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Vegetation of the Nature Reserve Voskop (Protected Landscape Area Český kras) and possible trends of its development

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ABSTRACT: Nine plots on transect situated through the ridge of Nature Reserve (NR) Voskop (Protected Landscape Area Český kras) demonstrate local vegetation variability. Ordinations with some transformation phytosociological relevés showed possible development trends.

Keywords: vegetation; Nature Reserve Voskop; development trends

Double-peaks Oujezdce – Na Voskopě (next only as NR Voskop) are situated in Zdice-Liteň part of Český kras (Czech Karst), made by slight hills without extreme biotops, which are poorer of rare plants than the central karst area. According to these reasons is botanically less known also. Locality of NR Voskop belongs to the last xerotherm habitats of Czech thermophyticum, further to south yet appear influence of Hřebeny and Brdy. The parent rock is Koněprusy limestone. These make sink holes on plateau of Oujezdce. NR Voskop borders upon big quarry Čertovy schody (Devil stairs) near Suchomasty village and on nothern part are affected by abandoned old limestones quarries too. In this locality there are plants fixed on limestone rocky outcrops. Area of all NR Voskop belongs into the 1st zone of PLA Český kras (Skalický, Jeník 1974).

The bigger part of double-peaks is covered by forest stands. Community of *Carpinion* (Neuhäuslová et al. 1998) with a rich herb layer (associations *Melampyro-Carpinetum* and *Corno-Carpinetum*) passes through *Quercion pubescenti-petraeae* to *Seslerio-Festucion pallentis* and *Helianthemo cani-Festucion pallentis*. But it often passes to (formerly) grazing forests (Samek 1964; Průša 1974). At present these grazing forests are created by coppice of *Quercus petraea* agg., *Carpinus betulus, Sorbus torminalis* and *Fagus sylvatica*. Its present pattern is probably result of a longtime cattle grazing and coppice management. Among low and often very deformed vegetative regenerated trees is the rich xerotherm herb cover. An exception a well-preserved *Cephalanthero-Fagenion* is in NR Voskop on northwestern slope, which is a rare exception beside the locality of central part of Český kras (Skalický, Jeník 1974). Allochthonous tree species occur in a tree layer, e.g. *Larix decidua, Picea abies, Pinus nigra, Robinia pseudoaccacia, Quercus robur* and *Q. cerris* (Průša 1974).

MATERIAL AND METHODS

Through the ridge a transect has been situated in NR Voskop, to describe nearly all local vegetation types (Fig. 1). Plot 1 was situated into forest type 1W2 – *(Fagi-) Carpineto-Quercetum calcarium; nutricium* (Anonymous 1995; Viewegh et al. 2003). Plots 2, 3, 4 and 6 belong to a different succession stages of the forest type 1C8 – *Carpineto-Quercetum subxerothermicum; Brachypodium pinnatum.* Plots 5, 8 and 9 alternatively cover development stages with small trees succession and with allochthonous tree species of the forest type 1X8 – *Corneto-Quercetum xerothermicum.* Plot 6 cover very canopy

