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A NEW PLANT ASSOCIATION OF *CARICION GRACILIS* ALLIANCE OF THE CENTRAL APENNINES (ITALY)

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Abstract: This note describes a new plant association of marshy meadows, named *Ranunculo-Caricetum buxbaumii* ass. nova hoc loco, occurring in the karstic basin of Pian Grande at 1270 m above sea level in central Apennines (Umbria). The new plant association belongs to *Caricion gracilis* alliance, is distributed towards the southern limit of the area of distribution of *Carex buxbaumii* in the Italian peninsula and represents a synvicariant of *Caricetum buxbaumii* of central Europe.

Keywords: anmoor, *Carex buxbaumii*, dolines, holotype, karstic basin, microtopography, synvicariance, vegetation profile.

Introduction

The species *Carex buxbaumii* Wahlenb. (*Cyperaceae*) is present in very few locations in Italy, i.e. only two sites in the central Apennines have been reported, namely the Pian Grande of Castelluccio di Norcia (Umbria), lg. F. Pedrotti, VII 1966, and Quarto di S. Chiara (Abruzzo), lg. F. Pedrotti, 3-VII-1988 [3, 17].

The goal of this note was to examine the sociology of *C. buxbaumii* in Pian Grande of Castelluccio di Norcia.

Study area

The Pian Grande of Castelluccio di Norcia is a vast basin of karstic and structural origin at an altitude of 1270 m in the group of the Sibillini Mountains (central Apennines); it is about 6.5 km long and 3 km wide and has an overall surface of about 1300 sq. km [18]. The highest point of the bottom of the plain is at 1278 m, and the lowest is at 1268 m, but the central part is vaster and lies between 1270 and 1268 m of elevation.

This almost flat area is grooved by a natural ditch that collects surface water and channels it toward a swallow hole. Scattered there are shallow dolines (50-80 cm) with flat bottoms that are partially impermeable. The soils of Pian Grande are highly hydromorphic, submerged underwater for about seven months of the year and developed on clayey sediments with a variable content of carbonates. These soils are generally rich in anmoor type humus and feature an A horizon that is sometimes acidic, sometimes neutral, which merges, at the depth of 20-25 cm, into a strongly mottled Bg (gley) horizon that is highly base saturated [4].

The flat bottom of Pian Grande is occupied by grassland vegetation that can be grouped into the alliances *Caricion gracilis*, *Nardo-Agrostion* and *Cynosurion*. The species *Carex buxbaumi* occurs in the impermeable zone of lacustrine clays in grasslands of *Caricion gracilis* alliance [4].

Description of *Ranunculo-Caricetum buxbaumii* ass. nova

Table 1 reports 14 relevés conducted in the wet meadows of Pian Grande dominated by *Carex buxbaumii*; these relevés were assigned to a new plant association named *Ranunculo-Caricetum buxbaumii* ass. nova hoc loco. The degree of cover of *C. buxbaumii* ranges between 20 and 80 %; the character species of the upper syntaxonomical units are *Carex gracilis*, *Galium constrictum* and *Carex vulpina*; the numerous companion species come prevalently from mowable meadows of *Cynosurus cristatus* (*Cynosuro-Trifolietum pratensis*) and pastures of *Nardus stricta* (*Polygono-Nardetum*). Their presence can be explained in part by the fact that the *Ranunculo-Caricetum buxbaumii* meadows are regularly mown once a year, at the end of July. The moss layer is fairly dense and is formed of six species, one of which, *Drepanocladus aduncus*, predominates over the others. The number of species varies from 8 to 22 per relevés, with an average of 15.9 species per survey. The *Ranunculo-Caricetum buxbaumii* association differs from *Caricetum buxbaumii* Issler 1933, described in central Europe, through the presence of *Ranunculus apenninus* and *R. pedrottii*. *R. apenninus* is distributed throughout the Apennines, where it grows in montane pastures and in the meadows of Pian Grande and Pian Perduto, where it was previously noted by Marchesoni [2]; to date the species *R. pedrottii* has been noted only in Pian Perduto (Marche) and Pian Grande in Umbria [5]. The species composition of *Ranunculo-Caricetum buxbaumii* is very poor compared to that of *Caricetum buxbaumii* of central Europe, and constitutes a synvicariant association at the southernmost limit of the area of distribution of *Carex buxbaumii*.

