N. Jogan

Mediterranean annual grasses in the Slovenian flora

Abstract

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According to the literature, 45 species of Mediterranean annual grasses were believed to occur in the submediterranean region of Slovenia. A thorough analysis of old data and herbarium material proved that 7 of them: *(Apera interrupta, Bromus intermedius, B. scoparius, Gastridium ventricosum, Heleochloa alopecuroides, Phalaris paradoxa, Phleum arenarium)* had been reported in error, 4 are probably extinct, 6 were only found as casuals, and a further 6 have not been recorded in the last 50 years. This leaves merely 19 species as confirmed, native or naturalized members of the Slovenian flora.

Introduction

There are three reasons why we selected the Mediterranean annual grasses (MAG) of the Slovenian flora as a research object: (1) Slovenian floristics has tended to neglect grasses during the last decades; hence 10 of the studied species were included in the list of "insufficiently known" plant species in the *Slovenian plant Red Data Book* of Wraber & Skoberne (1989); (2) a permanent occurrence of annuals in a given territory is a good indicator of Mediterranean influence; and (3) Slovenia has only about 45 km of coastline of which only about 15 km are relatively intact, and on the coast there are only few, limited limestone areas, where microclimatic conditions are more Mediterranean than on the flysch areas.

The 45 MAG species which, according to the literature, are believed to thrive only in the submediterranean (SM) region were therefore selected for a study of their presence and distribution in Slovenia.

Material and methods

For each selected MAG species a map of its distribution in Slovenia was prepared, based on data from the literature and on the revision of specimens in the herbarium in Ljubljana (LJU) and the author's personal herbarium. The Central European floristic

Table 1: Conspectus of MAG species recorded from Slovenia, with comments on their occurrence (err. = reported in error, freq. = frequent, scatt. = scattered), habitat type, regional distribution (abbreviations as in Fig. 1; parenthetical indications refer to casual occurrence), and conservation status as previously given (by WS = Wraber & Skoberne 1989, and Kg = Kaligarič 1990) and currently accepted (K = insufficiently known, R = rare, V = vulnerable, Ex = extinct, NRR = not found recently (not in the last 50 years).

Species	*Occurrence*	*Habitat*	*Range*	*Cons. status WS/Kg*	*current*
Aegilops cylindrica Host	casual		(SM, PA)		
Aegilops neglecta Bertol.	freq.-scatt.	natural & ruderal	sm-k		
Aegilops geniculata Roth	scatt.	natural & ruderal	sm-k		
Aegilops triuncialis L.	scatt.	natural & ruderal	sm-k		
Alopecurus rendlei Eig	casual		(SM, SP, PA)	(K)	NRR
Apera interrupta (L.) P. Beauv.	err.			(K)	
Avena barbata Link	freq.	natural & ruderal	SM		
Avena sterilis L.	freq.	natural & ruderal	sm-k		
Brachypodium distachyum (L.) P. Beauv.	rare	natural	sm-k	(R)	V
Briza maxima L.	casual		(SM)		NRR
Bromus diandrus Roth	scatt.	ruderal			
Bromus intermedius Guss.	casual		(SM)		
Bromus japonicus Thunb.	freq.-scatt.	natural & ruderal	SM (SP)		
Bromus madritensis L.	freq.	natural & ruderal	SM		
Bromus molliformis Lloyd	err.			(K)	
Bromus rigidus Roth	scatt.	ruderal	sm-k (PA)		
Bromus scoparius L.	err.			(K)	
Bromus squarrosus L.	freq.-scatt.	natural & ruderal	SM (PA)		
Catapodium marinum (L.) C. E. Hubb.	casual		(SM)	(R)	
Crypsis aculeata (L.) Aiton	rare	natural	sm-c	(Ex)	Ex
Dasypyrum villosum (L.) P. Candargy	casual		(SM)		NRR
Eragrostis cilianensis (All.) F. T. Hubb.	casual		SM		
Gastridium ventricosum (Gouan) Schinz & Thell.	err.		(K)		
Hainardia cylindrica (Willd.) Greuter	rare	natural	sm-c	(R)	V
Heleochloa alopecuroides (Piller & Mitterp.) Roemer	err.				
Heleochloa schoenoides (L.) Host	rare	natural	sm-c	(K)	Ex
Hordeum leporinum Link	common	natural & ruderal	SM		
Hordeum marinum Huds.	scatt.	ruderal	sm-c		
Lagurus ovatus L.	rare	natural (?)	sm-c	(K)	Ex
Lolium rigidum Gaud.	scatt.	ruderal	sm-c	(R)	
Parapholis incurva (L.) C. E. Hubb.	freq.	natural (ruderal)	sm-c	(K)	
Parapholis strigosa (Dumort.) C. E. Hubb.	rare	natural	sm-c	(R)	V
Phalaris brachystachys Link	casual		(SM)		NRR
Phalaris canariensis L.	casual		(Slovenia)		
Phalaris paradoxa L.	err.				
Phleum arenarium L.	err.				
Phleum paniculatum Huds.	rare(casual?)	natural	SM (PA, SP)		NRR
Phleum tenue (Host) Schrad.	casual		(SM)		NRR

Table 1 (continued).

