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STATUS OF *Molinietum caeruleae* COMMUNITIES IN KROWIE BAGNO – COMPARISON OF MONITORING RESEARCH AFTER 40 YEARS

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Summary. Phytosociological and soil studies of moor-grass meadows *Molinietum caeruleae* within the largest complex of meliorated peat-bogs of Polesie Lubelskie were carried out. In total, 51 phytosociological records and 17 soil profiles were analysed. A great floristic differentiation of examined spots and numerous share of rare and protected species was found on a small area. Most of the spots were classified as *Molinietum caeruleae typicum* sub-complex, while a few as *M. c. buxbaumii*, *M. c. cladietosum marisci*, *M. c. caricetosum paradoxae*, and *M. c. schoenetosum ferruginei.* Majority of M. c. *typicum* spots are characterised by large percentage of shrub species, which may indicate the giving up of agricultural management of those meadows. The soil analyses allowed for classifying them to post-bog peat-muck (MtI) and moderately mucked (MtII), as well as – much rarely to boggy peat soils. Those soils developed from short sedge, bush, and mossy peats and were characterised by acidic or weakly acidic, rarely neutral pH values.

Key words: plant communities, soil cover, long-term changes, Krowie Bagno peat-bog

INTRODUCTION

Variable-moisture moor-grass meadows classified in the *Molinietum coeruleae* complex (Koch 1926) formerly belonged to phytocenoses often found in the Lublin region [Fijałkowski 1959, Fijałkowski and Chojnacka-Fijałkowska 1990]. Within the peat-bog complex Krowie Bagno, they were the dominating phytocenose type by 60's of the twentieth century. They covered almost half of the area [Jargiełło 1973, 1976] of that largest meliorated peat-bog complex in Polesie Lubelskie (about 3500 ha). Jargiełło [1973] estimated the area of moor-grass meadows as 2150 ha. Since then, the area occupied by the community has dramatically decreased [Fijałkowski *et al.* 2000]. Present meadow area with domination of purple moor grass is estimated as not more than 260 ha [Buczek and Urban 2004]. Although the range of variable-moisture meadows drastically

decreased, floristically interesting spots of *Molinietum caeruleae* survived in many places of Krowie Bagno, namely near Lubowierz, Lubowierzek [Lorens and Sugier 2004], and Krychowskie lakes, and locally in the central part. The authors distinguished several variants near Lubowierz and Lubowierzek lakes within the moor-grass meadows. Those were subjected to a survey that provided material for geo-botanical comparative assays of that plant community 40 years after complex studies performed by Jargiełło [1973, 1976].

METHODS

Botanical and soil studies were carried out in 2004. Fifty-one phytosociological records were made twice: in July and September. The area of recorded spots was 25 m². The 11-grade scale was used to estimate the plant cover extent. The cover extent of purple moor grass (*Molinia caerulea*) in examined spots was estimated after the control in September. Syntaxonomic analyses were based of works by Matuszkiewicz [2001], Grynia [1968], as well as Kucharski and Michalska-Hejduk [1994].

Among 17 soil outcrops from 0–10, 10–20, and 20–30 cm depths, 51 soil samples were collected (n = 51). Chemical analyses of soil were performed in accordance with the methods developed by Sapek and Sapek [1997]. The following items were determined in solutions obtained from soil samples digested in nitric and perchloric acids: total phosphorus (colorimetry using molybdate-vanadate agent), potassium, calcium, and sodium (flame EAS technique), as well as magnesium and iron (ICP-AAS). The ash content along with pH_{H2O} and pH_{KCl} were determined as well.

Location of phytosociological records and soil outcrops was determined by means of a GPS device. Further monitoring every 5 years is planned to be performed at designated sites in future.

RESULTS

Of the 51 phytosociological records taken and analysed, 32 that are the most representative are presented in Table 1. Studied spots contained 9 tree and bush species, 118 herbal plant species, and 29 bryophyte species – 146 taxons in total.

