Chromosome numbers and reproductive systems of selected representatives of *Pilosella* from the Krkonoše Mts (the Sudetes Mts). Part 3

Chromozomové počty a reprodukční systémy zástupců rodu *Pilosella* v Krkonoších – 3

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Chromosome counts/DNA ploidy level (DNA-PL) and modes of reproduction of the following species, hybridogenous species and hybrids of *Pilosella* from the Krkonoše Mts (Czech Republic) are reported: *P. aurantiaca* (2n = 36, 2n = 45, DNA-PL tetraploid, pentaploid, all apomictic); *P. bauhini* subsp. *bauhini* (2n = 45, with a long hemizygous marker chromosome – MC, apomictic); *P. caespitosa* (2n = 36, 2n = 45, apomictic, both cytotypes MC); *P. cymosa* subsp. *vaillantii* (2n = 45, MC); *P. lactucella* (2n = 18, DNA-PL diploid); *P. officinarum* (2n = 36, sexual); *P. blyttiana* (2n = 36); *P. floribunda* (2n = 36, MC); *P. glomerata* (DNA-PL tetraploid, 2n = 45, MC, apomictic, 2n = 46, MC); *P. iserana* (2n = 35 + fragment, MC, 2n = 36, MC, DNA-PL tetraploid,, apomictic); *P. piloselliflora* (2n = 36, DNA-PL pentaploid); *P. rubra* (2n = 54); *P. schultesii* (2n = 36); *P. rothiana* (2n = 36, apomictic); *P. scandinavica* (2n = 36, MC, apomictic). In addition, a heptaploid plant (2n = 63, apomictic), probably a hybrid between *P. rubra* (2n = 54, reduced gamete) and *P. aurantiaca* (2n = 36, unreduced gamete) and a rare hybrid corresponding morphologically to *P. fusca* (2n = 36, apomictic), which is probably a hybrid between *P. aurantiaca* and *P. blyttiana,* were found. The latter hybrid has not been previously reported from the Krkonoše Mts or the Czech Republic. New data for *P. cymosa* subsp. *vaillantii*, *P. fusca*, *P. rothiana* and *P. scandinavica* for this mountain range are presented. It is shown that tetraploid and pentaploid *P. aurantiaca* differ in the number and shape of their stem leaves, which makes it easier to identify them in the field.

Keywords: chromosome numbers, DNA ploidy level, *Hieracium*, hybridization, *Pilosella*, reproductive systems

Introduction

From 1999 to 2001 we published papers on the chromosome numbers and modes of reproduction of *Hieracium* subgen. *Pilosella* from the Krkonoše Mts (Krahulcová & Krahulec 1999, Krahulec et al. 2000, Krahulcová et al. 2001). Later on, we summarized our knowledge of the chromosome numbers, breeding systems, clonal structure and chloroplast haplotypes of representatives of the subgenus *Pilosella* from this mountain range (Krahulec et al. 2004, Fehrer et al. 2005). Some data presented in this study were previously published (Krahulec et al. 2004, Křišťálová et al. 2010), but without specifying the localities of the respective plants (*P. cymosa*, *P. scandinavica*, *P. rothiana*). The present paper includes new data on 15 species of *Pilosella* from the Krkonoše Mts. In addition, two rare hybrids are

recorded as occurring there. Certain hybridogenous species and several rare recent hybrids are discussed with respect to their origin in the Krkonoše Mts and their occurrence outside this mountain range.

Material and methods

We followed the procedures used in previous papers on this topic, which were summarized by Křišťálová et al. (2010). For several taxa we give only the DNA ploidy level determined by flow cytometry. All plants studied are documented by herbarium specimens deposited in the herbarium of the Institute of Botany, Průhonice (PRA). Taxonomy and nomenclature follow Bräutigam (2011) and for subspecies of *P. cymosa* Bräutigam & Greuter (2007).

