

FLORISTIC DIVERSITY OF THE “ŁĄKI W KOMBORNI” NATURA 2000  
SITE PLH180042 (WESTERN CARPATHIANS)

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**ABSTRACT.** The vascular flora in the “Łąki w Komborni” Natura 2000 site comprises 219 species representing 44 families and 147 genera. Species from the families Asteraceae, Poaceae, Lamiaceae, Fabaceae, Rosaceae, Polygonaceae, Cyperaceae, Apiaceae, and Ranunculaceae were found to dominate. A geographical and historical analysis of species confirmed the clear dominance of apophytes (84%) over anthropophytes (16%) as well as perennials (69%) over short-lived (23%) species. The biological spectrum was dominated by hemicyptophytes (54%) and therophytes (19%), compared with other life forms. In terms of synecology, the flora was mainly represented by species from the classes *Molinio-Arrhenatheretea*, *Stellarietea mediae*, *Artemisietea vulgaris* and *Phragmitetea*. The “Łąki w Komborni” site is a habitat for 82 (37%) medicinal species and 155 (70%) forage species for bees. Noteworthy is the occurrence of protected species, e.g. *Gladiolus imbricatus*, *Trollius europaeus*, *Centaurium erythraea*, *Dactylorhiza majalis*, *Platanthera bifolia* and *Primula elatior*.

**KEY WORDS:** Natura 2000 site, meadows, floristic diversity, vascular plants, south-eastern part of Poland

## INTRODUCTION

Meadows are semi-natural communities associated with human activity; they play an important role in the conservation of biodiversity and in the agricultural landscape (WOLAŃSKI & TRĄBA 2007, KAĆKI 2012, TRĄBA & WOLAŃSKI 2012, ZARZYCKI & KORZENIAK 2013, KOTAŃSKA et al. 2015).

Meadow communities have a complex structure and a variable dynamics of growth and development. The high nature value of meadow ecosystems is related to their phytocoenotic diversity and species richness, in particular the presence of many rare and protected species (BABCZYŃSKA-SENDEK 2009, NOWAK et al. 2015, WÓJCIK & JANICKA 2016, ZIAJA & WÓJCIK 2016a, b). The floristic diversity of meadows depends on natural habitat factors and human activity (regulation of water relations, fertilisation, treatments, mowing and sward grazing) (ELLENBERG 1988, KOTAŃSKA 1993, KRYSZAK & KRYSZAK 2007, SPYCHALSKI et al. 2011). Among semi-natural habitats, meadows are indicated as valuable biotopes for pollinator restoration (WRZESIEŃ & DENISOW 2006a, DENISOW & WRZESIEŃ 2007).

In the recent decades, meadows have undergone rapid transformations both in Poland and in Europe. Disappearance of meadow communities and loss of biodiversity have been reported (BATOR 2005, POSCHLOD et al. 2005, ZAŁUSKI 2007, LINDBORG et al. 2008, TRĄBA & WOLAŃSKI 2012, EUROPEAN RED LIST... 2016); they were mainly caused by anthropogenic factors, e.g. abandonment or intensification of land use and changes in the water relations (KOTAŃSKA 1993, ZAŁUSKI 2011, KAĆKI 2012). These processes result in changes in the meadow species composition, initiation of secondary succession, an increase in the share of expansive species and reduction of species diversity (MICHALSKA-HEJDUK & KOPEĆ 2012, KULIK 2014).

The semi-natural ecosystems of *Molinia* meadows are most important for preservation of biodiversity and most endangered in Europe (KAĆKI & MICHALSKA-HEJDUK 2010, NOWAK et al. 2015). These meadows are regarded as one of the species-richest ecosystems; they are characterised by the highest nature values and offer a habitat for many rare plant species (KAĆKI & MICHALSKA-HEJDUK 2010, ZIAJA & WÓJCIK 2016a, b). Given the high natural values and the high degree of threat in Europe, wet meadows have been included in the list of habitats protected under the

Natura 2000 network as habitat type 6410 (Council Directive 92/43/EEC on the conservation of natural habitats and wild fauna and flora).

The aim of the study was to know flora richness and diversity in the protected area.

## MATERIAL AND METHODS

The field study was conducted in the “Łąki w Komborni” Natura 2000 site PLH180042 (49°41'N, 21°51'E) in 2015-2016 (Fig. 1). The study area is situated in Iskrzynia, Krościenko Wyzne Commune, Krosno County, Podkarpackie Province. According to the physical-geographical division of Poland (KONDRACKI 2012), the study area is part of the Jasielsko-Krośnieńska Basin mesoregion, Śródkowobeskidzkie Foothills macroregion in the Outer Western Carpathians. The aim of protection of the Natura 2000 site is to preserve intermittently wet meadows from the alliance *Molinion caeruleae* and three species of butterflies from the Annex II of the Habitats Directive: *Lycaena dispar*, *Maculinea teleius*, *M. nausithous*. The entire complex covers an area of 13.14 ha. Habitat 6410 occupies over 50% of the area (7.17 ha) and the conservation status of meadows has been evaluated as unsatisfactory (U1) (PZO Łąki w Komborni PLH 180042). The vascular plant nomenclature followed that proposed by MIREK et al. (2002), the names of the families were adopted from RUTKOWSKI (2004), and the phytosociological classification was based on that developed by MATUSZKIEWICZ (2005). The geographical-historical status was specified in accordance with ZAJĄC (1979) and TOKARSKA-GUZIŁ (2005). The classification of life forms (according to Raunkiaer) was provided as in ZARZYCKI

et al. (2002). Classification into medicinal and forage plant groups followed LIPIŃSKI (1958), RUTKOWSKI (2004) and WRZESIEŃ & DENISOW (2006b).