Among bushes, *Salix rosmarinifolia* and *Salix cinerea* were distinguished by the highest (IV) stability rate. Moreover, *Betula pubescens* and *Frangula alnus* were found in over 50% of the records. *Betula humilis* was found also relatively often (16 records; stability rate II).

Although up to 118 species could be found on the list of herbal plants, almost half of them (52 species) were recorded in single or two phytosociological records. Among herbal plants, only *Molinia caerulea* was found in all records at

coverage level varying from 30 to 100%. Moreover, two species characteristic for *Molinietalia* order were found in a relatively largest number of examined spots: *Galium uliginosum* (76%) and *Cirsium palustre* (69%). Most of species characteristic for *Molinion* complex did not achieve even the stability rate IV. Only *Selinum carvifolia* was found in almost 50% of the records. Other species characteristic for that complex, as well as for *Molinietum caeruleae* community, were recorded in a small number of examined spots. *Succisa pratensis* was found in 15 (stability rate II), while others, such as *Ophioglossum vulgatum* and *Gentiana pneumonanthe* in 4, whereas *Iris sibirica* in only 2 records. A spot (record No. 19, about 100 m south of lake Lubowierz) in which *Iris sibirica* was characterised by 30% coverage, was interesting. *Molinio-Arrhenatheretea* class was represented by relatively numerous *Holcus lanatus* and *Festuca rubra* that were found in several spots (records No. 5–9, 11, and 29) with 10–20% coverage. Moreover, *Potentilla erecta* (73%) and *Valeriana officinalis* (45%) were found in the largest number of records. In several records, higher percentages of reed species of *Magnocaricion* and *Caricion Davallianae* complexes, such as *Cladium mariscus, Carex buxbaumii, Carex paniculata, Carex appropinquata, Schoenus ferrugineus, Carex davalliana*, or *Carex flava*, were determined. In two phytosociological records (No. 30 and 31), *Pinguicula vulgaris ssp. bicolor* was observed: butterwort co-existed with other carnivorous species (*Drosera rotundifolia*) in the former. Most (37%) of *Molinietum* spots (represented, among others, by record No. 16; Table 1) were distinguished by floristic poverty (8–12 species in a record), high *Molinia caerulea* coverage level, poorly developed or absent mossy layer, and few bush species. Meadows of such structure locally dominated near lake Laskie and in the eastern part of lake Lubowierzek, as well as in western and central parts of Krowie Bagno.

In mossy layer of examined spots, a total of 29 species were recorded. Only two of them: *Caliergonella cuspidata* and *Campylium stellatum*, were characterised by stability rate II. The xerothermal species *Brachytecium rutabulum,* found in 6 records, was worth mentioning because its occurrence is associated with significant habitat drying. Also 4 species from *Sphagnum* genus, that are atypical for *Molinietum*, were recorded.

Analysis of the phytosociological records allowed for classifying the examined spots, in majority, as *Molinietum caeruleae typicum*. Only single spots (documented with 5 records) with large percentage of reed species were counted to other communities: *M. caeruleae caricetosum buxbaumii* (records No. 21–25), *M. c. cladietosum marisci* (record No. 26), *M. c. caricetosum paradoxae* (record No. 28), and *M. c. schoenetosum ferruginei* (record No. 18).

Studied soil profiles collected from under moor-grass meadows made it possible to classify them as weakly (MtI) and moderately mucked (MtII) post-

Table 1.
Floristic composition of *Molinetum caeruleae* (records worked between 8–11 July 2004 and repeted 4–5 September 2004)