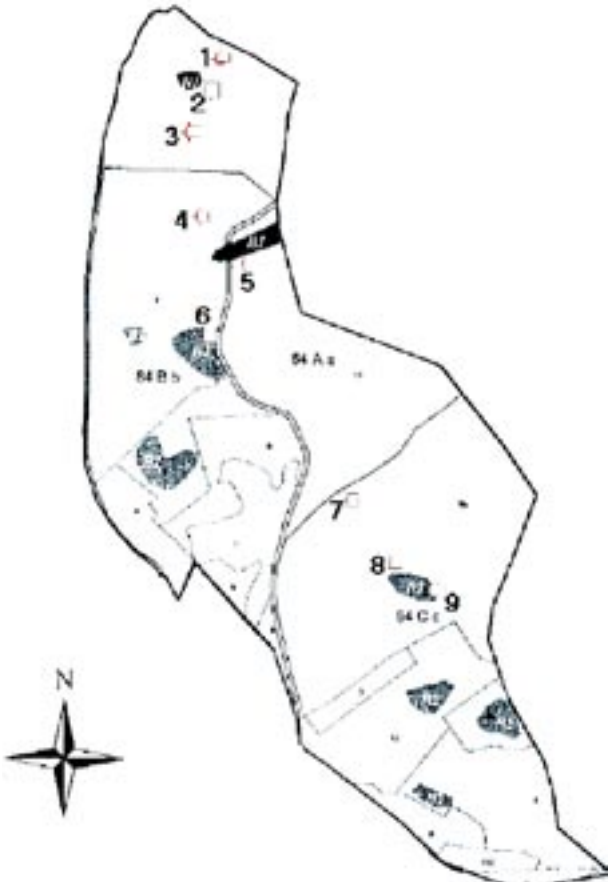

Fig. 1. Plots situated on transect in National Reserve Voskop

open stage of the forest type 2W3 – *Fageto-Quercetum calcarium: Mercurialis perennis-Impatiens noli tangere.* Phytosociological relevés were made on all plots (Table 1). These relevés were processed by DCA ordination method embraced in CANOCO program (ter Braak 1988). Three ordinations were made with following input data transformations: (a) without any transformation, (b) input data of E_1 only, (c) both above mentioned ways together (in a one ordination frame). These transformations were used to clarify interference of herb phytocoenosis by higher (mainly tree) layers at different successions stages (different canopy, resp. introduced tree species).

Taxonomy nomenclature was worked up after Dostál (1989), geobotanic nomenclature after Neuhäuslová et al. (1998) and forest typology nomenclature after Anonymous (1995) and Viewegh et al. (2003).

RESULTS AND DISCUSSION

Ordination results of no transformed input data of phytosociological relevés are shown on Fig. 2. Plots without tree and shrub layers with considerable predominancy of semi-steppe to steppe vegetation (Plots 2, 5 and 9; Table 1) are quite clearly separated. Plots with presence of shrubs and trees differ clearly by canopy. Plots with more open canopy (Plots 6 and 7; Table 1) are closer to gap plots (Plots 2, 5 and 9; Table 1). However, differences are shown whether dominant species on plot are autochthonous or dominant species are strongly out of natural composition. Plot 8 a *Pinus nigra* is planted, meanwhile all other (forest) plots have mostly allochthonous broadleaves in different proportions and different canopy in their higher étages (Table 1). A prob-

