





Shrubland habitats in Dragoman municipality: a case study from western Bulgaria

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ABSTRACT

Key words:

EUNIS, field verification, mapping, vegetation

The current research focuses on the investigation of shrubland vegetation in Dragoman municipality. The study is motivated by the willingness of the authors to check the shrubland habitats' territorial extent and their importance to ecosystem processes, following the increased degree of succession over the last three decades. On the other hand, governmental subsidizing has been common for the last decade, leading to a clearance of lands with shrubs. Shrublands were studied through the application of the Braun-Blanquet approach and were defined by the European Nature Information System (EUNIS) classification. One main habitat type with three subtypes have been defined. Those are the *Subcontinental and continental deciduous thickets* (F3.24) that covers the largest area, *Peri-Pannonic dwarf almond scrub* (F3.24122), *Moesian oriental hornbeam thickets* (F3.2431), *Moesian lilac thickets* (F3.2432), covering a total area of 52.32 km². Secondary succession has to be considered among the main reasons for shrubland distribution. The lower number of grazing animals and forest clearings act as boosters for this ecological process. Large areas in Dragoman municipality are characterized also by shallow soils that are unable to sustain forest vegetation, thus giving way to shrubs.

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1. Introduction

Shrub communities are an indivisible part of many ecosystems, providing an array of benefits to us. They are an important component of the biodiversity of a region, providing food and shelter for a wide range of animals, such as insects, birds, etc. There are a number of classifications that involve shrublands. However, as far as the European Union is concerned, the most widely accepted reference information system throughout the EU is the European Nature Information System (EUNIS). It consists of three modules and one of them focuses especially on habitat types (<http://eunis.eea.europa.eu/habitats-code-browser.jsp>). The current study is not making an exception of the above-mentioned rule and aims at classifying shrubland habitats according to the EUNIS classification. A decade ago, Ozden and Hodgson (2011) studied shrublands and applied the EUNIS classification in their research in Cyprus. A year before them, Feoli (2010) focused on the investigation of shrubland species in Italy and their relation to climate change. These two research papers are examples of the adoption of the EUNIS classification in different European countries. In 2020 a group of scientists introduced the latest update regarding this classification (Chytrý *et al.*, 2020). They worked on the creation of a tool for assigning relevés' records to habitat types.

A number of scientists have investigated shrubland habitats in Bulgaria as well. Dimitrov et al. (2004) conducted a study, based on vegetation changes in anthropogenic territories in Vitosha Nature Park. Pedashenko et al. (2015) focused on the investigation of the floristic and vegetation diversity in Kongura Reserve, located in the southwestern parts of Bulgaria. Vassilev et al. (2020) made a significant contribution to the up-to-date scientific knowledge on the *Crataego-Prunetea* Tuxen 1962 class in Bulgaria. An important addition to the literature review is the research of Tzonev et al. (2009), where shrubland diversity in the country was reviewed.

The main aim of the study is to investigate the distribution and the diversity of shrubland habitats in Dragoman municipality, while the subject of the study is of a present-day interest. The last three decades can be characterized by a significant reduction of the number of grazing animals, leading to a constant decrease of the pressure on pastures and meadows. This trend has led to the natural process of secondary succession. Unlike primary succession, secondary succession is typical for areas where vegetation once occurred. Grasslands that are not mowed currently, nor grazed intensively, are slowly colonized by shrub species, which change them into shrubland and woody vegetation types, or different kinds of mosaic habitats between grasslands and shrubland species. Other habitats have been abandoned after forest clearings and they possess the necessary ecological features for the growth of shrubland taxa. Moreover, the town of Dragoman is the administrative center of a border municipality, characterized by a permanent population decrease, adding even more weight to the previously mentioned processes. In addition, over the last decade there has been a considerable increase of the subsidies specifically granted for shrubland clearing, in order to increase agricultural areas or pastures. Therefore, the authors of the current study were interested to find out more about the present status of the shrubland habitats in Dragoman municipality, and to check how the above-mentioned processes influence this type of vegetation.

2. Materials and Methods

Dragoman municipality is located in the western part of Bulgaria. The municipality covers an area of around 324 km² with predominance of the semi-mountainous relief, which is a prerequisite for the development of shrubland habitats, along with the climatic and soil characteristics of the area (a lack of sufficient precipitation and a poor development of the edaphic factor in some parts).

