h.

Literatura / Literature:

- MARTINČIČ, A. & T. WRABER, N. JOGAN, A. PODOBNIK, B. TURK, B. VREŠ, V. RAVNIK, B. FRAJMAN, S. STRGULC KRAJŠEK, B. TRČAK, T. BAČIČ, M. A. FISCHER, K. ELER, B. SURINA, 2007: Mala flora Slovenije. Ključ za določanje praprotnic in semenk. Tehniška založba Slovenije. Ljubljana. 967 pp.
- PRAPROTNIK, N., 2011: Alpski botanični vrt Juliana. Prirodoslovni muzej Slovenije. 133 pp.
- PRAPROTNIK, N., 2012: Alpski botanični vrt Juliana in seznam rastlin. *The Juliana Botanical Garden and Lists of its Plants*. Scopolia 75: 1-105
- THE INTERNATIONAL PLANT NAMES INDEX. www.ipni.org (6. 1. 2016)
- TUTIN, G. & al., 1984-1980: Flora Europaea 1-5. Cambridge, University Press.

Alpski botanični vrt Juliana v Trenti je odprt od 1. maja do 30. septembra vsak dan od 8.30 do 18.30.

Informacije o vrtu posreduje Prirodoslovni muzej Slovenije, Prešernova 20, p.p. 290, SI - 1000 Ljubljana, Slovenija:

tel.: + 386 1 241 09 40

fax.: + 386 1 241 09 53

e-mail: uprava@pms-lj.si

spletna stran: <http://www2.pms-lj.si/juliana/juliana.html>

The "Juliana" botanical garden in the Trenta valley is open daily from 8.30 to 18.30 between May 1st and September 30th.

For any information on the garden please contact the Slovene Museum of Natural History, Prešernova 20, p.p. 290, SI - 1000 Ljubljana, Slovenija:

tel.: + 386 1 241 09 40

fax.: + 386 1 241 09 53

e-mail: uprava@pms-lj.si

website: <http://www2.pms-lj.si/juliana/juliana.html>

Please send all seeds orders to the index.seminum@botanicni-vrt.si

KAZALO / INDEX

Travniki zelene površine ali pisani vrtovi?	3
Izvleček	3
Uvod	3
Material in metodika	11
Rezultati in diskusija	16
Zaključek	44
Meadows - Green Surfaces or Colorful Gardens?	47
Abstract	47
Introduction	47
Results and discussion	60
Conclusion	87
Literatura / Literature	89
Index seminum annis 2015 et 2014 collectorum	99
Abstract	99
Material and methods	99
Index seminum annis 2015 et 2014 collectorum	101
CONIFERO PHYTINA (Gymnospermae)	101
MAGNOLIOPHYTINA (Angiospermae)	101
Semina e plantis spontaneis in loco natali annis 2015 et 2014 lecta	119
LITERATURA (citirana in uporabljena) / LITERATURE (cited and used)	129
Alpski botanični vrt Juliana	132
»Juliana« Alpine Botanical Garden	132
Semina in horto alpino Juliana Museum historiae naturalis Slo- veniae anno 2015 lecta	134
Literatura / Literature	143

STVARNO KAZALO / SUBJECT INDEX

- Acanthaceae 101
Aceraceae 101
Actinidiaceae 101
Alismataceae 101
Alliaceae 101
Allium angulosum 35,
42, 78, 84
Allium carinatum 35, 78
Allium ericetorum 35, 78
Allium scorodoprasum
35, 78
Allium senescens 35,
78
Allium sphaerocephalon
35, 78
Aloeaceae 102
Amaranthaceae 102
Amaryllidaceae 102
Anacardiaceae 102
Anthericum ramosum
34, 40, 77, 83
Anthyllis vulneraria 30,
73
Apiaceae 102
Apocynaceae 102
Aquifoliaceae 103
Araceae 103
Araliaceae 103
Arecaceae 103
Asclepiadaceae 103
Asphodelaceae 103
Asphodelus albus 29,
72
Asteraceae 103
Berberidaceae 104
Betula pendula 6, 50
Betula pubescens 6, 50
Betulaceae 104
Bignoniaceae 104
Boraginaceae 105
Brassicaceae 105
Bromeliaceae 105
Buxaceae 105
Caesalpiniaceae 106
Calycanthaceae 106
Campanulaceae 106
Cannabaceae 106
Carpinaceae 106
Caryophyllaceae 106
Celastraceae 107
Centaurea scabiosa 40, 82
Chamaecytisus purpureus 39,
82
Cichoriaceae 107
Cirsium pannonicum 40, 82
Cistaceae 107
CONIFEROPHYTINA 101
Convallariaceae 107
Convolvulaceae 107
Cornaceae 108
Costaceae 108
Cotinus coggygria 8, 52
Crassulaceae 108
Crocus reticulatus 21, 64
Crocus vernus subsp. albiflorus
21, 65
Crocus vernus subsp. vernus
21, 22, 64, 65
Cucurbitaceae 108
Cyperaceae 108
Datiscaceae 108
Dictamnus albus 30, 72
Dioscoreaceae 108
Dipsacaceae 108