No. of record	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Working No. of record	50	48	3	4	47	51	1	7	43	10	11	12	17	16	18	26	28	29	30	31	8	13	5	6	32	34	46	33	40	27	35	37
Cover of shrub layer	+	+	2	1	+	0	+	0	+	+	+	3	4	1	+	+	1	+	2	+	1	1	1	1	1	+	2	1	+	+	+	+
Cover of herb layer	9	9	8	7	9	10	10	10	8	10	7	10	7	9	9	8	10	9	9	8	9	9	9	8	8	9	10	9	8	8	9	9
Cover of moss layer	0	0	+	+	+	0	+	1	+	1	0	+	0	0	0	+	4	5	0	1	1	+	1	1	3	4	+	4	1	+	4	1
Number of species in record	28	36	24	14	29	31	20	23	27	37	19	33	19	19	21	12	19	25	8	22	37	30	27	29	24	28	26	29	38	25	29	20
SHRUB LAYER																																
Salix rosmarinifolia		+	+	+	+				+			2	4	+	+		+	+		+	+	+		+	+	+	+	+	+	+		+
Salix cinerea	+	+			+		+			+	+		+	+	+		+	+		+	1	+	1	1					+		+	+
Betula humilis			1	+	+												+	+		+					1	+	+	1				
Frangula alnus	+		+	+			+		+	+		+				+			+			+						+		+		
Betula pubescens		+	+	+					+			+	+			+		+	+	+	+				+	+	+	+		+	+	
Salix pentandra													+	+	+			+														
HERB LAYER																																
ChAll. *Molinion*, O. *Molinietalia**																																
Molinia caerulea	8	9	7	6	7	3	5	7	6	8	3	5	6	8	8	6	9	8	7	7	5	7	8	6	6	5	5	6	6	5	5	8
Selinum carvifolia	+		+	+	+	+	1			+		+		+	+			+		+		+	2	1	+	+		+				
*Galium uliginosum**			+	+	+		1	1	+	+	+	+	+		+		+	+	+	+	+	+	1	1	+	+		+		+	+	+

Campanula patula *							+	+							+																
Galium mollugo *		+					+														+										
Poa pratensis												+										+									
ChAll. *Calthion**, ChAll. *Filipendulion*																															
*Lathyrus palustris**	+	+	+			+	+		+	+		+	+	+	+								+				+	+	+	+	+		
Lysimachia vulgaris	+	+	+	+	+	+	+			+			+	+	+		+	+	+		+	1	+	+	+	+		+	+	+	+	
Lythrum salicaria	+	+			+		+	+	+	+	+	+									+		+	+		+	+		+			
*Cirsium rivulare**	+	+			+																										
Stachys palustris	+		1	+			+						+	+	+																
Thalictrum flavum		+	1				+			+		+	+	1	+							+									
Valeriana officinalis	+				+		+	+				+			+		+			+	+		+				+			+	+
Filipendula ulmaria		+				+				1	+	2										+					+		+		+	
Veronica longifolia	+		+		+																						+					
Cl. *Phragmitetea**, ChAll. *Magnocaricion*																															
Carex buxbaumii																	1	+			1	1	2	1	2	1		1	+		+	+

*Phragmites australis**				+	+					+												+	+	+	+	+	1			+	+	
Iris pseudacorus			+	+				+		+	+	+									+	+	+	+		+						
Lysimachia vulgaris																																
Peucedanum palustre																	+		+							+	+					
Carex appropinquata																								+				3	1			
Carex rostrata																					+					+		+				
ChCl. *Scheuchzerio-Caricetea nigrae*																																
Carex flava	+	+			+				+	+	+	+	+		+	+		+		+	+	+	+		+	+	+	+	+	+	+	+
Comarum palustre														+	+		+	+	+	+		+		+	+	+	+	+				
Carex davalliana					+											+	+	+		+		+			+					+	+	+
Schoenus ferrugineus																+		2										+			+	1
Parnassia palustris																		+		+					+	+			+	+	+	
Agrostis canina													+		+																+	
Carex nigra										+														+					+			
Menyanthes trifoliata																								+	+	+		+		+		
Others																																
Potentilla erecta	+		+	+	1	+	3	+	+	+		+	+		1	+	+	+	+	+	+	+	+	+	+		+	+	1	+	+	+
Geum rivale	1	+				+			1	1	2	1	+																1			

