



A dry meadow as a live seed bank and an object of research

J. Bavcon* & A. Marinček

Botanical Garden Ljubljana, Department of Biology, Lžanska cesta 15, 1000 Ljubljana, Slovenia

* author for correspondence [Joze.Bavcon@guest.arnes.si]

Abstract. – Dry meadows, particularly those in lowlands, are becoming quite rare. In 2002, the Botanical Garden of Ljubljana took a dry meadow on lease. The meadow, covering a surface of 2 ha, lies in the close vicinity of Ljubljana. It has not, for the last 40 years, been subjected to any intensive treatment. The very first sample inventorying of plant species in the course of 2001 revealed the presence of a large number of species; of these quite a number appear in the Slovenian Red Data List of Pteridophytes and Spermatophytes. In the course of the regular monitoring in 2002 the number of determined species increased to 120. The meadow is quite rich in wild orchids, which makes it all the more valuable. It is in the initial stage of overgrowing. A late one-time mowing once a year is expected to contribute to its conservation. The goal of taking the garden on lease and exposing it to proper management is to contribute to an active conservation of this type of habitats and their biodiversity.

Key words: active protection, dry meadow, mowing, biodiversity, live seed bank.

1 Introduction

Dry meadowlands, particularly those in lowlands, are becoming quite rare both in Slovenia and in the world at large. Disappearing along with them is also the diversity of plant and animal species. Changes are evident from associations and species composition, while some of the species are disappearing. These changes result from agricultural intensification – manuring, mowing or abandonment of mowing. Orchids and other geophytes as well as other families (Kaligarič 1977) are particularly sensitive to the introduction of minerals (manuring). In terms of species the degradation of meadows is under a substantial impact of the new technology of fodder preparation, particularly the transition to silage which dictates earlier mowing when meadow plants are not seeding as yet (Šilc 2002).

In 2002, the Botanical Garden of Ljubljana took a dry meadow on lease. The meadow lies at Vižmarje, in the close vicinity of Ljubljana. The peasants had noticed certain plants which otherwise grew at higher areas. The first sample inventory of plant species in the course of 2001 and the fact that in the close vicinity of Ljubljana certain rare species were present in large numbers prompted our effort to preserve this meadow in an as original form as possible. As we learned from its owners, the meadow has not been intensively exploited (neither manured nor mown more than once a year) for the last forty years, which of course heightened our interest in the area. We also learned that the owners of the nearby land were interested in ploughing it up to

cultivate various field crops. It was therefore imperative to act without delay if all that richness of plants was to be preserved. A single intervention in terms of intensifying the exploitation of the area could destroy the vegetation.

2 Methods

Floristic inventorying was complemented by observation of abiotic factors (dryness in summer time, depth of soil). The reference of the inventoried area according to the Central European mapping is 9852/4 and according to the UTM square VM60. In the course of 2002 the meadow was visited eight times. The plants were determined either in the field or later on in the Botanical Garden. Some of them were transferred to the cultivation area of the Botanical Garden. The rarer species were numerically evaluated, which should enable us to compare the state then with that in the years to come when the meadow will again be mown once a year.

3 Results and discussion

The very first sample inventorying of plant species in the course of 2001 showed the presence of certain species that are not very frequent in the environments of Ljubljana. In 2002 the meadow was under constant monitoring in order to register the current state which will be compared later to the state after a one-time mowing. Quite a number of species also appear in the Red List of Pteridophytes and Spermatophytes (Wraber & Skoberne 1989). All of them fall into the category of vulnerable species highly susceptible to human interventions in the biotope – e.g. *Anacamptis pyramidalis* (L.) L.C.Rich., *Epipactis palustris* (L.) Crantz, *Gladiolus illyricus* Koch, *Gymnadenia conopsea* (L.) R.Br., *Lilium bulbiferum* L. subsp. *bulbiferum*, *Ophrys holosericea* (Burm.fil.) Greuter, *Orchis coriophora* L., *Orchis militaris* L., *Orchis morio* L., *Orchis tridentata* Scop., *Orchis ustulata* L.

According to the current inventory the meadow offers home to more than 120 different species. Our future work will include inventorying and determination of grasses and sedges most of which have not been inventoried as yet.

