

# Notes about the floristic diversity in the Triglav National Park and the vascular flora of the towns of Budva, Podgorica and Dubrovnik (Adriatic Coast of Croatia and Monte Negro)

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**Abstract:** This article describes the flora of the northern slopes of the Triglav Peak (Julian Alps). Further, we discuss the flora of Dubrovnik (the old town area) and the flora of the towns of Budva and Podgoritsa.

**Key words:** Julian Alps, Mediterranean flora, protected area

## Introduction

During a ten day trip to the highest peak of the Julian Alps – Triglav, we studied the rich and diverse flora of this region and subsequently with the flora of the towns of Dubrovnik, Budva and Podgorica. The whole trip took place in the fall of 2006.

## Material and Methods

We used the routing method for the description of the species. The determination of the species was done following TUTIN et al. (1964-1980), HAYEK (1924-1927; 1928-1931; 1932-1933), PIGNATTI (1982), HORVATIC (1967), and LAUBER & WAGNER (1996). The habitats of European significance found in the surveyed territories are listed under EUNIS. DAKSKOBLER & SURINA (2017) who have conducted a phytosociological analysis of alpine swards and heathlands (pioneer patches) on ridges and peaks in the Julian Alps (Northwest Slovenia).

## Results and Discussion

### 1. Triglav National Park

As a starting point for our trip to the Triglav peak, we chose the Mojstrana Village. We spent the first night in the Aljaz Lodge (1015 m a.s.l.). The lodge is located on the left bank of the Bistrice River. The river's karst spring can also be found about 2 km above the lodge. The vegetation between the village

and the lodge is comprised of Fagetum sylvaticae. The forest underlayer is comprised of *Erica carnea* L., *Campanula rotundifolia* L., *Cyclamen hederifolium* Aiton, *Helleborus niger* L., *Aquilegia vulgaris* L. and *Eupatorium cannabinum* L. Right before the lodge, the type of vegetation changes and is now comprised of *Piceetum myrtillosum* and the subforest is comprised of *Fagus sylvatica* L., *Vaccinium myrtillus* L., *Prunella vulgaris* L., *Melampyrum sylvaticum* L., *Mycelis muralis* (L.) Dumort., *Asplenium trichomanes* L., *Daphne mezereum* L., *Dryopteris filix-mas* (L.) Schott, *Polypodium vulgare* L., *Oxalis acetosella* L., *Polystichum aculeatum* (L.) Roth, *Origanum vulgare* L., *Trientalis europaea* L., *Geranium robertianum* L., *Hepatica nobilis* Mill., *Euphorbia amygdaloides* L., *Stellaria media* (L.) Vill., *Arabis alpina* L., *Epipactis helleborine* (L.) Crantz, *Mercurialis perennis* L., *Hypericum perforatum* L., *Ranunculus acris* L., *Salix silesiaca* Willd., *Potentilla erecta* (L.) Raeusch, *Bellis perennis* L., *Plantago media* L., *Urtica dioica* L. The lodge is located on the left bank of the Bistrice river. The northern slopes of Triglav peak are very steep, almost vertical at some points. They are a part of the Triglav National Park, which has been a natural protected area since 1981. The Park covers 880 square km (4% of the territory of Slovenia). Sandjo Beschev, our guide, chose the Prag Route which crosses the whole northern slope. The terrain here is comprised mainly of karst rocks. There were some metal pegs stuck at some of the more vertical