Ranunculus acris	+	+			+	1	+	+	+	+	+	+									+			+			+		+			
Mentha arvensis	+	+			+	+	+		+	+		+		+							+	+	+	+					+	+	+	+
Cirsium arvense		+	1	+		+			+					+																		
Cardaminopsis arenosa		+	+			+		+	+		1			+	+																	
Luzula multiflora	+	+			+	+	+	+	+	+		+			+					+	+	+		+	+			+		+			+
Anthoxanthum odoratum						+			+	+	2	+																	+			
Linum catharcticum					+	+										1		+				+	+		+			+	+	+	+	+
Viola canina							+		+															+								
Briza media										+		+																	+	1	2	
Potentilla anserina	+	+								+	+			+																		
Carduus crispus		+											+		+																	
Galium verum							+					+																+		+		+	
Trifolium hybridum							+														+		+						+			
Drosera rotundifolia																+	+	+							+			+		+		
Carex panicea																+									+			+		+	+	
Polygala amarella		+																											+	+	+	
Dactylorhiza incarnata		+																		+		+				+						

MOSS LAYER																																
Brachythecium rutabulum			+		+			1												+				+					1			
Caliergonella cuspidata					+					1										+	+	+	+	+		1	+	1			+	
Campylium stellatum					+		+									+	1	2		+		+	+		1	1	+	+	+	+		
Bryum pallens			+																						+			1				
Sphagnum rubellum																	2	1		+					1			+				
Sphagnum palustre																		1							1			1				
Sphagnum subnitens																		1		1												+
Sphagnum angustifolium																										1		+				+
Fissidens adianthoides																	+			+						+					3	+
Fissidens osmundoides																+	+								+							+

Sporadic species in herb layer: *Carex paniculata* 1/1, 27/3, *Odontites rubra* 1/+, 8/+, *Eupatorium cannabinum* 1/+, *Galeopsis tetrahit* 1/+, *Stellaria graminea* 1/+, 23/+, *Arrhentherum elatius* 2/+, *Lotus uliginosus* 2/+, *Turritis glabra* 2/+, *Serratula tinctoria* 2/+, *Thalictrum lucidum* 2/+, *Carex flacca* 2/+, 6/+, *Melandrium album* 3/+, *Lathyrus pratensis* 5/+, *Calamagrostis canescens* 5/1, 12/+, *Plantago lanceolata* 6/3, *Leontodon autumnalis* 6/+, *Trifolium repens* 6/+, *Dactylis glomerata* 6/+, 7/1, *Lotus corniculatus* 6/+, *Scirpus silvaticus* 6/+, *Taraxacum* sp. 6/2, 7/+, *Cerastium vulgatum* 6/+, 8/+, *Plantago major* 6/+, 21/+, *Plantago media* 6/+, *Linaria vulgaris* 7/1, 8/+, *Carex leporina* 7/+, 21/+, *Veronica chamaedrys* 7/+, *Agrimonia eupatoria* 7/+, *Lycopus europaeus* 9/+, 26/+, *Antoxanthum odoratum* 10/+, 29/+, *Carex elata* 23/+, *Ranusculus repens* 24/+, 7/+, *Epilobium palustre* 8/1, 11/+, *Hieracium lachenalii* 8/+, *Festuca pratensis* 9/+, *Rhinanthus minor* 9/+, *Thelypteris palustris* 10/+, *Carex acutiformis* 11/+, *Cerastium arvense* 11/+, *Urtica dioica* 11/+, 14/+, *Salix aurita* 12/+, *Polygala vulgaris* 12/+, *Populus tremula* 14/+, Po*opulus nigra* 14/+, *Eriophorum angustifolium* 18/+, 29/+, *Iris sibirica* 19/3, 27/1, *Trifolim repens* 21/+, 29/+, *Inula germanica* 21/+, *Phalaris arundinacea* 21/+, *Caltha palustris* 22/+, *Carex disticha* 22/+, *Galium palustre* 22/+, *Cladium mariscus* 26/3, *Pinguicula vulgaris ssp. bicolor* 30/+, 31/+, *Carex lepidocarpa* 31/+, **Sporadic species in moss layer:** *Homalothecium sericeum* 3/+, 29/+, *Brahythecium salebrosum* 4/+, *Leptodictium riparium* 7/+, *Ceratodon purpureus* 9/+, *Bryum caespiticium* 9/+, *Bryum capillare* 12/+, *Leptobryum pyriforme* 12/+, 21/+, *Drepanocladus aduncus* 21/+, *Lophocolea heterophylla* 21/+, *Plagiomnium elatum* 22/+, *Atrichum undulatum* 23/+, *Plagiomnium cuspidatum* 23/+, *Polytrichum formosum* 24/+, *Marchantia polymorpha* 24/+, *Homalothecium nitens* 26/+, *Bryum pseudotriquetrum* 26/+, *Drepanocladus revolvens* 26/+, *Plagiomnium affine* 28/+, 29/+, *Campylium polygamum* 31/+.