## RESULTS AND DISCUSSION

The vascular plant flora in the study area comprised 219 species representing 44 families and 147 genera (Table 1). The most numerous were representatives of the families Asteraceae (30 species), Poaceae (26), Lamiaceae (14), Fabaceae (12), Rosaceae (12), and Polygonaceae (10), which accounted for 47% species in total (Table 2). A large number of families were represented by two or three species and 13 families by a single species. *Carex* (8 species), *Galium* (6), *Salix* (6), *Cirsium* (5), *Juncus* (5), *Rumex* (5), and *Veronica* (5) were the species-richest genera. The large species diversity of the analysed flora reflects the diversity of habitats in terms of trophy, humidity, intensity and type of anthropopressure.

The analysed meadows are characterised by high floristic richness in the relatively small area. Substantially fewer species were found in meadows with a similar area situated in the Foothills, i.e. 111 species in Wojkówka, the Dynowskie Foothills (ZIAJA & WÓJCIK 2014) and 118 species in Odrzechowa, the Bukowskie Foothills (BRĄGIEL & TRĄBA 2013). The meadow and pasture flora of the entire Dynowskie Foothills comprises 363 species (WOLAŃSKI & TRĄBA 2007).

The analysis of the life forms following the classification proposed by Raunkiaer has shown distinct dominance of hemicryptophytes (54%) and therophytes (19%) over other forms. Geophytes and hydrophytes accounted for 12% and 5%, respectively.

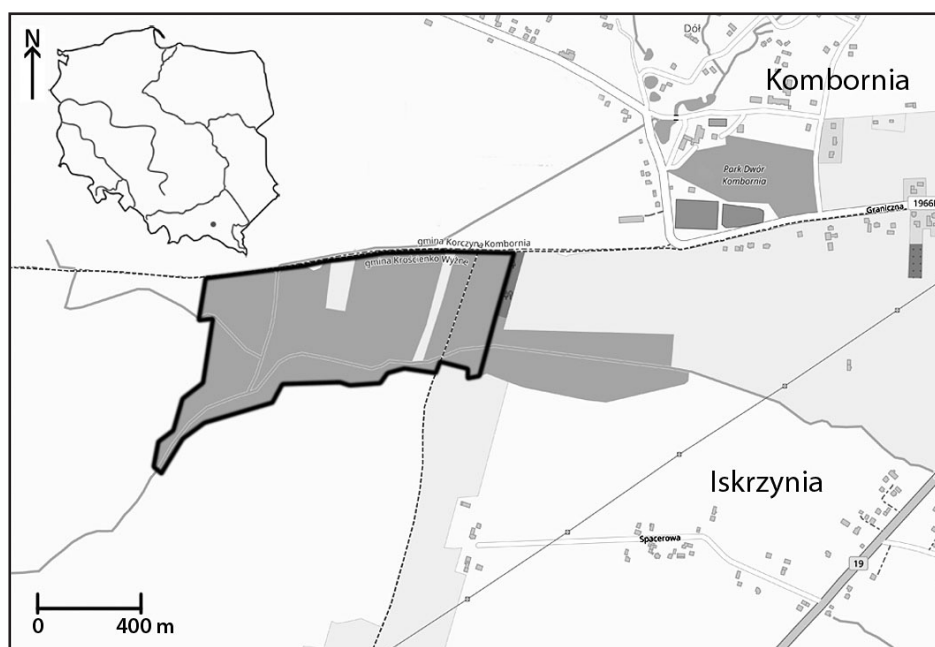


Fig. 1. Study area

Table 1. Alphabetical list and ecological characterization of vascular plant species (Natura 2000 site Łąki w Komborni)