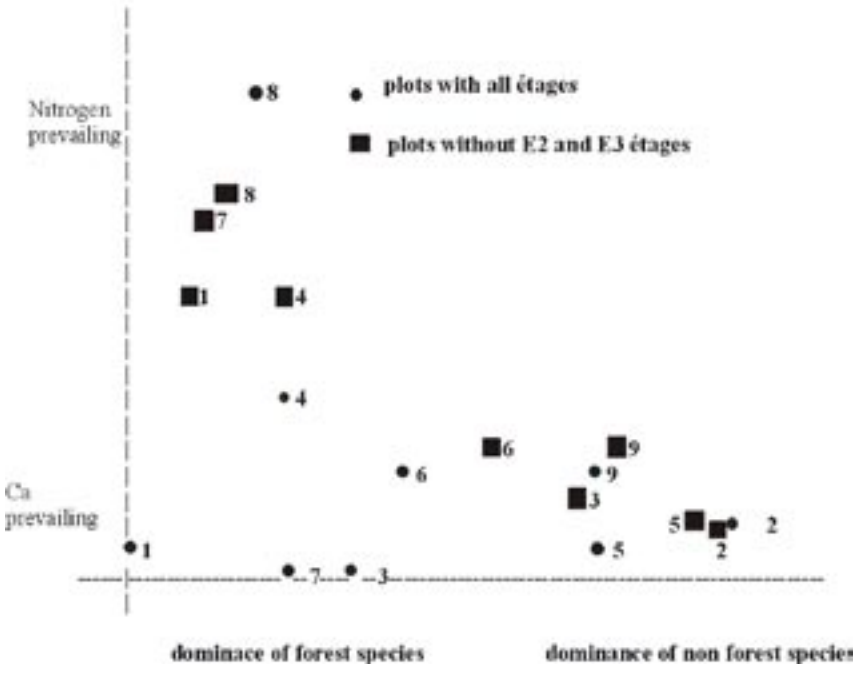

Fig. 2. Ordination without any transformation data

Table 1. Phytosociological relevés

Taxon + étage	Plot No.									Taxon + étage	Plot No.								
	1	2	3	4	5	6	7	8	9		1	2	3	4	5	6	7	8	9
E 3										*Galium aparine*	r								
Carpinus betulus	1		3	3			4			*Galium glaucum*					r	+		+	+
Fagus sylvatica	5		2				1			*Galium molugo*		+							
Larix decidua							1			*Galium verum*					r				
Quercus petraea agg.			2	3		2		3		*Geranium columbinum*									+
Quercus robur						2	2			*Geum urbanum*							+		
Pinus nigra								1		*Hedera helix*	+								
Pinus sylvestris							2			*Helianthemum ovatum*		+			+	+		+	1
E 2										*Hepatica nobilis*	1	+	+				1	+	
Acer campestre			2				1			*Hieracium murorum* agg.	+			r					
Acer platanoides							1			*Hypericum perforatum*		+				+			r
Carpinus betulus								1		*Koeleria macrantha*					r	+			r
Corylus avellana			2							*Lathyrus vernus*	+			r					
Cotoneaster integerrimus	1		1		1	1	1	+		*Lilium martagon*	r	+							
Crataegus spp.	1				1	1	1	+		*Lotus corniculatus*		r			r	r			r
Fraxinus excelsior							+			*Medicago minima*									+
Juniperus communis		1	1			1				*Melampyrum pratense*				r					
Prunus spinosa							1	r		*Melica nutans*	r								
Quercus petraea agg.								1		*Melica transsilvanica*						+			+
Quercus robur							1			*Mercurialis perennis*	2	+		+			2	2	
Rhamnus catharticus								r	r	*Mycelis muralis*			+						
Rosa spp.	1		1		1	+	1	r		*Myosotis arvensis* agg.		r							
Sorbus aria			2	1	2	1	1		1	*Oxalis acetosella*	r								
Sorbus torminalis					1	1		r		*Phyteuma spicatum*				r				r	
Swida sanguinea			3			1	2	+		*Pilosella officinarum*					+				
Ulmus glabra						1				*Poa nemoralis*	r			+					
E 1										*Polygala amara*					r	+			r
Acinos arvensis						+			r	*Polygaloides chamaebuxus*		1	+						
Acosta rhenana						+			r	*Potentilla neumanniana*					+	+			1
Ajuga genevensis		+				+			+	*Poterium sanguisorba*		+	+		+	+			+
Alliaria petiolata	r									*Primula veris*		+							
Alyssum alyssoides									r	*Prunella vulgaris*							+		
Alyssum montanum					r	r				*Pulsatilla pratensis* ssp.									
Anthericum ramosum		1	+	+	+	+	+	r	+	*bohemica*					+				+
Anthyllis vulneraria		+								*Pyrethrum corymbosum*	r			r	+	r			
Arrhenatherum elatius									r	*Rubus fruticosus* agg.								r	
Asperula cynanchica		+								*Salvia pratensis*		+			r	r			r
Asperula tinctoria				1						*Sanicula europaea*							+		
Astragalus glycyphyllos						r				*Sedum sexangulare*					+	+			+
Brachypodium pinnatum				1			2	2		*Senecio ovatus*								r	
Bromopsis ramosa	r			+	+	+	+			*Sesleria albicans*	r	3	1		2			+	
Campanula persicifolia	r									*Teucrium chamaedrys*		+	1	+	+			+	+
Carex humilis					+	+			+	*Thlaspi perfoliatum*						+			
Cephalanthera damasonium	+	+	+							*Thymus* spp.		+			+	+			+
Cerastium arvense		+			+				r	*Tithymalus cyparissias*		+			+	+			+
Coronilla varia		+			r				r	*Trifolium alpestre*		+							
Cuscuta spp.						r			r	*Turritis glabra*					r	r			r
Cyanus triumfettii					+	r			r	*Verbascum lychnitis*					r	+		r	
Echium vulgare					r	+		r	r	*Veronica officinalis*								r	
Erysimum crepidifolium									+	*Vignea muricata*	r								
Festuca pallens						+			+	*Vincetoxicum hirundinaria*					+	2	+	+	
Festuca valesiaca		+	1		1			+	2	*Viola hirta*		+			r	r		+	
Fragaria moschata				+						*Viola mirabilis*	r								
Fragaria viridis						r	+	+	+	*Viola riviniana*	+			r			r		