Table 2. Chemical properties of the examined soils

No. of record, No. of profile	Depth cm	Horizon	pH		Content						
			H_2O	KCl	%	$g \cdot kg^{-1}$					
					Ash	P	K	Na	Ca	Fe	Mg
1	0–10	Mtni	5.83	5.39	10.20	0.86	0.23	0.97	21.24	3.67	0.39
1	10–20	OtnituR$_2$	6.37	5.83	8.20	4.43	0.08	0.82	22.63	3.32	0.14
	20–30	OtnitumeR$_1$	5.56	6.04	8.60	3.66	0.07	0.85	23.07	3.07	0.17
2	0–10	Mtni	6.00	5.47	13.86	2.72	0.21	0.46	21.36	2.29	0.79
2	10–20	Mtni	6.37	5.84	13.20	2.95	0.13	0.43	23.04	2.15	0.47
	20–30	OtnituR$_2$	6.73	6.22	9.90	3.01	0.06	0.43	27.23	1.68	0.36
3	0–10	Mtni	7.08	6.62	15.20	2.58	0.38	1.05	20.95	3.46	0.45
5	10–20	OtnituR$_2$	6.90	6.47	14.10	1.98	0.29	1.01	23.91	2.47	0.36
	20–30	OtnitumeR$_1$	6.46	6.11	9.60	2.58	0.16	1.21	24.30	1.08	0.25
4	0–10	Mtni	5.94	4.78	9.90	3.44	0.38	0.83	18.99	4.30	0.36
6	10–20	Mtni	5.89	5.33	9.20	3.07	0.21	0.93	21.51	4.43	0.27
	20–30	Otnitu R$_3$	6.45	6.04	9.20	3.23	0.16	0.91	24.43	3.26	0.18
5	0–10	Mtni	5.55	4.67	9.10	3.18	0.19	0.83	17.01	1.47	0.21
7	10–20	Otni	6.35	5.86	8.10	3.07	0.15	0.82	17.90	1.36	0.19
	20–30	OtniszR$_3$	6.35	5.77	14.20	2.41	0.29	0.87	21.74	2.81	0.14
6	0–10	Mtni	6.73	6.36	11.20	2.84	0.13	1.06	40.73	2.63	0.21
11	10–20	Mtni	6.56	5.19	13.80	4.43	0.23	1.19	36.61	3.51	0.31
	20–30	OtniszR$_3$	6.57	6.24	8.10	5.16	0.80	1.12	39.37	2.13	0.18
7	0–10	Otnisz R$_3$	7.02	6.56	16.90	3.91	0.47	1.10	24.57	4.13	0.59
12	10–20	Otnime R$_2$	6.96	6.42	13.10	4.00	0.20	0.70	18.23	2.18	0.37
	20–30	OtnitumeR$_1$	6.99	6.40	7.10	2.67	0.10	0.81	22.49	1.53	0.27
8	0–10	Mtni	5.44	4.78	19.20	3.44	0.35	0.68	15.54	5.87	0.71
14	10–20	Mtni	6.59	6.11	12.10	3.23	0.13	0.72	24.01	4.10	0.28
	20–30	Otnitu R$_3$	6.71	6.02	8.10	3.83	0.09	1.03	28.67	4.08	0.17
9	0–10	Mtni	6.01	5.28	19.50	2.88	0.44	0.79	13.63	5.71	1.04
15	10–20	Mtni	6.66	6.14	9.20	3.23	0.16	0.98	24.34	3.20	0.26
	20–30	Otnitu R$_2$	6.97	6.39	8.10	3.18	0.10	1.06	31.49	3.75	0.29
10	0–10	Mtni	5.72	5.09	15.10	2.67	0.42	0.81	14.90	4.08	0.66
18	10–20	Mtni	6.41	5.88	15.20	2.88	0.35	1.14	17.50	3.55	0.51
	20–30	OtnitumeR$_1$	6.29	5.91	10.10	2.24	0.16	1.05	17.17	1.38	0.34
11	0–10	Mtni	5.13	4.56	12.87	2.95	0.39	0.31	6.16	2.61	0.72
19	10–20	Mtni	6.02	5.84	16.86	2.91	0.27	0.34	11.18	2.39	0.59
	20–30	OtnituR$_2$	6.18	5.82	7.92	2.85	0.07	0.27	12.69	1.42	1.12
12	0–10	Mtni	5.25	4.96	8.10	2.58	0.15	0.62	16.10	1.75	0.30
21	10–20	Mtni	6.03	5.61	18.00	3.10	0.38	1.07	20.19	3.15	0.56
	20–30	Mtni	6.30	5.66	11.20	2.24	0.21	0.95	23.45	2.42	0.43
13	0–10	Mtni	6.81	6.32	14.20	4.43	0.37	1.02	25.83	3.04	0.51
22	10–20	Otnitu R$_3$	6.77	6.18	13.80	4.17	0.26	0.92	25.82	3.26	0.38