places together with parts of suspended metal ropes – done with the purpose of assisting climbers on their way up. After we spent the night at the lodge, we started our ascension towards the peak. Our transect started from 1074 m and finished at 2864 m. The arboreal and bush vegetation around the Bistricea river is comprised of *Salix caprea* L., *Sorbus aria* (L.) Crantz, *Lonicera nigra* L., *Pinus mugo* Turra, *Carpinus betulus* L., *Acer heldreichii* Orph., *Juniperus communis* L., *Rhamnus alpinus* L., *Ribes alpinum* L., *Rosa pendulina* L., *Clematis alpina* (L.) Mill. and *Rhamnus catharticus* L. The natural habitat of the wall on the the Prag Route is 8210 Calcareous rocky slopes with chasmophytic vegetation. We found the following grassy species in the area: *Euphrasia rostkoviana* Hayne, *Solidago virgaurea* L., *Parnassia palustris* L., *Cerastium alpinum* L., *Rhinanthus minor* L., *Toeffildia pusilla*, *Rhododendron ferrugineum* L., *Paris quadrifolia* L., *Lilium carniolicum* Bernh. ex W.D.J.Koch, *Silene alpina* (Lam.) Thomas, *Astrantia minor* L., *Globularia aphyllanthes* Crantz, *Aster alpinus* L., *Dryas octopetala* L., *Globularia cordifolia* L., *Gentianella ciliata* (L.) Borkh., *Silene pusilla* Waldst. & Kit., *Scrophularia heterophylla* subsp. *laciniata* (Waldst. et Kit.) Maire & Petitm., *Dianthus petraeus* Waldst. & Kit., *Selaginella selaginoides* (L.) Link, *Campanula cochlearifolia* Lam., *Gentiana asclepiadea* L., *Linum capitatum* Kit. ex Schult., *Carex kitaibeliana* Degen ex Bech., *Anthericum liliiago* L. *Pseudorchis albida* (L.) A. & D. Love, *Biscutella laevigata* L., *Asperula capitata* Kit. Ex Schult., *Thesium alpinum* L., *Adenostyles alliariae* (Gouan) A. Kern., *Trollius europaeus* L., *Saxifraga bryoides* L., *Juncus trifidus* L., *Bartsia alpina* L., *Anthyllis aurea* Welden, *Prenanthes purpurea* L., *Iberis saxatilis* L., *Avenella flexuosa* (L.) Drejer, *Crepis viscidula* Froel, 1800 m a.s.l., *Saxifraga paniculata* Mill., *Arabis alpina* L., *Arctostaphylos alpinus* (L.) Sprengel, *Festuca rubra* L., *Festuca bosniaca* Kumm. & Sendtn., *Aquilegia alpina* L., *Salix reticulata* L., *Cystopteris alpina* (Lam.) Desv., *Achillea atrata* L., *Saxifraga stellaris* L., *Athamantha cretensis* L., *Bistorta vivipara* (L.) Gray, *Galium anisophyllum* Vill., *Poa alpina* L., *Pedicularis orthantha* Griseb., *Asplenium viride* Huds., *Polystichum lonchitis* (L.) Roth, *Cirsium spinosissimum* (L.) Scop.

Eventually, we reached the flat Kotel locality whose natural habitat is e 6170 Alpine and subalpine calcareous grasslands. The species we found here are: *Silene acaulis* (L.) Jacq., *Papaver sendtneri* A. Kern. ex Hayek, *Arabis bellidifolia* Crantz, *Alyssum oviense* A. Kern., *Draba aizoides* L., *Pritzelago alpina* (L.) Kuntze, *Saxifraga aphylla* Sternb., *Saxifraga hohenwartii* Vest, *Potentilla nitida* L., *Sorbus chamae-*

*mespilus* (L.) Crantz, *Globularia nudicaulis* L., *Pinguicula grandiflora* Lam., *Scabiosa lucida* Vill., *Campanula zoyisii* Wulfen, *Phyteuma orbiculare* L., *Tofieldia calyculata* (.) Wahlenb., *Noccaea rotundifolia* (L.) Moench, *Iberis umbellata* L., *Rumex scutatus* L., *Cerastium alpinum* L., *Moehringia ciliata* (Scop.) D.T., *Scleranthus perennis* L., *Molinia arundinacea* Schrank. At the Triglav peak itself (2864 m) we managed to determine *Hutschinsia brevicaulis* Hoppe and *Thlaspi rotundifolium* (L.) Gaud. Next to the Triglav Lodge at Kredarica (2541 m), we found *Myosotis alpestris* F. W. Schmidt.