The establishment of vegetation plots was carried out in 2019 and 2020 when 212 vegetation plots (relevés) were collected, following the Braun-Blanquet approach (Braun-Blanquet, 1965). An additional number of 1340 field observation points focusing on the verification of the habitats, provided more scientific data for the shrubland investigation. A special focus of the above-mentioned field observation was the confirmation of the already existing information. Spatial data from Forestry Management Plans were also used for polygon mapping. All data was analyzed cartographically with the ArcGIS 10.1 software. Orthophoto images were added in order to check if the initial data was consistent with the current condition of the habitats. Some polygons with shrubland vegetation were delineated from the rest using the software tools available for that purpose, while other polygons – with similar or equal attributive data – were merged. Some polygons were deleted, because of the lack of current shrubland vegetation within their boundaries. As a result, a map of the shrubland habitats in Dragoman municipality was created (Fig. 1). The vegetation classification was *a priori* performed up to an alliance level and was used as a basis for the habitats' identification. All the alliances identified, were *a posteriori* related

to the EUNIS habitat types. The EUNIS classification was applied in order to identify the finest possible differentiation of the shrubland habitats in the area.

3. Results

One main habitat type with three subtypes were defined as a result of the study: *Subcontinental and continental deciduous thickets* (F3.24), *Peri-Pannonic dwarf almond scrub* (F3.24122), *Moesian oriental hornbeam thickets* (F3.2431) and *Moesian lilac thickets* (F3.2432) (Fig. 1), covering a total area of 52.32 km², being a part of the *Aestilignosa* biome. Their syntaxa were classified into two classes: *Crataego-Prunetea* Tx. 1962 and *Quercetea pubescentis* Doing-Kraft ex Scamoni et Passarge 1959.

3.1. Subcontinental and continental deciduous thickets (F3.24)

Abiotic characteristic and distribution:

This habitat type covers a total area of 39.9 km². It has a fragmented distribution, especially in the northwestern and southwestern parts of the municipality. The habitat occurs mainly on silicates and carbonates within the hypsometric band between 600 and 1000 m.a.s.l. The main soil types are *rendzic Leptosols*, *LPk*, *albic Luvisols*, *LVa*, *chromic Luvisols*, *LVx* and *eutric Fluvisols*, *FBe*.

Composition and structure:

This vegetation is naturally occurring in the investigated area and is observed in abandoned pastures and meadows, as well as in the transitional areas of forest vegetation. The dominant species are *Rosa* spp., *Crataegus monogyna* Jacq. and *Prunus spinosa* L. The shrub layer, alongside with the grassland layer, is well-developed, covering 80–95%. This vegetation falls within the *Crataego-Prunetea* Tx. 1962 class and *Berberidion vulgaris* Br.-Bl. ex Tx. 1952 alliance.

Conservation status: None.

3.2. Peri-Pannonic dwarf almond scrub (F3.24122)

Abiotic characteristic and distribution:

This habitat type is presented along with the type of the Moesian lilac thickets (F3.2432). Their total coverage is 0.31 km² and can be found on massive limestones and *rendzic Leptosols*, *LPk* between 600 and 1000 m a.s.l.

Composition and structure:

This habitat subtype is represented by low steppe deciduous shrub communities, often dominated by the dwarf almond (*Amygdalus nana*) and the burnet rose (*Rosa pimpinellifolia*). The vegetation total cover varies in the range of 60–90%. The lilac (*Syringa vulgaris*) also plays an important role in these phytocoenoses. This vegetation is to be found on the karst terrains of Chepan and Mala Planina Mountains. The formation of complex vegetation is a common phenomenon. Mosaics are formed most often in combination with dry grasslands of the *Festuco-Brometea* class and *Syringo-Carpinion orientalis* Jakucs (1959) 1960 shrub communities of the *Quercetea pubescentis* Doing-Kraft ex Scamoni et Passarge 1959 class. The vegetation of *Peri-Pannonic dwarf almond scrub* habitat type is related to the *Pruno tenellae-Syringion* Jovanović ex Čarni et al. 2009 alliance of the *Crataego-Prunetea* Tx. 1962 class.

Conservation status: Included in the Red Data Book of the Republic of Bulgaria.

3.3. Moesian oriental hornbeam thickets (F3.2431)

This EUNIS habitat type is covering a total area of 12.11 km².