	20–30	Otnitume R_2	6.85	6.41	9.20	3.83	0.17	1.16	28.36	1.91	0.24
14	0–10	Mtni	5.06	4.11	7.20	1.98	0.16	0.47	7.35	1.25	0.25
23	10–20	Mtni	5.99	5.44	12.50	2.06	0.16	0.44	10.17	1.77	0.27
	20–30	Otnitu R_2	5.61	5.38	17.10	2.24	0.19	0.57	13.92	2.03	0.36
15	0–8	Mtni	6.53	6.15	8.80	3.07	0.18	1.03	30.24	1.87	0.27
27	8–20	Mtni	6.78	6.27	11.20	3.23	0.21	1.01	30.54	2.08	0.26
	20–30	OtnituR_2	6.96	6.39	8.10	2.25	0.11	1.02	30.41	1.32	0.21
16	0–10	Mtni	6.64	6.09	18.20	2.41	0.19	0.66	8.39	4.18	0.61
30	10–20	Mtni	6.54	6.16	14.10	3.44	0.20	0.78	16.22	1.72	0.39
	20–30	OtnitumeR_1	6.32	5.90	7.80	2.67	0.12	0.92	20.04	1.22	0.31
17	0–10	Mtni	6.73	6.38	21.10	2.62	0.44	0.76	17.18	4.56	0.75
31	10–20	OtnitumeR_1	6.87	6.29	12.00	3.83	0.17	0.58	19.57	1.30	0.33
	20–30	OtnitumeR_1	6.69	6.18	7.20	3.35	0.01	0.74	16.74	1.08	0.31

bog peat-muck soils, or much rarely as boggy peat soils. These soils developed from short sedge, reed, and mossy peats. Numerical data listed in Table 2 indicate that analysed soil formations could be counted among specific boggy soils, in which ash content does not exceed 25%. The acidity of studied soils varied – most often weakly acidic, rarely acidic or neutral.

