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Contribution to the Syntaxonomy of Rare Tall Sedge Community in Central Apennine (Umbria-Italy): I. *Caricetum buxbaumii*

Abstract

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This contribution describes a new plant association of marshy meadows, named *Deschampsio cespitosae-Caricetum buxbaumii* *ass. nova hoc loco*, occurring in the karstic basins of Sibillini Mountains (Pian Grande, Pian Piccolo and Savelli-Castel S. Maria, Umbria Region) between 1000-1350 m above sea level. The new association is distinguished from *Ranunculo-Caricetum buxbaumii* Pedrotti 2016 and *Galio palustris-Caricetum buxbaumii* Ciaschetti & al. 2020 for its floristic and ecological features. After the comparison with the original tables of Issler's *Caricetum buxbaumii* and Ritter-Studnicka's *Valeriano-Caricetum buxbaumii*, all Apennine associations belong to *Caricion gracilis* alliance, and are southern synvicariants of the *Caricetum buxbaumii* Issler 1933 of Central Europe.

Key words: *Carex buxbaumii* communities, *Caricion gracilis*, Apennine Karstic plains, Central Italy.

Introduction

The vegetation of the *Magnocaricetalia elatae* Pignatti 1953 Order has been the subject in recent years of numerous studies aimed at finding common traits for classification at the European level (Mucina & al. 2016, Landucci & al. 2020) or to look for distinctive elements that characterize these plant communities distributed on a continental scale at the local level (Gigante & Venanzoni 2000; Pedrotti 2015, 2016b; Ciaschetti & al. 2020, Landucci & al. 2013; Lastrucci & al. 2012, 2014). Swamps, with large sedges, have now almost all disappeared or deeply transformed throughout the Italian plains and hilly territory due to reclamations and anthropic pressure. In this context, the karstic plains, which range along the Apennine ridge at an altitude of 900-1300 m from the Umbro-Marchigiano Apennines, up to the Abruzzo and Molise Regions (Pedrotti 1976), represent a very important subsystem of the Apennine ecoregional Province (Blasi & al. 2018) and an exceptional reservoir of biodiversity hosting almost all the species that characterize the vegetation of the *Magnocaricetalia* (Ciaschetti & al. 2020).

Carex buxbaumii Wahlenb. is an amphiatlantic boreal species with a still unknown range of distribution (Segal & Westhoff 1959). It is a rare and threatened species in Europe (Sotek 2006; e.g. Grulich 2012; Bernátová & al. 2018). It is rare also in Italy (Pedrotti 1971) and included in the Red Lists of The Italian Flora as Endangered (Rossi & al. 2013); The EEC Habitat Directive 92/43 does not include any rare tall sedge communities. Only Poland and some other Nordic countries (Estonia, Latvia, etc.), where *Caricetum buxbaumi* is attributed to *Caricion davallianae*, can protect this association by including it in Habitat 7210* “Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*” and in Habitat 7230 “Alkaline fens” (Wolejko & al. 2005; Bacieczko & Kaszycka 2015; Stanko & al. 2018) though it has been stated for this association a severe reduction (Wolejko & al. 2005). The aim of this paper is to present a comparison of the communities of *Caricetum buxbaumii* of the Apennines with those analyzed in the recent European literature (e.g. Landucci & al. 2020).

Materials and methods

We have considered 34 phytosociological relevés (according to Braun-Blanquet 1964) from Umbria and Abruzzo Regions (Fig. 1): 10 unpublished (made in the Sibillini Mountains) and 24 taken from the literature (Gigante & Venanzoni 2005; Pedrotti 2015 and Ciaschetti & al. 2020) were rearranged in order to compare the classification with recent European literature (e.g. Landucci & al. 2020). Floristic nomenclature follows Pignatti (2017-2019) and Bartolucci & al. (2018) for vascular plants; Aleffi & al. (2020) for mosses.

We have applied cluster analysis by complete linkage using similarity ratio as resemblance function by the Matedit software (Burba & al. 1992, downloadable at www.vegitaly.it). Relevés are stored in the free botanical database <http://www.anachive.it> (Landucci & al. 2012; Gigante & al. 2012; Lucarini & al. 2015).

Results

Deschampsia caespitosa-*Caricetum buxbaumii* ass. nova. hoc. loco (Table 1, holotypus: rel. 5 of Table 1)

Floristic analysis

The new association is characterized by a general depletion of species of the *Magnocaricetalia* Order (evidenced for all communities also in Landucci & al. 2013, 2020; Venanzoni & al. 2018; Ciaschetti & al. 2020) and the presence of transitional meadows species such as *Deschampsia caespitosa*, *Ranunculus repens* and *Potentilla reptans* (typical and diagnostic species are highlighted in Table 1). The comparison with the relevés of central Italy (Table 1) shows a clear separation between that of the proposed association and those described as *Ranunculo pedrotti*-*Caricetum buxbaumii* Pedrotti 2015 and *Galio palustris*-*Caricetum buxbaumii* Ciaschetti & al. 2020; the cluster analysis (Table 1) confirms a sharp classification that not made possible to include all relevés in one association.