No	Species	Family	LS	GHs	LF	Phu	UF	
1	<i>Achillea millefolium</i> L. s. str.	Asteraceae	p	Ap	H	M-A	M	N, P
2	<i>Aegopodium podagraria</i> L.	Apiaceae	p	Ap	H	Q-F	M	N, P
3	<i>Agrostis capillaris</i> L.	Poaceae	p	Ap	H	N-C	-	-
4	<i>Ajuga reptans</i> L.	Lamiaceae	p	Ap	H	Q-F	M	N, P
5	<i>Alchemilla monticola</i> Opiz	Rosaceae	p	Ap	H	M-A	M	-
6	<i>Alisma plantago-aquatica</i> L.	Alismataceae	p	Ap	Hy	Ph	-	-
7	<i>Alliaria petiolata</i> (M. Bieb.) Cavara & Grande	Brassicaceae	b	Ap	H	AR	M	-
8	<i>Alnus glutinosa</i> (L.) Gaertn.	Betulaceae	t	Ap	M	AG	M	P
9	<i>Alopecurus pratensis</i> L.	Poaceae	p	Ap	H	M-A	-	-
10	<i>Anagallis arvensis</i> L.	Primulaceae	a	Arch	T	SM	M	-
11	<i>Angelica sylvestris</i> L.	Apiaceae	p	Ap	H	M-A	M	N, P
12	<i>Anthoxanthum odoratum</i> L. s. str.	Poaceae	p	Ap	H	M-A	-	-
13	<i>Apera spica-venti</i> (L.) P. Beauv.	Poaceae	a	Arch	T	SM	-	-
14	<i>Armoracia rusticana</i> P. Gaertn., B. Mey. & Scherb.	Brassicaceae	p	Arch	G	AR	M	-
15	<i>Arrhenatherum elatius</i> (L.) P. Beauv ex J. Presl & C. Presl	Poaceae	p	Ap	H	M-A	-	-
16	<i>Artemisia vulgaris</i> L.	Asteraceae	p	Ap	H	AR	M	-
17	<i>Atriplex patula</i> L.	Chenopodiaceae	a	Ap	T	SM	-	-
18	<i>Batrachium circinatum</i> (Sibith.) Fr.	Ranunculaceae	p	Ap	Hy	Po	-	-
19	<i>Berula erecta</i> (Huds.) Coville	Apiaceae	p	Ap	Hy	Ph	-	-
20	<i>Betonica officinalis</i> L.	Lamiaceae	p	Ap	H	M-A	M	N, P
21	<i>Briza media</i> L.	Poaceae	p	Ap	H	M-A	-	-
22	<i>Bromus secalinus</i> L.	Poaceae	a	Arch	T	SM	-	-
23	<i>Bryonia alba</i> L.	Cucurbitaceae	p	Kn	H	-	M	-
24	<i>Calamagrostis epigejos</i> (L.) Roth	Poaceae	p	Ap	G	EA	-	-
25	<i>Caltha palustris</i> L.	Ranunculaceae	p	Ap	H	M-A	-	P
26	<i>Calystegia sepium</i> (L.) R. Br.	Convolvulaceae	p	Ap	G	AR	-	N, P
27	<i>Campanula patula</i> L. s. str.	Campanulaceae	b	Ap	H	M-A	-	N, P
28	<i>Campanula trachelium</i> L.	Campanulaceae	p	Ap	H	Q-F	-	N, P
29	<i>Capsella bursa-pastoris</i> (L.) Medik.	Brassicaceae	a	Arch	T	SM	M	-
30	<i>Carduus acanthoides</i> L.	Asteraceae	b	Arch	H	AR	-	N, P
31	<i>Carex flava</i> L.	Cyperaceae	p	Ap	H	M-A	-	-
32	<i>Carex gracilis</i> Curtis	Cyperaceae	p	Ap	G	Ph	-	-
33	<i>Carex hirta</i> L.	Cyperaceae	p	Ap	G	M-A	-	-
34	<i>Carex nigra</i> Reichard	Cyperaceae	p	Ap	G	Ph	-	-
35	<i>Carex ovalis</i> Gooden.	Cyperaceae	p	Ap	H	-	-	-
36	<i>Carex spicata</i> Huds.	Cyperaceae	p	Ap	H	-	-	-
37	<i>Carex tomentosa</i> L.	Cyperaceae	p	Ap	G	M-A	-	-
38	<i>Carex vulpina</i> L.	Cyperaceae	p	Ap	H	Ph	-	-
39	<i>Centaurea cyanus</i> L.	Asteraceae	a	Arch	T	SM	M	N, P
40	<i>Centaurea jacea</i> L.	Asteraceae	p	Ap	H	M-A	M	N, P
41	<i>Centaurium erythraea</i> Rafn (PS)	Gentianaceae	b	Ap	T	EA	M	=
42	<i>Cerastium holosteoides</i> Fr. emend. Hyl.	Caryophyllaceae	a	Ap	C	M-A	-	N, P
43	<i>Chaerophyllum aromaticum</i> L.	Apiaceae	p	Ap	H	AR	-	N, P
44	<i>Chamomilla suaveolens</i> (Pursh) Rydb.	Asteraceae	a	Kn	T	M-A	M	N, P
45	<i>Chenopodium album</i> L.	Chenopodiaceae	a	Ap	T	SM	M	P
46	<i>Chenopodium polyspermum</i> L.	Chenopodiaceae	a	Ap	T	SM	-	P
47	<i>Cirsium arvense</i> (L.) Scop.	Asteraceae	p	Ap	G	AR	-	N, P
48	<i>Cirsium canum</i> (L.) All.	Asteraceae	p	Ap	H	M-A	-	N, P
49	<i>Cirsium oleraceum</i> (L.) Scop.	Asteraceae	p	Ap	H	M-A	M	N, P
50	<i>Cirsium palustre</i> (L.) Scop.	Asteraceae	b	Ap	H	M-A	-	N, P
51	<i>Cirsium rivulare</i> (Jacq.) All.	Asteraceae	p	Ap	H	M-A	-	N, P
52	<i>Convolvulus arvensis</i> L.	Convolvulaceae	p	Ap	G	AI	-	N, P
53	<i>Conyza canadensis</i> (L.) Cronquist	Asteraceae	a	Kn	T	SM	M	P
54	<i>Crataegus monogyna</i> Jacq.	Rosaceae	s	Ap	N	R-P	M	N, P
55	<i>Crepis biennis</i> L.	Asteraceae	b	Ap	H	M-A	M	N, P
56	<i>Cruciata glabra</i> (L.) Ehrend.	Rubiaceae	p	Ap	H	Q-F	-	-

