

# LIMESTONE CLIFF VEGETATION OF *PORTENSCHLAGIELLO RAMOSISSIMAE- CAMPANULETUM PORTENSCHLAGIANAEE*, CROATIA

NENAD JASPRICA<sup>1\*</sup> & MASSIMO TERZI<sup>2</sup>

<sup>1</sup>Institute for Marine and Coastal Research, University of Dubrovnik, P.O. Box 83, HR-20000 Dubrovnik, Croatia (nenad.jasprica@unidu.hr)

<sup>2</sup>Institute of Bioscience and Bioresources, Italian National Council of Research, via Amendola 165/A, IT-70126, Bari, Italy (massimo.terzi@ibbr.cnr.it)

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Based on field investigations and using the Braun-Blanquet approach, the paper describes the chasmophytic association *Portenschlagiello ramosissimae-Campanuletum portenschlagianae*, from Croatian Mediterranean cliffs.

**Keywords:** Adriatic, *Centaureo-Portenschlagiellion*, ICPN, phytosociology, phytosociological nomenclature, plant associations, chasmophytic vegetation.

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Na temelju terenskih istraživanja i uz pomoć Braun-Blanquet fitocenološke metode, u radu je opisana hazmofitska asocijacija *Portenschlagiello ramosissimae-Campanuletum portenschlagianae* rasprostranjena uz obalu južne Hrvatske (Dalmacija).

**Keywords:** Jadran, *Centaureo-Portenschlagiellion*, ICPN, fitocenologija, fitocenološka nomenklatura, biljne asocijacije, hazmofitska vegetacija.

**Nomenclature:** For vascular plant taxa FLORA CROATICA DATABASE (<https://hirc.botanic.hr/fcd/>, accessed on November 17, 2017); for syntaxa MUCINA *et al.* (2016) and TERZI *et al.* (2017).

## INTRODUCTION

In the amphi-Adriatic region, the thermophilous chasmophytic vegetation on calcareous bedrock was classified in the endemic order *Centaureo dalmaticae-Campanuletalia pyramidalis* of the class *Asplenieta trichomanis* (TRINAJSTIĆ, 1980, 2008; MUCINA *et al.*, 2016; TERZI & DI PIETRO, 2016; TERZI *et al.*, 2017). Along the eastern Adriatic, the order includes two alliances, *Centaureo dalmaticae-Campanulion* and the *Centaureo cuspidatae-Portenschlagiellion ramosissimae* (TRINAJSTIĆ, 2008; TERZI *et al.*, 2017).

The latter, with a distribution range in the thermo-meso-Mediterranean bioclimates of the Central and Southern Adriatic seaboard (MUCINA *et al.*, 2016), was originally described by five associations: *Campanulo pyramidalis-Moltkietum petraeae*, *Inulo verbascifoliae-Centaureetum cuspidatae*, *Seslerio robustae-Putorietum calabricaee*, *Centaureetum ragusinae*, and *Portenschlagiello ramosissimae-Campanuletum portenschlagianae* (TRINAJSTIĆ, 1980). Some other associations were subsequently added to the alliance (TERZI *et al.*, 2017).

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\* corresponding author

Being described as early as the first description of the alliance, *Portenschlagiello-Campanuletum portenschlagianae* is a well recognized association. Its first diagnosis consists of a synoptic table derived from four (unpublished) relevés from the islands of Hvar and Brač (TRINAJSTIĆ, 1980). An additional relevé, from the island of Brač and representing a particular facies with *Centaurea ragusina*, was published by PAVLETIĆ (1986).

This association is usually cited in the scientific literature with the authority of "Trinajstić 1980" or "Trinajstić ex Pavletić 1986" (TRINAJSTIĆ, 2008; MEKINIĆ *et al.*, 2013). However, both these citations are incorrect. In fact, *Portenschlagiello-Campanuletum portenschlagianae* was invalidly published by TRINAJSTIĆ (1980) because, from January 1<sup>st</sup> 1979 onwards, a synoptic table is not considered a sufficient diagnosis (art. 7 of ICPN – International Code of Phytosociological Nomenclature, WEBER *et al.*, 2000). The association was not subsequently validated by PAVLETIĆ (1986) because the only relevé published in her paper does not include *Portenschlagiella ramosissima*, which is one of the name-giving taxa (art. 3f of ICPN).

The aims of the present study were (i) to investigate the floristic structure of the association *Portenschlagiello-Campanuletum portenschlagianae* in detail for the first time, and (ii) to validate this association according to the 3<sup>rd</sup> edition of the ICPN (WEBER *et al.*, 2000). For these purposes, in 2017, seven relevés were collected using the BRAUN-BLANQUET (1964) approach, and one additional relevé was drawn from PAVLETIĆ (1986). The survey covered the entire distribution area of the community. Life forms follow RAUNKIAER (1934) while chorotypes follow the categories reported in PIGNATTI (1982) and EURO-MED PLANTBASE (2006-2017). The 5<sup>th</sup> zone of the Gauss-Krüger coordinates was applied (see Tab. 1).