Furthermore, it was found that phosphorus content in examined soil profiles was within the range from 0.86 to 5.16 g kg^{-1}. The largest amounts of P were contained in samples from profiles No. 6, 13, and 15, while the smallest – No. 3, 10, and 14. Studied soils were characterised by low potassium (from 0.01 to 0.47 g kg^{-1}), sodium (from 0.31 to 1.21 g kg^{-1}), and magnesium levels (from 0.14 to 1.12 g kg^{-1}). Data in Table 2 indicate that soils from profiles No. 3, 4, 10, 11, 13 contained the most potassium, No. 3, 6, 13, 15 – sodium, and No. 2, 7, 9, 10, 11, 12, and 17 – magnesium quantities. Calcium content ranged from 7.35 to 40.73 g kg^{-1}. The highest amounts of Ca were found in soil samples from profiles No. 3, 2, 6, 9, 13, and 15, while the lowest – from No. 5, 10, 11, 14, 16, and 17. Iron concentrations ranged from 1.08 to 5.87 g kg^{-1}. The highest Fe quantities were recorded in soil from profiles No. 4, 8, and 9.

Free water was observed in all soil sampling points at maximum 0.6 m below the ground level. In central part and near lake Laskie, water level in summer was not more than 1.5 m below ground level.

DISCUSSION

When compared to *Molinietum caeruleae* spots presented in the works of Jargiełło [1973, 1976], the current community classified to that complex is characterized by larger floristic diversity. Jargiełło in his studies counted 89 herbal species, while 118 were recorded nowadays. Paradoxically, current area of moor-grass meadows in Krowie Bagno is many times smaller than in 60's (2150 ha vs. 260 ha, respectively). At the same time, many currently analysed spots (37%), namely where all management activity was given up, were characterised by floristic poverty (8–15 species in a record). Such poor floristic areas with *Molinietum caeruleae* were found on about 75% of moor-grass-dominating meadows: north of the lake Lubowierz, south-east of the lake Lubowierzek, south-west of the lake Laskie, north and north-east of the lake Krychowskie, and locally in the central part of Krowie Bagno. Floristically abundant *Molinietum* spots were currently recorded on a very reduced area, hence high diversity refers to not more than 25% of the present area of moor-grass meadows in the examined object. Some species characteristic for *Molinion* complex or *Molinietalia* order, such as *Dianthus superbus* or *Trollius europaeus,* were absent at present. Instead, other protected (14 species) and rare plants (3 species) were quite numerous, which confirms still considerable floristic assets of examined meadows, although on reduced area as compared to 60's of the 20th century. Relatively large number

of current records contained *Betula humilis* (16 records), *Lathyrus palustris* (27), *Carex buxbaumii* (13), and *Carex davalliana* (12). Other herbal species, such as *Drosera rotundifolia, Schoenus ferrugineus*, *Menianthes trifoliata, Gentiana pneumonanthe*, *Ophioglossum vulgatum*, or *Dactylorhiza incarnata* were rarer – in 4–6 records. *Pinquicula vulgaris ssp. bicolor*, *Iris sibirica*, and *Cladium mariscus* were found in single records. At several spots (3–5), the presence of recently protected species of *Sphagnum* genus was noted that had not been found earlier in *Molinietum* in the Lublin region neither by Grynia [1968] nor by Fijałkowski and Chojnacka-Fijałkowska [1990].