No	Species	Family	LS	GHs	LF	Phu	UF
57	<i>Cucubalus baccifer</i> L.	Caryophyllaceae	p	Ap	H	AR	- N, P
58	<i>Dactylis glomerata</i> L.	Poaceae	p	Ap	H	M-A	-
59	<i>Dactylorhiza majalis</i> (Rchb.) P.F. Hunt & Summerh. (PS)	Orchidaceae	p	Ap	G	M-A	- N, P
60	<i>Daucus carota</i> L.	Apiaceae	b	Ap	H	M-A	M N, P
61	<i>Deschampsia caespitosa</i> (L.) P. Beauv.	Poaceae	p	Ap	H	M-A	-
62	<i>Echinochloa crus-galli</i> (L.) P. Beauv.	Poaceae	a	Arch	T	SM	-
63	<i>Echinocystis lobata</i> (F. Michx.) Torr. & A. Gray	Cucurbitaceae	a	Kn	T	SP	-
64	<i>Elymus caninus</i> (L.) L.	Poaceae	p	Ap	H	AR	M
65	<i>Elymus repens</i> (L.) Gould	Poaceae	p	Ap	G	AI	M
66	<i>Epilobium hirsutum</i> L.	Onagraceae	p	Ap	H	Ph	- N, P
67	<i>Epilobium palustre</i> L.	Onagraceae	p	Ap	H	Ph	- N, P
68	<i>Equisetum arvense</i> L.	Equisetaceae	p	Ap	G	AI	M
69	<i>Equisetum fluviatile</i> L.	Equisetaceae	p	Ap	Hy	Ph	-
70	<i>Equisetum palustre</i> L.	Equisetaceae	p	Ap	G	M-A	-
71	<i>Erigeron annuus</i> (L.) Pers.	Asteraceae	b	Kn	H	-	- N, P
72	<i>Euonymus europaea</i> L.	Celastraceae	s	Ap	N	Q-F	M N, P
73	<i>Eupatorium cannabinum</i> L.	Asteraceae	p	Ap	H	AR	M N, P
74	<i>Fallopia convolvulus</i> (L.) Á. Löve	Polygonaceae	a	Arch	T	SM	- N, P
75	<i>Festuca pratensis</i> Huds.	Poaceae	p	Ap	H	M-A	-
76	<i>Festuca rubra</i> L. s. str.	Poaceae	p	Ap	H	M-A	-
77	<i>Filipendula ulmaria</i> (L.) Maxim.	Rosaceae	p	Ap	H	M-A	M P
78	<i>Galeopsis bifida</i> Boenn.	Lamiaceae	a	Ap	T	SM	M N, P
79	<i>Galeopsis speciosa</i> Mill.	Lamiaceae	a	Ap	T	SM	M N, P
80	<i>Galeopsis tetrahit</i> L.	Lamiaceae	a	Ap	T	SM	M N, P
81	<i>Galium aparine</i> L.	Rubiaceae	a	Ap	T	AR	- N, P
82	<i>Galium boreale</i> L.	Rubiaceae	p	Ap	H	M-A	- N, P
83	<i>Galium mollugo</i> L. s. str.	Rubiaceae	p	Ap	H	M-A	- N, P
84	<i>Galium palustre</i> L.	Rubiaceae	p	Ap	H	Ph	- N, P
85	<i>Galium spurium</i> L. subsp. <i>spurium</i>	Rubiaceae	a	Arch	T	-	- N, P
86	<i>Galium verum</i> L. s. str.	Rubiaceae	p	Ap	H	T-G	M N, P
87	<i>Geranium dissectum</i> L.	Geraniaceae	a	Arch	T	SM	- N, P
88	<i>Geranium palustre</i> L.	Geraniaceae	p	Ap	H	M-A	- N, P
89	<i>Geranium pratense</i> L.	Geraniaceae	p	Ap	H	M-A	- N, P
90	<i>Geum rivale</i> L.	Rosaceae	p	Ap	H	M-A	M N, P
91	<i>Geum urbanum</i> L.	Rosaceae	p	Ap	H	AR	M
92	<i>Gladiolus imbricatus</i> L. (PS)	Iridaceae	p	Ap	G	M-A	- P
93	<i>Glechoma hederacea</i> L.	Lamiaceae	p	Ap	H	AR	M N, P
94	<i>Gnaphalium uliginosum</i> L.	Asteraceae	a	Ap	T	I-N	-
95	<i>Heracleum sphondylium</i> L. s. str.	Apiaceae	p	Ap	H	M-A	M N, P
96	<i>Hieracium umbellatum</i> L.	Asteraceae	p	Ap	H	N-C	- N, P
97	<i>Holcus lanatus</i> L.	Poaceae	p	Ap	H	M-A	-
98	<i>Hypericum maculatum</i> Crantz	Hypericaceae	p	Ap	H	B-A	M P
99	<i>Hypericum perforatum</i> L.	Hypericaceae	p	Ap	H	-	M P
100	<i>Hypericum tetrapterum</i> Fr.	Hypericaceae	p	Ap	H	M-A	M P
101	<i>Iris pseudacorus</i> L.	Iridaceae	p	Ap	Hy	Ph	M N, P
102	<i>Juglans regia</i> L.	Juglandaceae	t	Kn	N	-	M P
103	<i>Juncus articulatus</i> L. emend. K. Richt.	Juncaceae	p	Ap	H	M-A	-
104	<i>Juncus bufonius</i> L.	Juncaceae	a	Ap	T	I-N	-
105	<i>Juncus conglomeratus</i> L. emend. Leers	Juncaceae	p	Ap	H	M-A	-
106	<i>Juncus effusus</i> L.	Juncaceae	p	Ap	H	M-A	-
107	<i>Juncus inflexus</i> L.	Juncaceae	p	Ap	H	M-A	-
108	<i>Knautia arvensis</i> (L.) J.M. Coult.	Dipsacaceae	p	Ap	H	M-A	M N, P
109	<i>Lamium album</i> L.	Lamiaceae	p	Arch	H	AR	M N, P
110	<i>Lapsana communis</i> L. s. str.	Asteraceae	b	Ap	T	AR	- N, P
111	<i>Lathyrus pratensis</i> L.	Fabaceae	p	Ap	H	M-A	- N, P
112	<i>Leontodon hispidus</i> L.	Asteraceae	p	Ap	H	M-A	- N, P
113	<i>Leucanthemum vulgare</i> Lam. s. str.	Asteraceae	p	Ap	H	M-A	- N, P