## DESCRIPTION AND VALIDATION OF THE SYNTAXON

### *Syntaxonomic scheme*

ASPLENIETEA TRICHOMANIS (Braun-Blanquet in Meier et Braun-Blanquet 1934) Oberdorfer 1977

CENTAUREO DALMATICAЕ - CAMPANULETALIA PYRAMIDALIS Trinajstić ex Terzi et Di Pietro 2016

**Centaureo cuspidatae-Portenschlagiellion ramosissimae** Trinajstić ex Terzi et Di Pietro 2016

*Portenschlagiello ramosissimae-Campanuletum portenschlagianae* Trinajstić ex Jasprica et Terzi 2017, *ass. nov. hoc loco*

Validated name: *Portenschlagiello-Campanuletum portenschlagianae* Trinajstić 1980 *nom. inval.* (art. 7); *Holotypus*: relevé no. 4 in Table 1 in this article.

Distribution records: Eastern Adriatic: South Croatia: the Cetina River Canyon, the islands of Brač and Hvar, Mt Biokovo. According to TRINAJSTIĆ (1980, 2008), this community also occurs in the Pelješac peninsula.

Ecology: The association is developed on limestone cliffs occurring within south-facing slopes at altitudes ranging between 3 and 770 m a.s.l. (Tab. 1). The degree of vegetation cover ranges between 10% and 40%. Altogether, we recorded 56 taxa, with an average of 18 taxa per relevé. The majority of the accompanying taxa (15) belong to *Festuco-Brometea* followed by those of *Lygeo sparti-Stipetea tenacissimae* and *Quercetea pubescentis* with three taxa in each class. In the present case, *Campanula portenschlagiana*, *Fibigia triquetra*, *Tanacetum cinerariifolium*, *Campanula pyramidalis*, *Inula verbascifolia* and *Portenschlagiella ramosissima* are the most frequent species (75-100%). The analysis of the life-forms showed that chamaephytes (42.9%) and hemicryptophytes (41.1%) contributed equally, followed by phanerophytes (14.3%) and geophytes (1.7%). The chorological spectrum showed the dominance of the East-Mediterranean chorotype (25%), followed by West Balkan endemics (19.6%), South-Mediterranean (17.9%) and Balkan-Italian (12.5%) taxa.

The validation of the association *Portenschlagiello-Campanuletum portenschlagianae*, and the consequent identification of its nomenclatural type and original diagnosis represent, in our opinion, a first basic stage towards the understanding of the syntaxonomic relationships between the various associations currently classified in *Centaureo-Portenschlagiellion*.

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Relevé number		1	2	3	4*	5	6	7	8	Frequency (%)
Altitude (m a.s.l.)	Plot size (mq)	320	770	770	190	310	3	3	420	
Aspect	Slope (°)	SW	S	SE	E	S-SE	W-WN	E	S	
Vegetation cover (%)	No. of taxa	90	10	20	30	20	40	30	10	
CHT	LF	17	25	18	14	15	25	12	15	
<b><i>Asplenietea trichomanis</i></b>										
EUA	H	+	.	.	+	+	+	+	.	62
EUA	H	+	+	.	+	.	+	+	.	62
BAL	Ch	.	+	+	.	.	.	.	.	25
MEDE	P	+	.	.	.	.	.	.	.	12
MEDE	P	+	.	.	.	.	.	.	.	12
MEDS	Ch	.	+	.	.	.	.	.	.	12
MEDS	P	.	+	.	.	.	.	.	.	12
MEDE	Ch	.	.	+	.	.	.	.	.	12
EUA	H	.	.	.	.	.	+	.	.	12
Companions										
<b><i>Festuco-Brometea</i></b>										
MEDE	Ch	+	+	+	.	.	+	+	.	62
MEDS	H	.	.	+	+	+	.	.	+	50
MEDE	H	.	.	.	+	+	.	.	+	37
END_w_bl	H	+	.	.	.	.	.	.	+	25
END_w_bl	Ch	.	+	+	.	.	.	.	.	25
MEDE	Ch	.	+	.	.	.	+	.	.	25
PAL	H	.	.	.	+	.	+	.	.	25
MEDS	Ch	.	.	.	.	.	+	.	+	25