The distribution of *Ranunculo-Caricetum buxbaumii* in Pian Grande is strictly linked to microtopography; it occupies an intermediate position between *Caricetum vesicariae* and *Polygono-Nardetum*. *Caricetum vesicariae* occurs in the central part of the dolines where the water pool is 60-70 cm deep in winter, while in summer the groundwater level reaches the lowest level of -80 cm; *Polygono-Nardetum*, instead, grows on moist soils, without the influence of groundwater [21]. Therefore, from the bottom of the dolines looking eastwards, the following vegetation zones can be observed: *Caricetum vesicariae*, *Caricetum gracilis*, *Ranunculo-Caricetum buxbaumii* and *Polygono-Nardetum*. The profile reported by Oberdorfer (1957) from south Germany is entirely similar to that of Pian Grande: *Caricetum buxbaumii* is found between *Caricetum elatae* and *Cnidio-Juncetum* associations. As can be seen in Table 1, it is possible to distinguish two variants of *Ranunculo-Caricetum buxbaumii*, namely a var. with *Veronica scutellata*, occurring in sites with seasonal variations in water level, albeit not very strong ones, and a var. with *Heleocharis pauciflora* in sites with more drained soils. The vegetation map of Pian Grande on the scale of 1:5000 [4] presents the distribution of *Ranunculo-Caricetum buxbaumii* and the other phytosociological units: *Caricetum vesicariae*, *Caricetum gracilis*, *Caricetum otrubae*, *Ranunculo-Caricetum buxbaumii* [sub *Caricetum gracilis buxbaumietosum*] var. with *Veronica scutellata* and var. with *Heleocharis pauciflora*. Later, also the association *Caricetum distichae* was reported for Pian Grande [19].

Discussion

The *Caricetum buxbaumii* association was described in the Rhine Valley in France by Issler (1933) [13]. However, subsequent phytosociological studies conducted by many botanists in various parts of Europe have demonstrated that the sociological affinities of *Carex buxbaumii* varies rather

Tab. 1: *Ranunculo-Caricetum buxbaumii* ass. nova hoc loco (* holotype)