No	Species	Family	LS	GHs	LF	Phu	UF
114	<i>Lolium perenne</i> L.	Poaceae	p	Ap	H	M-A	- -
115	<i>Lotus corniculatus</i> L.	Fabaceae	p	Ap	H	M-A	- N, P
116	<i>Lotus uliginosus</i> Schkuhr	Fabaceae	p	Ap	H	M-A	- N, P
117	<i>Luzula campestris</i> (L.) DC.	Juncaceae	p	Ap	H	N-C	- -
118	<i>Lychnis flos-cuculi</i> L.	Caryophyllaceae	p	Ap	H	M-A	- N, P
119	<i>Lycopus europaeus</i> L.	Lamiaceae	p	Ap	Hy	AG	M N, P
120	<i>Lysimachia nummularia</i> L.	Primulaceae	p	Ap	C	M-A	- N, P
121	<i>Lysimachia vulgaris</i> L.	Primulaceae	p	Ap	H	M-A	- N, P
122	<i>Lythrum salicaria</i> L.	Lythraceae	p	Ap	H	M-A	M N, P
123	<i>Matricaria maritima</i> subsp. <i>inodora</i> (L.) Dostál	Asteraceae	a	Arch	T	SM	- N, P
124	<i>Medicago lupulina</i> L.	Fabaceae	b	Ap	H	M-A	- N, P
125	<i>Melandrium album</i> (Mill.) Garcke	Caryophyllaceae	a	Arch	T	AR	- N, P
126	<i>Mentha aquatica</i> L.	Lamiaceae	p	Ap	Hy	Ph	- N, P
127	<i>Mentha arvensis</i> L.	Lamiaceae	p	Ap	G	-	M N, P
128	<i>Mentha longifolia</i> (L.) L.	Lamiaceae	p	Ap	H	M-A	- N, P
129	<i>Molinia caeruleae</i> (L.) Moench s. str.	Poaceae	p	Ap	H	M-A	- -
130	<i>Myosotis arvensis</i> (L.) Hill	Boraginaceae	a	Arch	T	SM	- N, P
131	<i>Myosotis palustris</i> (L.) L. emend. Rchb.	Boraginaceae	p	Ap	H	M-A	- N, P
132	<i>Myosoton aquaticum</i> (L.) Moench	Caryophyllaceae	p	Ap	G	AR	- N, P
133	<i>Ononis arvensis</i> L.	Fabaceae	p	Ap	H	M-A	- P
134	<i>Oxalis fontana</i> Bunge	Oxalidaceae	p	Kn	G	SM	- P
135	<i>Padus avium</i> Mill.	Rosaceae	t	Ap	M	Q-F	M N, P
136	<i>Padus serotina</i> (Ehrh.) Borkh.	Rosaceae	t	Kn	N	-	- N, P
137	<i>Papaver argemone</i> L.	Papaveraceae	a	Arch	T	SM	M P
138	<i>Papaver rhoeas</i> L.	Papaveraceae	a	Arch	T	SM	M P
139	<i>Phalaris arundinacea</i> L.	Poaceae	p	Ap	G	Ph	- -
140	<i>Phleum pratense</i> L.	Poaceae	p	Ap	H	M-A	- -
141	<i>Phragmites australis</i> (Cav.) Trin. ex Steud.	Poaceae	p	Ap	G	Ph	- -
142	<i>Pimpinella major</i> (L.) Huds.	Apiaceae	p	Ap	H	M-A	M N, P
143	<i>Plantago intermedia</i> Gilib.	Plantaginaceae	p	Ap	T	I-N	- P
144	<i>Plantago lanceolata</i> L.	Plantaginaceae	p	Ap	H	M-A	M P
146	<i>Plantago major</i> L. s. str.	Plantaginaceae	p	Ap	H	M-A	M P
146	<i>Platanthera bifolia</i> (L.) Rich. (PS)	Orchidaceae	p	Ap	G	-	- P
147	<i>Poa annua</i> L.	Poaceae	a	Ap	H	M-A	- -
148	<i>Poa pratensis</i> L. s. str.	Poaceae	p	Ap	H	M-A	- -
149	<i>Poa trivialis</i> L.	Poaceae	p	Ap	H	M-A	- -
150	<i>Polygonum amphibium</i> L.	Polygonaceae	p	Ap	G	Po	- N, P
151	<i>Polygonum aviculare</i> L.	Polygonaceae	a	Ap	T	SM	M N, P
152	<i>Polygonum lapathifolium</i> L. subsp. <i>lapathifolium</i>	Polygonaceae	a	Ap	T	BT	- N, P
153	<i>Polygonum persicaria</i> L.	Polygonaceae	a	Ap	T	SM	- N, P
154	<i>Potentilla anserina</i> L.	Rosaceae	p	Ap	H	M-A	M P
155	<i>Potentilla erecta</i> (L.) Raeusch.	Rosaceae	p	Ap	H	N-C	M P
156	<i>Primula elatior</i> (L.) Hill (PS)	Primulaceae	p	Ap	H	Q-F	M N, P
157	<i>Prunella vulgaris</i> L.	Lamiaceae	p	Ap	H	M-A	M N, P
158	<i>Quercus robur</i> L.	Fagaceae	t	Ap	M	Q-F	M P
159	<i>Ranunculus acris</i> L. s. str.	Ranunculaceae	p	Ap	H	M-A	- P
160	<i>Ranunculus auricomus</i> L. s. l.	Ranunculaceae	p	Ap	H	Q-F	- P
161	<i>Ranunculus flammula</i> L.	Ranunculaceae	p	Ap	H	Ph	- P
162	<i>Ranunculus repens</i> L.	Ranunculaceae	p	Ap	H	M-A	- P
163	<i>Rhamnus cathartica</i> L.	Rhamnaceae	s	Ap	N	R-P	M N, P
164	<i>Rhus typhina</i> L.	Anacardiaceae	s	Kn	N	-	- -
165	<i>Rorippa sylvestris</i> (L.) Besser	Brassicaceae	p	Ap	G	M-A	- N, P
166	<i>Rosa canina</i> L.	Rosaceae	s	Ap	N	R-P	M P
167	<i>Rubus caesius</i> L.	Rosaceae	s	Ap	N	R-P	- N, P
168	<i>Rumex acetosa</i> L.	Polygonaceae	p	Ap	H	M-A	M P
169	<i>Rumex confertus</i> Willd.	Polygonaceae	p	Kn	H	-	- P
170	<i>Rumex crispus</i> L.	Polygonaceae	p	Ap	H	M-A	- P