The area under study can be evaluated through different classifications. According to the palearctic classification of habitat types (Devillers & Devillers-Terschuren 1996) this is a semi-dry Central European meadow rich in orchids (34.3221) which, being a priority habitat, falls under the habitat directive (Council of Europe 1992) so that it has to be considered also in the Natura 2000.

Syntaxonomically, meadowlands of this type are placed into the class *Festuco-Brometea*, order *Brometalia erecti*, and association *Bromion erecti*. The floristic inventories as completed do date point to a more massive presence of the species that count as leading within the association *Onobrychido viciifoliae-Brometum*; a closer determination of the association, however, will also require suitable phytocenological inventories.

Tomažič (1949) described small glade-type pine groves growing on the rough gravel in Posavje, as well as nearby rocky, gravelly meadows mown only once a year, in other words, he also dealt with surfaces not overgrown with pine trees or else the latter grow merely along the margins. He repeatedly referred to a locality known as "Dovjež ob Savi"; judging from the enumerated plant species it would seem fairly certain that he described the very meadow which is the object of our research.

The species considered characteristic of the association (Tomažič 1941) are given in table 1.

The 2002 inventories do not include all of the species cited by Tomažič. The inventorying has not been completed as yet, and it should also be taken into account that the present species composition may have undergone changes so that some species observed in the past may now actually be missing. Noticed among the cited species were *Carex humilis*, *Koeleria pyramidata*,

Ophrys holosericea, *Hypochoeris maculata*, *Trifolium montanum*, *Linum viscosum* and *Bromus erectus*.

The meadow is in the initial stage of overgrowing. A late one-time mowing wants to contribute to its conservation. It is to be expected that the mowing will be followed by an increased presence of at least some of the species, Orchidaceae in particular. This method of meadow conservation and prevention of overgrowing is resorted to also elsewhere in the world (Fitzgerald 2000).

Table 1. Characteristic species of the association *Festuceto pseudovinae-Centaureetum rhenanae* Tomažič 1941. (syn.: Asoc. *Carex humilis-Centaurea rhenana* Tomažič 1940)

Tomažič 1941	Current name
<i>C. nitida</i> Host	<i>Carex liparocarpos</i> Gaud.
<i>Festuca (vallesiaca</i> Schleich. ssp.) <i>pseudovina</i> (Asch. et Graebn. Hack. var. <i>parviflora</i> Asch. et Graebn.	<i>Festuca pseudovina</i> Hack. ex Wiesbaur
<i>Centaurea rhenana</i> Boreau	<i>Centaurea rhenana</i> Boreau
<i>Onobrychis viciifolia</i> Scop. subsp. <i>arenaria</i> (Kit. em. Koch) Thell. var. <i>typica</i> Beck [= <i>O. arenaria</i> (Kit.)]	<i>Onobrychis arenaria</i> (Kit.) Ser.
<i>Andropogon ischaemum</i> L.	<i>Andropogon ischaemum</i> L.
<i>Festuca (vallesiaca</i> Schleich ssp.) <i>sulcata</i> (Hack.) Nym., Asch. et Graebn. <i>F. brevifolia</i> Belli	<i>Festuca rupicola</i> Heuff.
<i>Seseli annuum</i> L.	<i>Seseli annuum</i> L.
<i>Carex humilis</i> Leyss.	<i>Carex humilis</i> Leyss.
<i>Carex caryophyllea</i> Latour	<i>Carex caryophyllea</i> Latour
<i>Koeleria (pyramidata</i> (Lam.) Domin. ssp.) <i>montana</i> (Hausm.) D.T.	<i>Koeleria pyramidata</i> (Lam.) PB.
<i>Ophrys fuciflora</i> (Cr.) Rchb.	<i>Ophrys holosericea</i> (Burm.fil.) Greuter
<i>Ophrys aranifera</i> Huds.	<i>Ophrys sphegodes</i> Mill.
<i>Ophrys muscifera</i> Huds.	<i>Ophrys insectifera</i> Huds.
<i>Brachypodium pinnatum</i> (L.) Beauv.	<i>Brachypodium pinnatum</i> (L.) Beauv.
<i>Hypochoeris maculata</i> L.	<i>Hypochoeris maculata</i> L.
<i>Trifolium montanum</i> L.	<i>Trifolium montanum</i> L.
<i>Linum viscosum</i> L.	<i>Linum viscosum</i> L.
<i>Bromus erectus</i> Huds.	<i>Bromus erectus</i> Huds.