Relevé no.	1	2	3	4	5	6	7	8	9*	10	11	12	13	14	Frequency (%)
Altitude (m. a.s.l.)	1270	1269	1273	1273	1269	1269	1270	1268	1271	1270	1271	1271	1271	1271	
Vegetation cover %	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
Relevé area (sq. meters)	4	10	40	10	10	20	50	60	50	30	8	8	8	50	
No. of species per relevé	10	8	18	14	22	15	19	17	20	10	13	15	22	20	
Differential and character species of association															
<i>Carex buxbaumii</i>	4.4	3.3	3.3	3.3	3.4	2.2	2.2	5.3	2.2	4.4	3.3	1.2	1.2	2.2	100
<i>Ranunculus apenninus</i>	+	.	+	+	+	+	1.1	1.2	1.1	.	+	1.1	2.2	1.1	86
<i>Ranunculus pedrotii</i>	+	.	+	+	1.1	+	.	.	+	1.1	+	+	+	1.1	79
Character species of alliance (<i>Caricion gracilis</i>)															
<i>Carex gracilis</i>	+	+	+	+	+	1.1	2.2	1.1	2.2	1.2	.	.	+	.	79
Character species of order (<i>Magnocaricetalia</i>) and class (<i>Phragmiti-Magnocaricetea</i>)															
<i>Galium constrictum</i>	+	.	+	+	.	.	.	.	.	.	+	.	+	+	43
<i>Carex otrubae</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	+	7
Differential species of variant with <i>V. scutellata</i>															
<i>Veronica scutellata</i>	+	2.2	+	+	+	+	+	1.1	1.1	+	.	.	.	.	71
Differential species of variant with <i>H. pauciflora</i>															
<i>Heleocharis pauciflora</i>	.	.	.	.	.	.	.	.	.	.	1.2	1.2	1.2	1.1	29
Other vascular species															
<i>Leontodon autumnalis</i>	+	1.1	2.2	2.2	2.2	1.1	1.1	1.1	1.1	1.1	1.1	2.2	2.2	2.2	100
<i>Deschampsia caespitosa</i>	+	.	1.1	+2	1.2	+2	1.1	+2	+	+	+	+	+	+	93
<i>Agrostis canina</i>	.	1.2	+	1.1	1.1	2.2	+	1.1	.	1.1	.	+	+	+	79
<i>Ranunculus flammula</i>	+	1.1	1.1	+	+	1.1	1.1	+	1.1	+	.	.	.	.	71
<i>Carex leporina</i>	.	+	+2	+	1.2	+2	1.2	1.2	1.2	.	.	.	.	.	57
<i>Agrostis stolonifera</i>	+	.	+	+	+	.	.	.	1.1	.	.	.	+	+	50
<i>Sanguisorba officinalis</i>	.	.	+	+	+	+	1.1	.	1.1	.	.	.	+	.	50
<i>Trifolium badium</i>	.	.	+	+	+	.	1.1	1.1	.	.	+	.	.	+	50
<i>Sieglingia decumbens</i>	.	.	.	.	.	+	+	+	+	.	+	+	+	.	50
<i>Juncus inflexus</i>	.	.	.	.	.	.	1.2	+2	+2	.	+	+	+	+	50
<i>Carex panicea</i>	.	.	+	.	+	.	.	.	.	.	+	1.1	1.1	+	43

<i>Carex hirta</i>	.	.	.	.	.	.	.	.	.	1.1	.	.	+	+	+	+	36
<i>Potentilla erecta</i>	.	.	.	.	1.1	+	+	.	+	.	1.1	+	+	+	.	.	36
<i>Nardus stricta</i>	.	.	.	.	+2	+	1.2	1.2	.	.	+2	.	.	.	.	.	36
<i>Juncus acutiflorus</i>	.	+2	.	.	.	1.1	.	+	.	.	+	.	.	.	.	.	29
<i>Anthoxanthum odoratum</i>	.	.	.	.	+	.	+	+	.	.	+	.	+	+	.	.	36
<i>Festuca rubra</i>	.	.	.	.	+	.	.	.	+	.	.	.	+	+	.	.	29
<i>Carex pallescens</i>	.	.	.	+	+2	.	+2	.	.	.	.	.	.	.	.	.	21
<i>Luzula multiflora</i>	.	.	.	.	+	.	+	.	.	.	+	.	.	.	.	.	21
<i>Phleum nodosum</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	21
<i>Trifolium pratense</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	21
<i>Ophioglossum vulgatum</i>	.	.	.	.	+	.	.	.	.	.	.	1.1	.	.	.	.	14
<i>Vicia cracca</i>	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	14
<i>Rumex acetosa</i>	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	14
<i>Lathyrus pratensis</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	14
<i>Alopecurus pratensis</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	7
<i>Epilobium palustre</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	7
<i>Taraxacum balticiforme</i>	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	7
<i>Euphrasia stricta</i>	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	7
<i>Rhinanthus major</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	7
<i>Cynosurus cristatus</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	7
<i>Centaurea jacea</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	7
<i>Trifolium repens</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	7
Mosses																	
<i>Drepanocladus aduncus</i>	4.4	3.4	2.3	3.4	3.3	4.4	1.2	2.1	1.2	2.1	2.1	2.1	1.2	2.3	1.2	1.2	100
<i>Acrocladium cuspidatum</i>	.	.	.	.	.	+2	.	.	1.2	.	.	2.3	.	2.3	1.3	1.3	36
<i>Polytrichum commune</i>	.	.	.	.	+2	.	+2	+2	+2	.	.	.	.	.	.	.	29
<i>Aulacomnium palustre</i>	.	.	.	.	+	.	+2	+2	.	.	.	.	.	.	.	.	21
<i>Dicranum bonjeanii</i>	.	.	.	.	.	.	.	.	+2	.	.	.	.	.	.	.	7
<i>Campyllum polygamum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	7