Species	Occurrence	Habitat	Range	Cons. status WS/Kg	Cons. status current
Polypogon monspeliensis (L.) Desf.	casual		(SM)	(Ex)	
Psilurus incurvus (Gouan) Schinz & Thell.	casual (?)		(SM)		
Rostraria cristata (L.) Tzvelev	common	natural & ruderal	SM		
Scleropoa rigida (L.) Griseb.	freq.	natural & ruderal	SM (PD)		
Tragus racemosus (L.) All.	casual		(SM)		
Vulpia aetnensis Tineo	scatt.-freq.	natural & ruderal	SM		
Vulpia fasciculata (Forssk.) Samp.	rare	natural	sm-c		Ex

grid was used for mapping purposes, the smallest recognized unit being one quarter (quadrant) of the basic field (each basic field is a rectangle extending over 6' of geographical latitude and 10' of longitude – in our territory, about 11.2 × 12.9 km). On the basis of these maps, the approximate pattern of distribution and the degree of frequency in Slovenia were ascertained for each species.

Results and discussion

The results were rather surprising (see Table 1): out of the 45 species studied, 19 could be confirmed as native or naturalized members of the flora (4 of them rare to

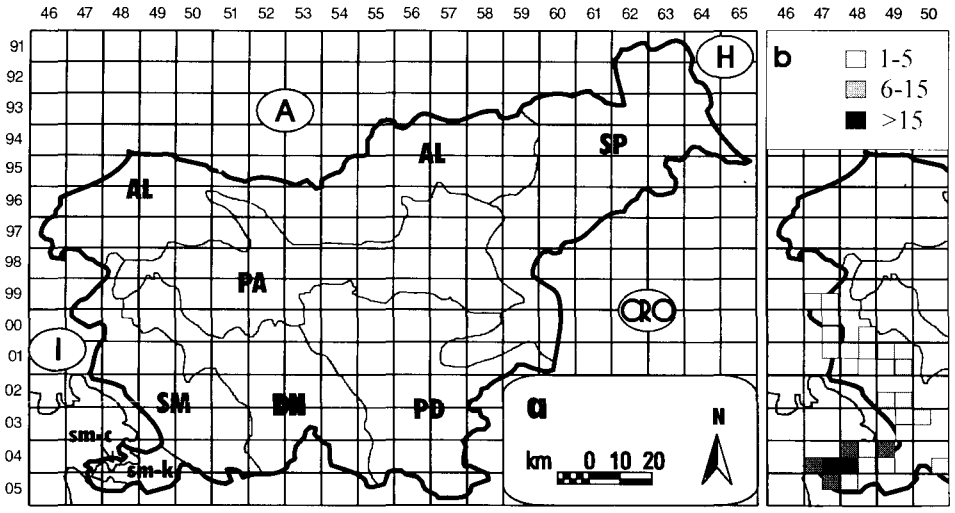

Fig. 1. Maps of the territory. – **a,** the phytogeographical regions of Slovenia (with the submediterranean region subdivided): AL = alpine, PA = prealpine, SP = subpannonic, PD = predinaric, DN = dinaric, SM = submediterranean (sm-c = coastal part of SM, sm-k = Istrian part of SM). – **b,** number of recorded MAG species per mapping grid unit, for SM.

scattered, 10 relatively frequent to common, and 5 ruderal or segetal – mostly archaeophytes); 6 proved to be only casuals whose Slovenian populations have to be occasionally re-established by seeds from adjacent eu-mediterranean regions such as the calcareous part of Istria; 4 are probably extinct; 6 have not been seen in the last 50 years (one of them being naturally rare, the others having probably never been more than casuals); and as many as 7 proved to have been reported from Slovenia in error.

The last three groups deserve some additional explanations.

Extinct or probably extinct species

In the *Slovenian plant Red Data Book* (Wraber & Skoberne 1989), only 2 MAG species are treated as extinct. The present study can confirm extinction for one of them *(Crypsis aculeata),* whereas the other *(Polypogon monspeliensis)* cannot be considered extinct because it most probably was only a casual: there is only one old record (Marchesetti 1897: 616) from the Slovenian coast.