No	Species	Family	LS	GHS	LF	Phu	UF	
171	<i>Rumex hydrolapathum</i> Huds.	Polygonaceae	p	Ap	Hy	Ph	–	P
172	<i>Rumex obtusifolius</i> L.	Polygonaceae	p	Ap	H	AR	M	P
173	<i>Salix alba</i> L.	Salicaceae	t	Ap	M	SP	M	N, P
174	<i>Salix caprea</i> L.	Salicaceae	s	Ap	N	EA	–	N, P
175	<i>Salix cinerea</i> L.	Salicaceae	s	Ap	N	AG	–	N, P
176	<i>Salix fragilis</i> L.	Salicaceae	t	Ap	M	SP	–	N, P
177	<i>Salix purpurea</i> L.	Salicaceae	s	Ap	N	SP	M	N, P
178	<i>Salix triandra</i> L.	Salicaceae	s	Ap	N	SP	–	N, P
179	<i>Sambucus nigra</i> L.	Caprifoliaceae	s	Ap	N	EA	M	P
180	<i>Sanguisorba officinalis</i> L.	Rosaceae	p	Ap	H	M-A	M	N, P
181	<i>Scirpus sylvaticus</i> L.	Cyperaceae	p	Ap	G	M-A	–	–
182	<i>Scrophularia nodosa</i> L.	Scrophulariaceae	p	Ap	H	Q-F	M	N, P
183	<i>Scutellaria galericulata</i> L.	Lamiaceae	p	Ap	H	Ph	M	N, P
184	<i>Selinum carvifolia</i> (L.) L.	Apiaceae	p	Ap	H	M-A	–	N, P
185	<i>Senecio fluviatilis</i> Wallr.	Asteraceae	p	Ap	H	SP	–	N, P
186	<i>Serratula tinctoria</i> L.	Asteraceae	p	Ap	G	M-A	M	N, P
187	<i>Setaria viridis</i> (L.) P. Beauv.	Poaceae	a	Arch	T	SM	–	–
188	<i>Sinapis arvensis</i> L.	Brassicaceae	a	Arch	T	SM	M	N, P
189	<i>Solidago gigantea</i> Aiton	Asteraceae	p	Kn	G	AR	M	N, P
190	<i>Solidago virgaurea</i> L.	Asteraceae	p	Ap	H	–	M	N, P
191	<i>Sonchus asper</i> (L.) Hill	Asteraceae	a	Arch	T	SM	–	N, P
192	<i>Sonchus oleraceus</i> L.	Asteraceae	p	Arch	T	SM	–	N, P
193	<i>Sparganium erectum</i> L. emend. Rchb. s. str.	Sparganiaceae	p	Ap	Hy	Ph	–	–
194	<i>Stachys palustris</i> L.	Lamiaceae	p	Ap	G	M-A	–	N, P
195	<i>Stellaria graminea</i> L.	Caryophyllaceae	p	Ap	H	M-A	–	N, P
196	<i>Succisa pratensis</i> Moench	Dipsacaceae	p	Ap	H	M-A	–	N, P
197	<i>Symphytum officinale</i> L.	Boraginaceae	p	Ap	H	M-A	M	N, P
198	<i>Tanacetum vulgare</i> L.	Asteraceae	p	Ap	H	AR	M	P
199	<i>Thalictrum lucidum</i> L.	Ranunculaceae	p	Ap	H	M-A	–	P
200	<i>Tragopogon orientalis</i> L.	Asteraceae	b	Ap	H	M-A	–	N, P
201	<i>Trifolium dubium</i> Sibth.	Fabaceae	a	Ap	T	M-A	–	N, P
202	<i>Trifolium hybridum</i> L.	Fabaceae	p	Ap	H	M-A	–	N, P
203	<i>Trifolium pratense</i> L.	Fabaceae	p	Ap	H	M-A	M	N, P
204	<i>Trifolium repens</i> L.	Fabaceae	p	Ap	H	M-A	–	N, P
205	<i>Trisetum flavescens</i> (L.) P. Beauv.	Poaceae	p	Ap	H	M-A	–	–
206	<i>Trollius europaeus</i> L. s. str. (PS)	Ranunculaceae	p	Ap	H	M-A	M	N, P
207	<i>Tussilago farfara</i> L.	Asteraceae	p	Ap	G	AI	M	N, P
208	<i>Typha latifolia</i> L.	Typhaceae	p	Ap	Hy	Ph	M	–
209	<i>Urtica dioica</i> L.	Urticaceae	p	Ap	H	AR	M	–
210	<i>Valeriana officinalis</i> L.	Valerianaceae	p	Ap	H	M-A	M	N, P
211	<i>Veronica arvensis</i> L.	Scrophulariaceae	a	Arch	T	SM	–	N, P
212	<i>Veronica beccabunga</i> L.	Scrophulariaceae	p	Ap	C	Ph	–	N, P
213	<i>Veronica chamaedrys</i> L. s. str.	Scrophulariaceae	p	Ap	C	M-A	–	N, P
214	<i>Veronica longifolia</i> L.	Scrophulariaceae	p	Ap	H	M-A	–	N, P
215	<i>Veronica persica</i> POIR.	Scrophulariaceae	a	Kn	T	SM	–	N, P
216	<i>Viburnum opulus</i> L.	Caprifoliaceae	s	Ap	N	Q-F	M	P
217	<i>Vicia cracca</i> L.	Fabaceae	p	Ap	H	M-A	–	N, P
218	<i>Vicia hirsuta</i> (L.) Gray	Fabaceae	a	Arch	T	SM	–	N, P
219	<i>Viola arvensis</i> Murray	Violaceae	a	Arch	T	SM	–	N, P