Abiotic characteristic and distribution:

This habitat type is also distributed fragmentally. It occurs almost everywhere, with the exception of the central parts of the triangle formed by Dragoman, Golemo Malovo and Letnitsa, where

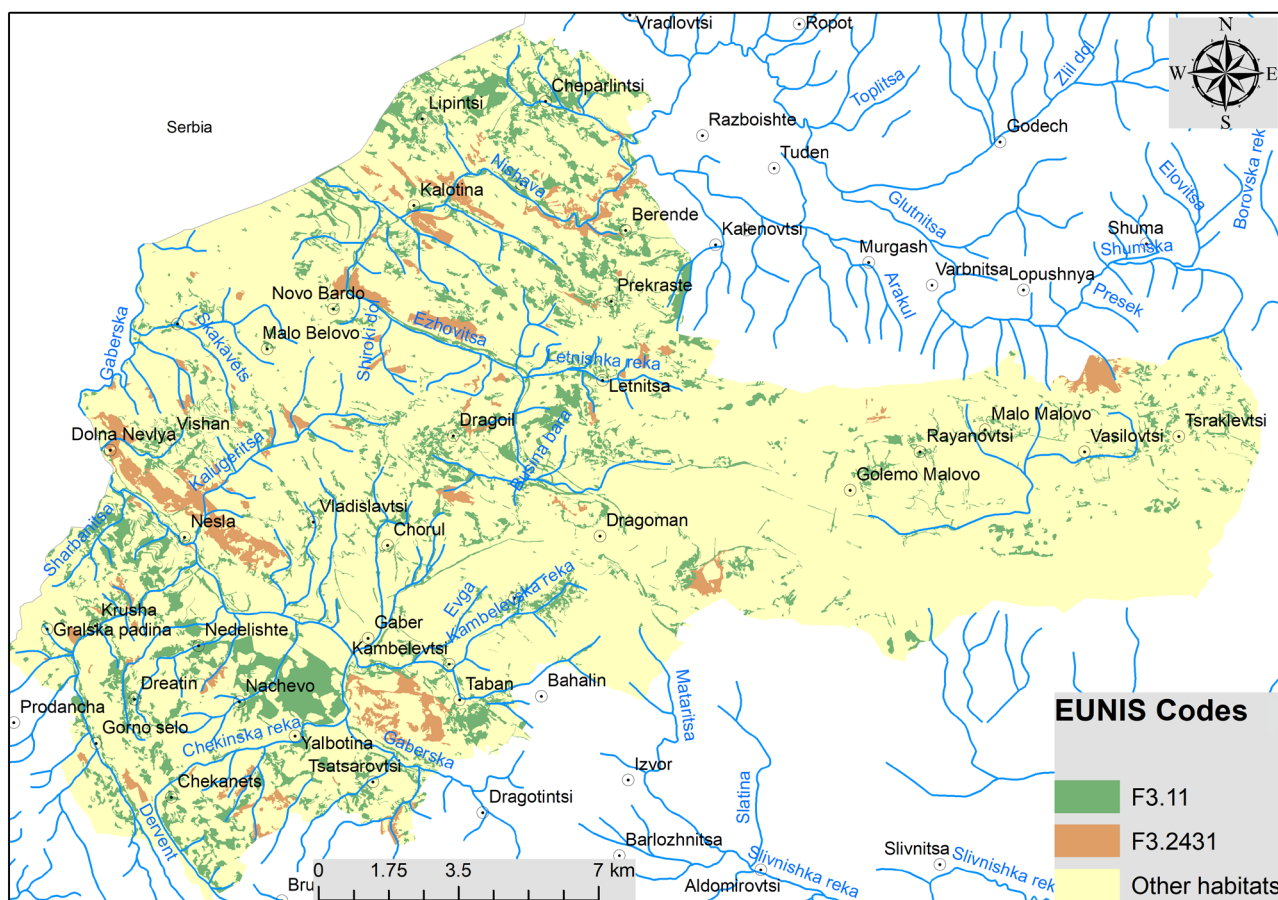


Figure 1. Distribution of the shrubland habitats in Dragoman municipality.

agricultural areas predominate. Shrubland vegetation grows on silicate and carbonate rocks between 600 and 1000 m.a.s.l. The prevailing soil types are *eutric Cambisols*, *CMe*, *rendzic Leptosols*, *LPK* and *albic Luvisols*, *LVa* and they are predominantly shallow.