### Dubrovnik

After we climbed down the Triglav peak, we took off south to the town of Dubrovnik. From Split to Dubrovnik, the vegetation is Mediterranean sclerophyllous forest and scrub. The rocks in this region are mostly calcareous. The arboreal and bush vegetation here is comprised of *Juniperus oxycedrus* L., *Pistacia terebinthus* L., *Pinus pinaster* Aiton, *Cedrus libani* A. Richt, *Cupressus sempervirens* L., *Pinus pinia* L., *Ficus carica* L., *Nerium oleander* L., *Chamaerops humilis* L., *Agave americana* L., *Capparis spinosa* L., *Olea europaea* L., *Smilax aspera* L. The grassy species found here were: *Tribulus terrestris* L., *Ecbalium elaterium* (L.) A. Rich., *Euphorbia peplis* L. and *Foeniculum vulgare* Mill.

Within the old town of Dubrovnik there are many tropical species, such as: *Citrus limon* (L.) Osbek, *Phoenix dactylifera* L., *Chamaerops humilis* L., *Melia azedarach* L., and *Passiflora caerulea* L. We found also the following grassy species: *Crithmum maritimum* L. and *Parietaria lusitanica* L.

### Budva

We spent more time researching the urban flora of Budva, where we stayed for 2 consecutive days. Here found the following arboreal and grassy species: *Punica granatum* L., *Wisteria sinensis* (Simk.) DC., *Cerantonia siliqua* L., *Cercis siliquastrum* L., *Celtis australis* L., *Spartium junceum* L., *Armeniaca vulgaris* Lam., *Myrtus communis* L., *Ulmus minor* Mill., *Falopia japonica* (Houtt.) Rouse Decr., *Partenocissus quinquefolia* (L.) Planch., *Actinidia deliciosa* L.F., *Carpinus orientalis* Mill., *Ailanthus altissima* (Mill.) Swingle, *Morus alba* L., *Paliurus spina-christi* Mill., *Juglans regia* L., *Coronilla emerus* L., *Colutea arbore-scens* L., *Magnolia grandiflora* L., *Evonymus japonica* Thunb., *Cornus sanguinea* L., *Bougainvillea glabra* Choisy, *Pistacia lentiscus* L., *Pittosporum tobira* (Tausch.) W. T. Aiton, *Arbutus unedo* L., *Castanea sativa* Mill., *Phillyrea latifolia* L., *Albizia julibris-*

*sin Durazz.*, *Smilax aspera* L., *Crataegus monogyna* Jacq., *Lagerstreumia indica* L., *Quercus pubescens* Willd., *Acacia dealbata* L., *Cistus incanus* L., *Gleditsia triacanthos* L., *Campsis radicans* Seem, *Hedera helix* L. and *Rubus sanguineus* Friv.

It has to be noted that there are a lot of alien species found within the urban area of Budva: *Eleusine indica* (L.) Gaertn., *Sorghum halepense* (L.) Pers., *Sporobolus indicus* (L.) R. Br., *Disphania multifida* (L.) Mosyakin & Clements., *Ambrosia trifida* L., *Conyza bonariensis* (L.) Cronq., *Amaranthus deflexus* L.