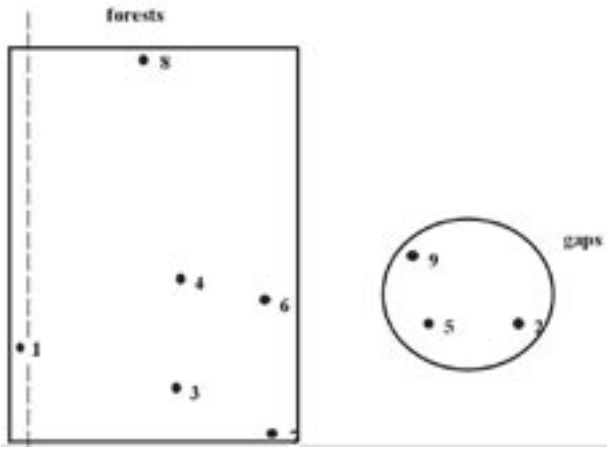

Fig. 3. Ordination with data E_1 étage only (input data transformation)

lematic determination of forest type 1C8 (*Carpineto-Quercetum subxerothermicum; Brachypodium pinnatum*) is signalized. Ordination indicates, plots 2, 4 and 6 can be the development stages of the forest type 1X8 (*Corneto-Quercetum xerothermicum*) and plot 3 is probably transition between 1st and 2nd Forest Altitudinal Vegetation Tiers of W – category (*Categoria calcaria*).

Rather different ordination is shown by (b) case input data transformation (Fig. 3). Plots with full character of the forest habitats, i.e. tree layer canopy 60% and more (Plots 1, 4, 7 and 8; Table 1), are quite clear. Plots 2, 3, 5, 6, and 9 with more open tree

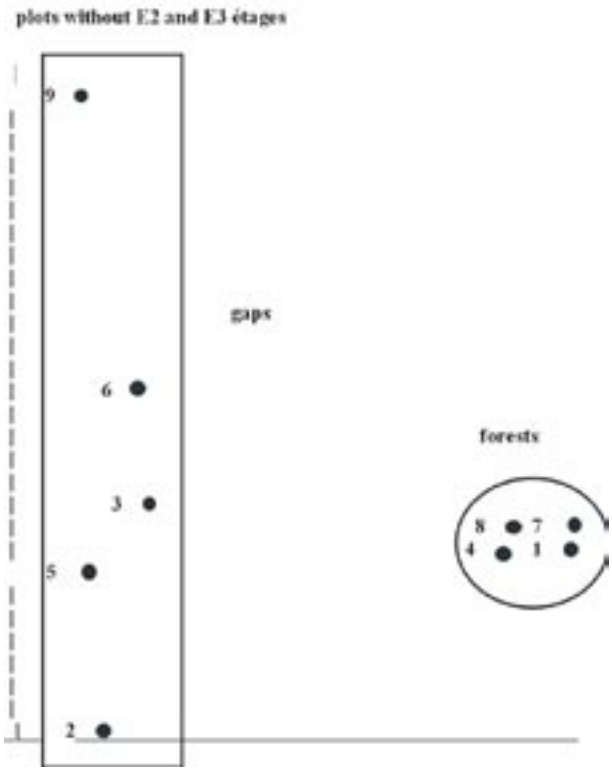

Fig. 4. Ordination with transformated and no transformated input data

layer (canopy bellow 50%) yet more tend to open gaps, probably due to greater forest steppe to steppe species presentation (Table 1). Problematic determination of forest type 1C8 (*Carpineto-Quercetum subxerothermicum; Brachypodium pinnatum*) is clear again.