		Relevé number											frequency (%)
		1	2	3	4*	5	6	7	8				
Altitude (m a.s.l.)		320	770	770	190	310	3	3	420				
Plot size (mq)		200	20	20	20	15	20	20	20				
Aspect		SW	S	SE	E	S-SE	W-WN	E	S				
Slope (°)		90	90	90	85	90	85	90	90				
Vegetation cover (%)		.	10	20	30	20	40	30	10				
No. of taxa		17	25	18	14	15	25	12	15				
CHT	LF												
MEDE	H	<i>Asperula aristata</i> L.f. ssp. <i>scabra</i> (J.Presl et C.Presl) Nyman											25
MEDE	H	<i>Koeleria splendens</i> C.Presl											12
BIT	Ch	<i>Thymus striatus</i> Vahl											12
MEDE	H	<i>Cephalaria leucantha</i> (L.) Roem. et Schult.											12
EUR	Ch	<i>Euphorbia myrsinites</i> L.											12
MEDS	Ch	<i>Helichrysum italicum</i> (Roth) G.Don											12
EUA	H	<i>Galium lucidum</i> All.											12
<b><i>Lygeo sparti-Stipetea tenacissimae</i></b>													
MEDS	H	<i>Brachypodium retusum</i> (Pers.) P.Beauv.											50
MEDS	H	<i>Dactylis glomerata</i> L. ssp. <i>hispanica</i> (Roth) Nyman											12
MEDS	Ch	<i>Euphorbia characias</i> L. ssp. <i>wulfenii</i> (Hoppe ex Koch) A.M.Sm.											12
<b><i>Quercetea pubescentis</i></b>													
MEDE	P	<i>Coronilla emerus</i> L. ssp. <i>emeroides</i> Boiss. et Spruner											37
MEDE	P	<i>Pistacia terebinthus</i> L.											25
EUR	H	<i>Arabis turrita</i> L.											12
<b><i>Trifolio-Geranietea sauguiinei</i></b>													
PAL	H	<i>Silene vulgaris</i> (Moench) Garcke ssp. <i>angustifolia</i> Hayek											50
EUA	H	<i>Thalictrum minus</i> L.											12
<b><i>Ononido-Rosmarinetea (=Cisto-Micromerietea julianae)</i></b>													
EUR	Ch	<i>Sedum ochroleucum</i> Chaix											25

Relevé number	1	2	3	4*	5	6	7	8	(%) frequency
Altitude (m a.s.l.)	320	770	770	190	310	3	3	420	
Plot size (mq)	200	20	20	20	15	20	20	20	
Aspect	SW	S	SE	E	S-SE	W-WN	E	S	
Slope (°)	90	90	90	85	90	85	90	90	
Vegetation cover (%)	.	10	20	30	20	40	30	10	
CHT	LF	No. of taxa	17	25	18	14	15	25	12
MEDS	Ch	<i>Micromeria juliana</i> (L.) Benth. ex Rchb.	.	.	.	+	.	.	25
		<i>Crataego-Prunetea</i>							
END w_bl	P	<i>Rhamnus intermedia</i> Steud. et Hochst.	+	.	.	.	.	.	25
		<i>Elyno-Seslerietea</i>							
ALP	Ch	<i>Globularia cordifolia</i> L.	.	+	.	.	.	.	25
		<i>Quercetea ilicis</i>							
MEDS	G	<i>Asparagus acutifolius</i> L.	.	+	.	.	.	.	12
MEDE	P	<i>Osyris alba</i> L.	.	.	.	.	+	.	12
		<i>Cymbalaria-Parietarietea diffusae</i>							
EUR	Ch	<i>Cymbalaria muralis</i> P.Gaertn., B.Mey. et Scherb.	.	+	.	.	.	.	12
		<i>Sedo-Scleranthetea</i>							
EUA	Ch	<i>Sedum album</i> L.	.	.	.	.	.	.	12
		<i>Artemisietea vulgaris</i>							
MEDE	H	<i>Calamintha nepetoides</i> Jord.	.	.	.	.	.	r	12

\* = holotypus; relevé no. 4; Place and date of relevés: Rel. 1. Pavletić (1986); Rel. 2. The island of Brač, Vidova Gora Mt., x = 5631729, y = 4793930; 14.6.2017; Rel. 3. The island of Brač, Vidova Gora Mt., x = 5631919, y = 4794143; 14.6.2017; Rel. 4. The island of Hvar, loc. Vratnik above village of Pitve, x = 5636534, y = 4778961; 5.7.2017. (*holotypus*); Rel. 5. The island of Hvar, Hum, x = 5637330, y = 4777707; 5.7.2017; Rel. 6. The Cetina River Canyon, x = 5637495, y = 4813056; 6.7.2017; Rel. 7. The Cetina River Canyon, x = 5637804, y = 4813220, 6.7.2017; Rel. 8. Biokovo Mt., above village of Podgora, x = 5670641, y = 4790724; 6.7.2017; Chorotypes (CHT): ALP – Alpine; BAL – Balkan; BIT – Balkan-Italian; END w\_bl – west-Balkan endemics; EUR – European; MEDE – east-Mediterranean; MEDS – south-Mediterranean; PAL – paleotemperate; EUA – Euroasian; Life forms (LF): Ch – chamaephytes, G – geophytes, H – hemicryptophytes, P – phanerophytes.

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