Fig. 1. Distribution of *Carex buxbaumii* in Italy (source www.anarchive.it) and study area.

Lastly, the relevés have been compared with the original tables of Issler's *Caricetum buxbaumii* and Ritter-Studnicka's *Valeriano-Caricetum buxbaumi* (results are shown in the Electronic Supplementary File 1). Both *Caricetum buxbaumii* and *Valeriano-Caricetum buxbaumii* are characterized by species of *Molinietalia cerulae* and *Caricetalia davallianae* due to vegetational catenal contact with peaty vegetation that does not happen in Central Italy where we found only catenal contacts with transitional meadows of *Potentilletalia anserinae* and *Trifolio-Hordeetalia secalini*. Same conclusion may be assumed also by comparing Table 2 with Table 1 in Segal & Westhof (1959); in fact, these authors define the *Caricetum buxbaumii* as a transitional association between the *Molinietalia* and the *Schuchzerio-Caricetea fuscae*.

Synecology

Deschampsio-Caricetum buxbaumii develops in stations with high water excursion and summer water stress conditions that occur in the karst bassin of Savelli-Castel Santa Maria (where it forms extensive populations, Fig. 2) and in the Pian Piccolo of Castelluccio.



Fig. 2. Schematic representation of the vegetation in the study area (Savelli/S. Maria Karstic plain). A: general view with 1 *Trifolio-Hordeetalia*, 2 *Deschampsio-Caricetum buxbaumii*, 3 *Caricetum gracilis*, 4 *Caricetum vesicariae*, 5 Sinkhole. B: *Carex buxbaumii*. C: life forms of *C. buxbaumii*, D: *Deschampsio-Caricetum buxbaumii*.

Synchorology

Deschampsio caespitosae-Caricetum buxbaumii is present in the Karstic basin of Savelli-Castel Santa Maria and Piani di Castelluccio, *Ranunculo pedrotti-Caricetum buxbaumii* only in the Piani di Castelluccio (Pedrotti 2015) and, finally, *Galio palustris-Caricetum buxbaumii* in the Major Highlands of Abruzzo (Ciaschetti & al 2020).

Final Remarks

The *Carex buxbaumii* populations of Central Italy constitute a distinct and isolated post glacial relict nucleus with distinct floristic, ecological, and historical characteristics that allow us to include them in the *Caricion gracilis* Alliance. The *Caricetum buxbaumii* Issler 1932 can be considered present only in the southern slope of the Italian Alps (where the species is reported) in contact with the peaty meadows vegetation of *Molinietalia* and *Scheucherio-Caricetea fuscae*. On the contrary, the *Carex buxbaumii* communities of the Apennine karstic plains, in catenal contact with the transition meadows of *Deschampsion caespitosae* and *Potentillion anserinae*, attributable to the habitat 3180* “Turloughs” not currently present in the Italian Interpretation Manual (<http://vnr.unipg.it/habitat>), are included into the *Caricion gracilis* Alliance. The present research highlights that the Habitat Directive 92/43 does not include any Habitat with the vegetation of the *Phragmiti-Magnocaricetea*

Class and therefore there are no tools of protection neither at the National nor at the European level for the very rare associations *Caricetum buxbaumii* - treated in this work - and others such as *Caricetum vulpinae* and *Caricetum distichae*.

Syntaxomic scheme

SCHUCHZERIO PALUSTRIS-CARICETEA NIGRAE NOM. MUT. PROPOS. EX STEINER 1992

Caricetalia davallianae Br.-Bl 1949

Caricion davallianae

Valeriano simplicifoliae-Caricetum buxbaumii Ritter-Studnicka 1972

PHRAGMITI-MAGNOCARICETEA ELATAE KLIKA IN KLIKA & NOVÁK 1941

Magnocaricetalia elatae Pignatti 1953

Caricion elatae Koch 1926

Caricetum buxbaumii Issler 1932

Caricion gracilis Gèhu 1961

Ranunculo pedrotti-Caricetum buxbaumii Pedrotti 2016

Galio palustris-Caricetum buxbaumii Ciaschetti, Pirone & Venanzoni 2020

Deschampsio cespitosae-Caricetum buxbaumii Venanzoni, Praleskouskaya & Ciaschetti 2021

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