Composition and structure:

This habitat's vegetation covered smaller territories in the past, especially in the areas lacking enough soil depth, where conditions are unfavorable for the development of forest cover. The dominant species is *Carpinus orientalis* Mill. It exhibits the widest distribution, supported by erosional processes and deforestation. The subdominants are *Quercus pubescens* Willd. and *Fraxinus ornus* L. The vegetation falls in the *Quercetea pubescentis* Doing-Kraft ex Scamoni et Passarge 1959 class and the *Carpinion orientalis* Horvat 1958 alliance.

Conservation status: None.

3.4. Moesian lilac thickets (F3.2432)

Abiotic characteristic and distribution:

This habitat type is presented along with the *Peri-Pannonic dwarf almond scrub* (F3.24122) and has the same typical features.

Composition and structure:

This habitat type is represented by the Dragoman s xerothermic tall shrub plant communities, dominated by *Syringa vulgaris*. The oriental hornbeam (*Carpinus orientalis*) often co-dominate this vegetation. It is mainly of secondary origin, except for places with extremely shallow soils or directly on the base rock, where it can be considered as primary vegetation. The formation of

complex vegetation is often observed. Complexes are made up of dry grasslands of the *Festuco-Brometea* class and *Pruno tenellae-Syringion* shrublands of the *Crataego-Prunetea* class. The vegetation of this habitat type is related to the *Syringo-Carpinion orientalis* alliance of the *Quercetea pubescentis* class.

Conservation status: Included in the Red Data Book of the Republic of Bulgaria.

4. Discussion

The last 30 years are characterized by a steady decrease of pasture workload, leading to an increase of shrubland vegetation across significant areas in western Bulgaria. Land abandonment, alongside with forest clearings, gave way to the development of secondary succession, which in turn provided the necessary conditions for the regeneration of native shrubland habitats. The degradation (at different phases) of G1.73 Eastern [*Quercus pubescens*] woods and G1.76 Balkano-Anatolian thermophilous [*Quercus*] forests is typical for Dragoman municipality, thus also leading to additional expansion of the shrubland territories. Shallow soils play an important part too, as they are not providing the necessary conditions for the expansion of the forest cover. Secondary succession is also an important factor in the transformation of grasslands into shrublands.

On the other hand, the governmental subsidies mentioned earlier, result in a decrease of the territories with shrubland vegetation. Yet, terrain observations clearly show that such areas have a limited distribution, as opposed to those that are experiencing an expansion of shrubland taxa.

The vegetation of the *Crataego-Prunetea* class and *Berberidion vulgaris* alliance perfectly corresponds with the *Medio-European rich-soil thickets* (F3.11) habitat type, although the latter is not typical for the Balkan Peninsula. The *Berberidion* vegetation fits well into the *Subcontinental and continental deciduous thickets* (F3.24) also, but a suitable habitat subtype could hardly be selected. That is why we decided that the *Berberidion vulgaris* alliance should be mapped at fourth habitat level only as EUNIS habitat code F3.24. The reduced number of grazing livestock, along with forest clearings have led to the wide distribution of this habitat type. The subsidized clearings, especially near the town of Dragoman, contributed to a decrease of the consistency of shrubland species there. However, the lack of such activities in the border areas with the Republic of Serbia resulted in a wide shrubland distribution. This is enhanced by the low population density in the areas around the villages of Cheparlinsi and Lipinsi to the northwest, and Nedelishte and Nachevo to the southwest.

5. Conclusion

The current study focuses on the investigation of shrubland habitats in Dragoman municipality, following the EUNIS classification. One major habitat type with three subtypes were established: Subcontinental and continental deciduous thickets (F3.24), Peri-Pannonic dwarf almond scrub (F3.24122), Moesian oriental hornbeam thickets (F3.2431), Moesian lilac thickets (F3.2432) with a territorial prevalence of the vegetation related to the *Berberidion vulgaris* alliance. Together they cover over 16% of the municipality's area, making them an important feature of the whole ecosystem. Several reasons explaining the presence of shrubland vegetation were defined: secondary succession has a leading role in the observed process and represents a logical occurrence considering land abandonment, decrease in livestock grazing and forest clearing. Some areas are characterized by shrubland vegetation clearings, promoted by governmental subsidies. Despite this fact, the authors' conclusion is that areas turned into shrublands prevail over areas deprived from that type of vegetation.

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