Explanation: **LS (Life span)**: a – annual, b – biennial, p – perennial, s – shrubs, t – trees; **GHS (geographical-historical status)**: Ap – apophytes, Arch – archaeophytes, Kn – kenophytes; **LF (Life forms)**: M – megaphanerophytes, N – nanophanerophytes, C – chamaephytes, H – hemicyrptophytes, G – geophytes, T – terophytes; Hy – hydrophytes, **Phu (Phytosociological unit)**: AG – *Alnetea glutinosae*, AI – *Agropyretea intermedio-repentis*, AR – *Artemisietea vulgaris*, B-A – *Betulo-Adenostyletea*, BT – *Bidentetea tripartiti*, EA – *Epilobietea angustifolii*, I-N – *Isoëto-Nanojungetea*, M-A – *Molinio-Arrhenatheretea*, N-C – *Nardo-Callunetea*, Ph – *Phragmitetea*, Po – *Potametea*, Q-F – *Quercio-Fagetea*, R-P – *Rhamno-Prunetea*, SM – *Stellarietea mediae*, SP – *Salicetea purpurea*, T-G – *Trifolio-Geranietea sanguinei*, **UF (Usage form)**: M – medicinale species, N – nectariferous, P – polleniferous, **PS** (protected species).

Phanerophytes made up 8%, with dominance of nanophanerophytes (6%) over megaphanerophytes (2%) (Table 2).