If the neighbouring parcels of land were no longer exposed to intensive exploitation, they could serve as a source of natural distribution for such species that used to be more common in these parts – as an original re-introduction locality. While inventorying the plants we also collected the seeds of the species for our seed banks. This natural habitat represents a natural reserve of plants which may spread to the neighbouring meadows some of which are intensively exploited for growing different cultures while others serve as intensive producing meadows. As the studied meadow is unique in this area, it is all the more important to take good care of it. It is very close to the actual town area, so it is within easy reach for collecting of seeds and monitoring. It is large enough (2 ha) to represent a natural resource of dry meadow plant species. It serves as a source of seeds for our seed bank as well as a source of live plants in a natural habitat which is used exclusively for observation and research. Mowing it once a year in the middle of August is enough to allow the seeds to ripen and to ensure the reproduction of plants. As seeds are collected in a reasonable quantity, this involves no threat to the natural populations of the species. Weekly monitoring allows us to conserve those among them whose presence in the meadow is less pronounced than that of other species.

4 Conclusions

A long-term objective of the project is to maintain the meadow in the current state, purchase it or at least arrange for a longer lease contract, and most of all, have it legally protected. This would be extremely useful in view of the fact that the meadow is located within a water collecting area from where a part of Ljubljana is provided with water. The Botanical Garden would there preserve not only the plants in their natural habitat but also the gene resources of the aforementioned population of plants which would serve for research projects and as a source for reintroduction and repopulation of similar impoverished and degraded surfaces but also as a place of live seed bank. The goal of taking the garden on lease and exposing it to proper management is to contribute to an active conservation of this type of surfaces and thus to the conservation of their biodiversity (UNEP 1994).

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References

- Devillers P. & Devillers-Terschuren J. (1996) A classification of Palaearctic habitats. Nature and environment, No. 78. Strasbourg, Council of Europe Publishing.
- Fitzgerald R. (2000) Management crisis for the extraordinary flora. *Plant Talk* 21: 21-25.
- Kaligarič M. (1997) Rastlinstvo Primorskega krasa in Slovenske Istre - travniki in pašniki. (Vegetation of Karst of Primorje and Slovene Istra-Meadows and Pastures) Zgodovinsko društvo za južno Primorsko. Koper, Znanstveno-raziskovalno središče Republike Slovenije Koper.
- Martinčič A., Wraber T., Jogan N., Ravnik V., Podobnik A., Turk B. & Vreš B. (1999) Mala flora Slovenije. Ključ za določanje praprotnic in semenk. (Key book for determinations Pteridophytes and Spermatophytes). Ljubljana, Tehniška založba Slovenije III izdaja.
- Šilc U. (2002) Kmetijstvo in biotska raznovrstnost. (Agriculture and biodiversity) *Proteus* 8(64): 372-373. Ljubljana, PDS.
- Tomažič G. (1941) Senožeti in pašniki na plitvih, pustih in suhih tleh Slovenije. (Asociacije iz podzveze Xerobromion v Sloveniji). (Meadows and Pastures on Shallow, Waste and Dry Ground (Associations Xerobromion in Slovenia)) *Zvezek 2*: 76. Ljubljana, Ponatis iz Zbornika Prirodoslovnega društva.
- Tomažič G. (1949) Asociacije borovih gozdov v Sloveniji. (Association of Pine forests in Slovenia) Razprave razreda za prirodoslovne in medicinske vede SAZU v Ljubljani, Knjiga IV.
- UL RS 82/2002 (2002) Pravilnik o uvrstitvi ogroženih rastlinskih in živalskih vrst v rdeči seznam. (Working Draft of the Red Data List of Pteridophytes and Spermatophytes) - Uradni list Republike Slovenije - Uredbe, 82, 8893-8975.
- UNEP (1994) Convention on Biological Diversity. Text and annexes. IUCN Secretariat
- Wraber T. & Skoberne P. (1989) Rdeči seznam ogroženih praprotnic in semenk SR Slovenije. (The Red Data List of Pteridophytes and Spermatophytes) Varstvo narave 14-15. Ljubljana, Zavod SR Slovenije za varstvo naravne in kulturne dediščine.

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