The ecology of *Heleochloa schoenoides,* another extinct species, is very similar to that of *Crypsis aculeata* and so the reason for their extinction is deemed identical: human destruction of suitable coastal habitats. Similarly, the only habitat of *Lagurus ovatus,* on the limestone peninsula of Izola, was destroyed by the building of a factory at the end of the previous century (Marchesetti, l. c.).

The fourth extinct MAG species, *Vulpia fasciculata,* grows on sand dunes and beaches – habitats whose occurrence on the Slovenian coast, even in the past, is doubtful. It would therefore be perhaps more appropriate to consider this species as a mere casual.

Species whose occurrence has not been recently confirmed

Many of species that had been recorded at the end of last century, a period of high floristic activity in the region, have not been seen in the last 50 years; probably, a thorough search will lead to their rediscovery, at least as casuals. The majority of them have probably never been more as just casuals of disturbed sites, but some (e.g. *Hordeum marinum,* with a relatively high number of records at the end of the 19th Century) might also have become extinct as a result of strong anthropic disturbance of coastal habitats.

Species erroneously reported from Slovenia

Erroneous citations are mainly due to a misunderstanding of E. Mayer's (1952) notion of the "Slovenian territory": in his work, the whole Slovenian ethnical (!) territory, that includes parts of southern Austria and north-eastern Italy, is covered. Some of the resulting mistakes are found exclusively in foreign floristic literature: for *Heleochloa alopecuroides* and *Phleum arenarium* in Domac (1979: 511, 512) and Conert (1979: 99; 1983: 190; 1985); but the other species were uncritically accepted also by Martinčič (1984) as members of the Slovenian flora.

A well-known source of erroneous floristic data is Fleischmann (1844), but his contribution to this group of MAG species is limited to the single case of *Apera interrupta.*

Finally, all indications of *Bromus intermedius* for the territory of Slovenia are based on a single record of Paulin from the vicinity of Sežana (Flora Exsiccata Carniolica No.

1863), but the supporting herbarium material was unfortunately wrongly determined and in actual in fact belongs to *Bromus japonicus* var. *velutinus* (W. D. J. Koch) Bornm.

Excluding the (presumed) casuals and erroneously reported species, 24 species remain, which according to their pattern of distribution can be grouped as follows: all are (or were) found in the coastal region, 16 also in Slovenian Istria and on the south-western edge of the Karst, 8 extend to the whole southern SM region, 5 can be found all over the SM region, and just 1 reaches the Predinaric region of Slovenia where it is very rare. This distributional gradient is consistent with the division of the SM region into three fairly clear-cut subunits with different degrees of Mediterranean influence (Fig. 1): (1) the coastal region, extending up to about 100 m a.s.l., (2) Slovenian Istria and the SW edge of the Karst (i.e., the Flysch area of Istria and the rocky Karst edge with mostly south-western and southern exposure), and (3) the remaining part of the SM region with a more moderately expressed Mediterranean influence. This subdivision of the SM region of Slovenia finds its counterpart in the subdivision of the adjacent Friuli-Venezia Giulia (Poldini 1991: 50) into (1) the Mediterranean region, (2) the Trieste Karst of the Illyric-Dinaric (Karst) region, and (3) to the remainder of the Illyric-Dinaric region and the transitional zone towards the Julian prealpine region. However, the borders of this proposed subdivision of the SM region disagree to some extent with the division of the same region (called Northern Coast Sector of the Adriatic Province of the Mediterranean Region) proposed by Zupančič & al. (1987), which was based mainly on phytocoenological data.

Conclusions

We may conclude that:

- The few habitats suitable for mediterranean annuals – not only grasses – are confined in Slovenia to the Submediterranean region. They are exposed to strong human influences; hence their existence is in great danger, as can also be seen from the *Slovenian plant Red Data Book,* in parallel to the situation in Bulgaria (Kožuharov & al. 1992: 43) where the highest number of endangered taxa is found along the Black Sea coast.
- The study of the flora of Slovenia, especially of the less interesting families such as the grasses, has been neglected in the last decades. It is urgent to start a new, systematic inventory of our flora, primarily in the areas where rare types of habitats still exist locally and nature is still relatively well preserved – a situation that is changing very rapidly –, particularly in the submediterranean and subpannonic regions of Slovenia;
- When using literature data, especially for plant species restricted to the marginal parts of Slovenia, one must be very cautious and critical, particularly when no herbarium material is available.

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Address of the author:
Dr N. Jogan, Department of Biology, Biology Faculty, Večna pot 111, SI-1000 Ljubljana, Slovenija.