Third ordination shows a theoretical situation based on (c) case input data information (Fig. 4). This ordination shows the stage of affection ground vegetation by higher stand layers regardless of their habitat naturalness. Barrens (gaps), resp. habitats with a sporadic shrub species presence only show quite clearly a minimum differences. Plot with very open tree canopy (Plot 6; Table 1) strongly trends to barrens (gaps). Plot 3 seems to be interesting. Coppiced origin *Carpinus betulus* dominates at tree layer. In spite of the stand being partly canopped (tree canopy is about 60%) it is not that old and is probably a first tree layer generation there. The ground (herb) vegetation has forest steppe characters of the barrens (gaps) (Table 1). Plots 7 and 8 establish entirely significant affection by tree layer. They are very similar by their higher nitrification after (theoretical) tree layer elimination, while they are conversely different with it (Fig. 4; Table 1). On plot 7 except for very high presentation of natural broadleaves (but in very unnatural proportion) were additionally planted conifers (*Pinus sylvestris* and *Larix decidua*). On the other hand plot 8 has considerable composition imported conifer *Pinus nigra.* The affection by tree layer is significant on plot 1 too. Natural domination of *Fagus sylvatica* represses higher nitrification of pure ground layer (Fig. 4; Table 1).

CONCLUSION

Ordination results quite explicitly show that the vegetation of NR Voskop is not at climax, but it covers different succession stages and its development could be influenced by management. Therefore the forest types determination does not seem to be convenient. Regards to a longtime anthropic influence of vegetation, the hypothesis offers. This area vegetation does not reach its climax stage and it will stay in pseudoclimax stage due to thin soil cover and water regime. In spite of some proposed management (Šamonil 2001a) aimed to natural vegetation composition (mainly its dominating tree layer), problem of the big nitrophilous herb species domination, especially on the ridge, is still open. It would show to a very high nitrate fall in the whole area, as Šamonil (2001b) suggested for other Nature Reserve within PLA Český kras. NR Voskop

vegetation would than be surely kept on a certain diverted development stage. Development trend will reveal next observation in a longer time period.

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Vegetace PR Voskop (CHKO Český kras) a možné trendy jejího vývoje

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ABSTRAKT: Devět ploch na transektu, zvoleném po hřebeni PR Voskop (CHKO Český kras), zachycuje proměnlivost zdejší vegetace. Ordinace při určité transformaci fytocenologických snímků ukázaly na možné trendy vývoje.

Klíčová slova: vegetace; PR Voskop; trendy vývoje

V odlehlejší části CHKO Český kras, v Přírodní rezervaci Voskop, byl zvolen hřebenový transekt devíti ploch, který zachytil téměř všechna stadia vegetace. Na plochách byl udělán fytocenologický zápis, který byl vyhodnocen ordinační metodou DCA, zahrnutou v programu CANOCO (ter Braak 1988).

Výsledky ordinací zcela jednoznačně ukázaly, že vegetace PR Voskop není v klimaxovém stadiu, ale zahrnuje různé sukcesní stupně a jejich vývoj může být ovlivněn dalším managementem. Proto se jeví určení LT nepříliš přesné. Vzhledem k dlouhodobému ovlivňování vegetace člověkem se nabízí hypotéza, že vegetace tohoto území nedojde svého klimaxového stadia a vzhledem k mělké půdě a vodním poměrům zůstane ve stadiu pseudoklimaxovém. Přestože se v PR navrhují určitá hospodářská opatření (Šamonil 2001a), směřující k přirozenému stavu složení vegetace (hlavně jejího determinujícího dřevinného patra), zůstává otevřená otázka značné dominance nitrofilních bylinných druhů (tab. 1) právě v její hřebenové části. Ukazovalo by to značný nitrátový spad na celém území, jak již pro jinou PR v rámci CHKO Český kras naznačil Šamonil (2001b). V tom případě by byla vegetace této PR zcela jistě udržována stále na určitém, odkloněném stupni vývoje. Směr vývoje napoví další sledování v delším časovém odstupu, protože pro území nejsou dostatečné podklady pro posouzení vývoje v minulosti.

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