Localities of relevés: 1-10 (depressions from the lower part of Pian Grande); 11-14 (mesic sites from the upper part of Pian Grande).

largely [1, 6, 8, 9, 10, 11, 12, 22, 23, 27] and others. Therefore, it is better to examine the syntaxonomical position of *Ranunculo-Caricetum buxbaumii* of Pian Grande in relation to *Caricetum buxbaumii* of central Europe. Currently, there are two different opinions about the classification of *Carex buxbaumii* meadows at alliance level: one in *Caricion gracilis* (respectively, *Magnocaricion*), and the other in *Caricion davallianae*. *Caricetum buxbaumii* was originally included in *Caricion gracilis* [7, 15, 16, 28], whereas other authors, such as Jutrzenka-Trzebiatowski and Szarejko (2001) [14] and Salmina (2005 and 2006) [25, 26], placed it in *Caricion davallianae*. In addition, it should be recalled that Ritter-Studnicka (1972) [24] described in Bosnia-Herzegovina the association *Valeriano-Caricetum buxbaumii*, assigned to *Caricion davallianae* alliance.

Dealing specifically with *Ranunculo-Caricetum buxbaumii*, some arguments can be put forward about its syntaxonomical classification. A number of character species of *Caricion gracilis*, including those of the upper units (*Magnocaricetalia* and *Phragmiti-Magnocaricetea*) are present more or less constantly: *Carex gracilis*, *Galium constrictum* and *Carex otrubae*. On the other hand, the only species attributable to *Caricion davallianae* alliance is *Carex panicea*. *Carex davalliana* is, however, present in a site near Pian Grande, namely Pian Perduto [20]. In addition, the soils of Pian Grande do not contain deposits of peat (moor-type humus) suitable for the vegetation of *Caricion davallianae* alliance, but humus of the anmoor type. Finally, the marshy meadows of *Caricion gracilis* are very extensive throughout Pian Grande, being assigned to four plant associations (*Caricetum gracilis*, *Caricetum vesicariae*, *Caricetum otrubae*, *Caricetum distichae*), to which *Ranunculo-Caricetum buxbaumii* is linked.

Conclusions

While the attribution of *Ranunculo-Caricetum buxbaumii* to *Caricion gracilis* is well documented, the same cannot be said for *Caricetum buxbaumii* of central Europe, because part of the findings of the authors cited above show clear affinity with *Caricion davallianae*. Therefore, it seems that in central Europe the meadows dominated by *C. buxbaumii* form different plant associations, in part belonging to *Caricion gracilis* and in part to *Caricion davallianae*.

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O NOUĂ ASOCIAȚIE VEGETALĂ DIN ALIANȚA *CARICION GRACILIS* ÎN APENINII CENTRALI (ITALIA)

(Rezumat)

Prezenta notă descrie o nouă asociație vegetală de pajiști mlăștinoase, și anume *Ranunculo-Caricetum buxbaumii* ass. nova hoc loco, care se întâlnește în bazinul carstic Pian Grande la o altitudine de 1270 m în Munții Apenini centrali (Italia). Noua asociație vegetală aparține alianței *Caricion gracilis*, este distribuită spre limita sudică a arealului speciei *Carex buxbaumii* în Peninsula Italică și reprezintă o sinvicariantă a lui *Caricetum buxbaumii* din Europa centrală.

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