Forty years ago, besides *Molinietum caeruleae typicum*, Jargiełło [1973, 1976] also distinguished another sub-complex – *Molinietum caeruleae caricetosum paniceae*. Nowadays, a negligible percentage of millet sedge in examined spots did not allow for isolating the sub-complex for which *Carex panicea* would be dominating. *Molinietum caeruleae* spots documented with records No. 18, 21–26, and 28 could be classified as sub-complexes singled out on the basis of a considerable share of reed species from *Magnocaricion* or *Caricion davallianae* complexes, i.e. *Molinietum caeruleae schoenetosum ferruginei*, *Molinietum caeruleae caricetosum buxbaumii, Molinietum caeruleae cladietosum marisci,* and *Molinietum caeruleae caricetosum paradoxae.*

At present, as compared to the study performed by Jargiełło [1973, 1976], no species typical for xerothermal communities such as *Teucrium chamedrys* or *Brachypodium pinnatum* were found on any examined area. Species like *Urtica dioica*, *Arabidopsis arenosa*, *Cirsium arvense* or *Carduus crispus* proved the mucking processes and the appearance of synantropic plants.

Paradoxically, spots of *Molinietum caeruleae* with a share of calciphilic species such as *Schoenus ferrugineus* or *Carex buxbaumii* were associated with habitats with the lowest pH value. They occurred both on acidic and weakly acidic soils. Calciphilic species in acidic habitats of moor-grass meadows in Krowie Bagno were also found by Jargiełło [1973], Fijałkowski [1959], as well as Fijałkowski and Chojnacka-Fijałkowska [1990] in other regions. On peat-mucky soils at the highest pH, spots of *Molinietum caeruleae* with presence of *Pinguicula vulgaris* and spots with larger percentage of *Molinio--Arrhenatheretea* class species occurred. Currently performed study revealed that peat-mucky soils under *Molinietum caeruleae* located around the lakes Lubowierz and Lubowierzek were characterised by lower pH value and, in general, by lower calcium, phosphorus, sodium, and potassium contents as compared to other fragments of Krowie Bagno where the share of calciphilic species was negligible.

Most of the studied spots of *Molinietum* have not been agriculturally performed for many seasons, which was indicated by large percentage of bushy species. Extensive utilisation of moor-grass meadows is a condition of their further existence [Zarzycki 1958], thus it is necessary to recover such management type,

at least on floristically the most interesting fragments of moor-grass meadows of Krowie Bagno.

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STAN ŁĄK TRZĘŚLICOWYCH *Molinietum caeruleae* KROWIEGO BAGNA PORÓWNANIE WYNIKÓW BADAŃ MONITORINGOWYCH PO 40 LATACH

Streszczenie. Przeprowadzono badania fitosocjologiczne i glebowe łąk trzęślicowych *Molinietum caeruleae* w obrębie największego kompleksu zmeliorowanych torfowisk Polesia Lubelskiego. Poddano analizie 51 zdjęć fitosocjologicznych oraz 17 profili glebowych. Stwierdzono duże zróżnicowanie florystyczne badanych płatów oraz liczny udział gatunków rzadkich i chronionych, ale na niewielkiej (ok. 25%) powierzchni. Większość płatów zaklasyfikowano do podzespołu *Molinietum caeruleae typicum*. Nieliczne do *M. c. buxbaumii*, *M. c. cladietosum marisci*, *M. c. caricetosum paradoxae* oraz *M. c. schoenetosum ferruginei.* Większość płatów *M. c. typicum* charakteryzuje duży udział gatunków zaroślowych, co wskazuje na zaprzestanie użytkowania rolniczego tych łąk. Analizy glebowe pozwoliły zaklasyfikować je do pobagiennych gleb torfowo-murszowych słabo (MtI) i średnio zmurszałych (MtII) oraz znacznie rzadziej do bagiennych gleb

torfowych. Gleby te wytworzyły się z torfów niskich turzycowych, szuwarowych i mechowiskowych. Charakteryzowały się odczynem kwaśnym lub słabo kwaśnym, rzadziej obojętnym.

Słowa kluczowe: zbiorowiska roślinne, pokrywa gleby, zmiany długotrwałe, torfowisko Krowie Bagno