- Elaeagnaceae 108
Ericaceae 109
Eryngium amethystinum 35, 78
Euphorbiaceae 109
Fabaceae 109
Fallopia japonica 6, 50
Fraxinus ornus 8, 52
Fumariaceae 109
Galanthus nivalis 20, 63
Genista tinctoria 40, 82
Gentiana lutea subsp.
symphyandra 34, 76
Geraniaceae 109
Gladiolus illyricus 33, 40, 74, 82
Globularia punctata 25, 68
Globulariaceae 109
Grossulariaceae 109
Hamamelidaceae 109
Helleborus atrorubens 24, 67
Helleborus multifidus subsp.
istriacus 23, 67
Helleborus niger 23, 67
Helleborus odorus 23, 67
Hyacinthaceae 110
Hydrangeaceae 110
Hypericaceae 110
Impatiens glandulifera 6, 50
Iridaceae 110
Iris graminea 27, 70
Iris pallida subsp. illyrica 27, 70
Iris pseudacorus 28, 71
Iris sibirica 27, 71
Iris sibirica subsp. erirrhiza 27,
70
Juglandaceae 110
Juniperus communis 8, 52
Jurinea mollis 30, 72
Lamiaceae 110
Lardizabalaceae 111
Laserpitium latifolium 34, 77
Laserpitium siler 34, 76
Leucojum aestivum 28, 42, 71,
84
Liliaceae 111
Linaceae 111
Linum viscosum 40, 82
Lychnis flos-cuculi 28, 71
Lythraceae 111
Magnoliaceae 111
MAGNOLIOPHYTINA 101
Malvaceae 111
Martyniaceae 112
Meliaceae 112
Mimosaceae 112
Moraceae 112
Muscari botryoides 25, 69
Muscari neglectum 26, 69
Myrtaceae 112
Narcissus poeticus subsp. ra-
diiflorus 25, 26, 68, 69
Nyctaginaceae 112
Oleaceae 112
Onagraceae 112
Paeonia officinalis 29, 72
Paeoniaceae 112
Papaveraceae 113
Passifloraceae 113
Peucedanum oreoselinum 34,
40, 76, 83
Phytolacca americana 6, 50
Phytolacca clavigera 6, 50
Phytolaccaceae 113
Picea abies 6, 50
Pinaceae 101
Pinus nigra 6, 50
Pinus sylvestris 6, 50
Pittosporaceae 113
Plantaginaceae 113

- Poaceae 113
Polemoniaceae 113
Polygonaceae 113
Populus alba 6, 50
Populus tremula 6, 50
Portulacaceae 114
Potentilla alba 24, 68
Potentilla tommasiniana 24, 67
Primula vulgaris 23, 66
Primulaceae 114
Prunus avium 6, 50
Pulsatilla montana 24, 67
Pulsatilla nigricans 25, 68
Quercus pubescens 8, 52
Ranunculaceae 114
Ranunculus acris 28, 71
Resedaceae 114
Rhinanthus 30, 73
Robinia pseudoacacia 6, 50
Rosaceae 114
Rubiaceae 115
Rudbeckia laciniata 6, 50
Rutaceae 115
Salvia pratensis 31, 73
Sambucaceae 116
Sanguisorba officinalis 33, 76
Sapindaceae 116
Satureja montana 35, 78
Satureja subspicata subsp. liburnica 35, 78
Satureja x karstiana 35, 78
Saxifragaceae 116
Scabiosa triandra 30, 73
Scrophulariaceae 116
Solanaceae 116
Solidago canadensis 6, 50
Solidago gigantea 6, 50
Staphyleaceae 117
Stipa pennata 72
Stipa eriocalis 30
Styracaceae 117
Taccaceae 117
Taxaceae 101
Taxodiaceae 101
Thymelaeaceae 117
Tiliaceae 117
Tragopogon pratensis subsp. orientalis 30, 73
Trifolium montanum 30, 73
Typhaceae 117
Ulmaceae 117
Urticaceae 117
Verbenaceae 117
Zingiberaceae 117
Zygophyllaceae 117

DESIDERATA

Please send all seeds orders to the:

Botanični vrt Univerze v Ljubljani
Ižanska cesta 15
SI-1000 Ljubljana
Slovenija
Tel.: +386(0) 1 427-12-80
Website: www.botanicni-vrt.si
e-mail: index.seminum@botanicni-vrt.si

Desiderata 2015

Your address:

--

In response to the International Convention on Biological Diversity (Rio de Janeiro, 1992), the Hortus Botanicus Universitatis Labacensis supplies the seeds requested as laid down in the present Convention.

I agree to comply with the conditions above.

Signature _____ Date _____

Please return this order form with numbers you wish to receive!