The most numerous group were perennials (150 species, 69%) typical for grassland ecosystems. Annual and biennial species were represented by 50 species (23%). The total number of shrubs and trees were 19 species 8%) (Table 2). Their occurrence in meadow communities indicates abandonment of land management and initiation of the succession process (FALIŃSKA 1991, BATOR 2005, BARABASZ-KRASNY 2011, TRĄBA & WOLAŃSKI 2012). To maintain stability, meadow communities require human activity (grazing, mowing). Abandonment of these measures results in disturbance in the biological rhythm of meadow plants and encroachment of tree and shrub seedlings. A similar phenomenon was observed in the Dynowskie Foothills (WOLAŃSKI & TRĄBA 2007), Przemyskie Foothills (BARABASZ-KRASNY 2011), and Wielickie Foothills (BATOR 2005). The early stage of succession can initially contribute to an increase in species diversity followed by a decline in the number of species, as reported by many researchers (FALIŃSKA 1991, BARABASZ-KRASNY 2011, SIENKIEWICZ-PADEREWSKA et al. 2012).

The analysis of the geographical and historical groups revealed considerable dominance of apophytes (183 species, 84%) over anthropophytes (36 species, 16%) (Table 2). Among alien species, archaeophytes were a majority (24 species, 11%); these usually were species migrating from nearby cereal crop (*Apera spica-venti*, *Matricaria maritima* subsp. *inodora*, *Papaver rhoeas*, *Centaurea cyanus*) and root crop (*Echinochloa crus-galli*, *Setaria viridis*, *Sonchus oleraceus*) fields. Kenophytes were represented by 12 species (5%); this group comprised commonly occurring invasive species, which posed no threat in the study area, i.e. *Echinocystis lobata*, *Erigeron annuus*, *Conyza canadensis*, *Juglans regia*, *Solidago gigantea*, *Padus serotina*, *Rhus typhina* and *Rumex confertus*. Discontinuation of management of meadow communities leads to transformations of the habitat, which in turn triggers colonisation by species from other habitats and enhances migration of alien species (FALIŃSKA 1991, BARABASZ-KRASNY 2011).

In terms of the phytosociological classification, 206 (94%) of the total species found in the study area are typical species or distinctive syntaxonomic units representing 16 classes. The largest group comprised species from the class *Molinio-Arrhenatheretea* (92 species, 42%) (Table 2). Synanthropic species from the classes *Stellarietea mediae* and *Artemisietea vulgaris* accounted for 23% of the total flora. Rush vegetation from the class *Phragmitetea* was represented by 19 species (9%), which indicates fertile, flooded, and waterlogged habitats. Due to the lack of management, there were empty spaces in the sward, which were colonised by vegetation from areas ad-

Table 2. Floristic diversification Natura 2000 site “Łąki w Komborni”

Specification	Number of species	%
<b>Total number of species</b>	219	100
<b>Family name:</b>		
Asteraceae	30	14
Poaceae	26	12
Lamiaceae	14	6
Fabaceae	12	5
Rosaceae	12	5
Polygonaceae	10	5
Others	115	53
<b>Life forms:</b>		
Megaphanerophytes (M)	5	2
Nanophanerophytes (N)	14	6
Chamaephytes (C)	4	2
Hemicryptophytes (H)	118	54
Geophytes (G)	27	12
Terophytes (T)	41	19
Hydrophytes (Hy)	10	5
<b>Life span (LS):</b>		
Annual (A)	39	18
Biennial (B)	11	5
Perennial (P)	150	69
Shrubs (S)	12	5
Trees (t)	7	3
<b>Geographical-historical groups:</b>		
Apophytes (Ap)	183	84
Archaeophytes (Arch)	24	11
Kenophytes (Kn)	12	5
<b>Phytosociological unit:</b>		
<i>Molinio-Arrhenatheretea</i> (M-A)	92	42
<i>Stellarietea mediae</i> (SM)	30	14
<i>Artemisietea vulgaris</i> (AR)	21	9
<i>Phragmitetea</i> (Ph)	19	9
Others	57	26
<b>Protected species (PS)</b>	6	3
<b>Usage form:</b>		
Medicinal species (M)	82	37
Nectariferous (N) and polleniferous (P)	119	54
Polleniferous (P)	36	16

acent to meadows; hence, the high share of synanthropic species, which has been reported from the Przemyskie Foothills (BARABASZ-KRASNY 2011) and Wielickie Foothills (BATOR 2005).

Eighty-two medicinal taxa (37%) were found in the analysed meadows, 155 taxa (70%) represented melliferous (nectariferous and polleniferous) plants providing reward to insects. The high vascular species diversity in the analysed area ensures continuity of the food chain from early spring to late summer.

Particularly noteworthy are protected species, with two under strict protection, i.e. *Gladiolus imbricatus* and *Trollius europaeus*, and four under partial protection, i.e. *Centaurium erythraea*, *Dactylorhiza majalis*, *Platanthera bifolia* and *Primula elatior*. The presence of rare and protected plants enhances the nature and landscape values of meadow communities, which has been highlighted by many authors (KĄCKI & MICHALSKA-HEJDUK 2010, KOTAŃSKA et al. 2015, ZIAJA & WÓJCIK 2016a, b).

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