We found the following grassy species on the town streets: *Cynodon dactylon* (L.) Pers., *Paspalum dilatatum* Poir., *Dittrichia graveolens* (L.) Greuter, *Paspalum paspaloides* (Michx.) Scribn., *Setaria viridis* (L.) P. Beauv., *Koeleria nitidula* Velen., *Piptatherum miliaceum* (L.) Aschers. et Sch., *Cyperus rotundus* (L.) Mey., *Hyparrhenia hirta* (L.) Stapf., *Rorippa sylvestris* (L.) Bess., *Bupleurum praealtum* L., *Sonchus teneramus* L., *Calamintha nepeta* (L.) Savi, *Bidens tripartita* L., *Cannabis sativa* L., *Picris echioides* L., *Portulaca oleracea* L., *Trigonella coerulea* (L.) Ser., *Bituminaria bituminosa* (L.) Stirt., *Origanum vulgare* L., *Heliotropium europaeum* L., *Cichorium inthybus* L., *Dichanthium ischaemum* (L.) Roberty, *Linaria vulgaris* Mill., *Xanthium strumarium* L., *Bilderdykia convolvulus* (L.) Dumort., *Lythrum salicaria* L., *Solanum nigrum* L., *Daucus carota* L., *Pastinaca sativa* L., *Datura stramonium* L., *Cyclamen hederifolium* Aiton, *Gypsophila muralis* L., *Brachypodium sylvaticum* (Huds.) P. Beauv., *Lathyrus sylvestris* L., *Scolymus hispanicus* L., *Echinochloa crus-galli* (L.) P. Beauv., *Mirabilis jalapa* L., *Carlina vulgaris* L., *Phragmites australis* (Cav.) Trin. ex Steud., *Centaurium erythraea* Raf., *Chondrilla juncea* L., *Odontites serotina* (Lam.) Dumort., *Echium italicum* L., *Melissa officinalis* L., *Centaurea calci-*

*trapa* L., *Anagalis arvensis* L., *Tussilago farfara* L., *Dactylis glomerata* L., *Tordylium apulum* L., *Silene noctiflora* L., *Inula conyza* L., *Pteridium aquilinum* (L.) Kuhn, *Ruscus aculeatus* L., *Asplenium adiantum-nigrum* L., *Primula acaulis* (L.) L., *Geum urbanum* L., *Lapsana communis* L., *Selaginella helvetica* (L.) Spring, *Eryngium maritimum* L., *Odontites lutea* (L.) Clairv., *Scilla autumnalis* L., *Teucrium polium* L., *Pallenis spinosa* (L.) Cass., *Clinopodium vulgare* L., *Glaucium flavum* Crantz., *Blackstonia perfoliata* (L.) Huds., *Satureja cuneifolia* Ten., *Eryngium amethystrinum* L., *Symphotrichum squamatum* (Michx.) GL. Nesom, *Campanula trachelium* L., *Lactuca saligna* L., *Linaria angustifolia* Rchb., *Jacobaea maritima* (L.) P. Pelser & Melideu, *Selaginella denticulata* (L.) Spring, *Cephalaria ambrosioides* (Sm.) Roem. & Schult. The following species can be found on the rocks: *Seseli rigidum* Waldst. & Kit., *Asparagus acutifolius* L. and *Ephedra fragilis* Desf. *Seseli rigidum* Waldst. & Kit., *Asparagus acutifolius* L. and *Ephedra fragilis* Desf.

### 3. Podgorica

Finally, on the streets of Podgorica we found *Amaranthus hybridus* L.

## Conclusion

We examined the floristic makeup of Alpine and Subalpine communities from Triglav peak. Ninety-eight species were found (trees, bush and grass species), out of which 4 species with a conservation status. Ninety-two species can be found in Bulgaria, while 26 species are typical only for the Julian Alps. In this area we also found for the first time in Montenegro – *Sporobolus indicus* (L.) R.Br.

In the city of Dubrovnik, we found 7 species (trees, bushes and grasses).

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# Флористично разнообразие в Националния парк Триглав (Словения) и на флората на градовете Будва, Подгорица и Дубровник (Адриатическия бряг на Хърватско и Черна гора)

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(Резюме)

В статията се описва флората на северните склонове на връх Триглав (Юлийски Алпи), както и висшата флора на градовете Дубровник, Будва и Подгорица. По трансекта хижа Аляжев дом – връх Триглав са определени 128 вида висши растения за Националния парк „Триглав“. За град Дубровник са отбелязани 7 вида висши растения, за градската флора на Будва са отбелязани 125 вида висши растения и от град Подгорица е определен един вид. Инвазивният вид *Sporobolus indicus* (L.) R. Br. се съобщава за първи път за флората на Черна Гора.