Results and brief discussion of selected taxa

All the data are given in Table 1. Most of this data accords with that published previously for this mountain range; the respective plants/cytotypes were recorded at additional localities. Here we only give some comments and discussion of the taxa that were either not studied previously or when there is some additional information.

Pilosella aurantiaca (L.) F. W. Schultz et Sch. Bip.
(syn.: *H. aurantiacum* L.)

In addition to the common tetraploid clone, several localities of the rarer pentaploid cytotype were found. It seems to occur at high altitudes. A plant from the Rýchory range belongs to the same genotype (isozyme phenotype) as those from the Zadní Rennerovky settlement and Velká Úpa (Krahulcová et al. 2001: 205). Both cytotypes can be distinguished in the field (see also Figs 1 and 2, Electronic Appendix 1: Figs 1, 2) as they show the same specific characters when growing in the same grassland, e.g. at the locality Zadní Renerovky. Pentaploid plants differ from tetraploids in the presence and shape of stem leaves and type of stolons: pentaploids have 2–3 stem leaves; the upper one is lanceolate and rather big, stolons are mostly underground, thin and with small scales. Tetraploids have (0–)1–2 stem leaves, the upper one usually being a small scale, stolons are above ground with green leaves. Pentaploid plants usually lack a leaf rosette at flowering time, but this character depends also on the density of surrounding vegetation, in dense vegetation the rosette is lost earlier. We realize that these results are based solely on the comparison of one pentaploid and one tetraploid clone and their validity need to be tested in regions where there are more clones.

Pilosella bauhini (Schult.) Arv.-Touv. subsp. *bauhini*
[syn.: *P. piloselloides* subsp. *bauhini* (Schult.) Bräut. & Greuter, *Hieracium bauhini* Schult.]

This species is rather common at low altitudes in the Czech Republic; it was collected at the margin of a limestone quarry near Černý Důl, situated in the southern foothills of the Krkonoše Mts. This plant belongs to the most common (in Bohemia) subspecies and most common apomictic pentaploid cytotype and was previously recorded at Dolní Malá Úpa, another locality in the Krkonoše Mts (Krahulec et al. 2000: 236, 241). Three other cytotypes are reported from the Czech Republic, namely tetraploid, hexaploid and heptaploid (Chrtek 2004, Rotreklová 2004, Křišťálová et al. 2010). All data reported for plants from the Czech Republic cover *P. bauhini* subsp. *bauhini*.

Table 1. – *Pilosella* taxa studied: their localities, chromosome number/DNA ploidy level and modes of reproduction (RS). Collectors: FK – F. Krahulec; AK – A. Krahulcová; JCH – J. Chrtek,; SB – S. Bräutigam; HCH – H. Chapman. Symbol (MC) in the column 2n indicates the presence of single large marker chromosome. n. d. – not determined.

Sample code	Locality	Coordinates	Altitude	Date	Collector	2n	DNA ploidy level	RS	Remark
Basic species									
***P. aurantiaca* (L.) F. W. Schultz et Sch. Bip.**									
731	Velká Úpa, Jana, Braunovy Boudy	50°41'30"N, 15°47'40"E	900	23 VI 2002	FK	36		n. d.	
773	Zadní Rennerovky, above local road	50°42'05"N, 15°39'50"E	1270	12 VII 2002	FK, AK, HCH		4x	apomictic	
915	Rýchory, Sněžné Domky	50°39'10"N, 15°52'10"E	1050	19 VI 2003	FK	45		apomictic	The same isozyme phenotype as found in the plant from Zadní Rennerovky (Krahulcová et al. 2001)
1306	Pomezní Boudy, Mokré jámy	50°44'20"N, 15°48'30"E	1000	21 VI 2007	FK, AK		5x	apomictic	
1310	Pomezní Boudy, Mokré jámy	50°44'20"N, 15°48'30"E	1000	21 VI 2007	FK, AK		5x	n. d.	
1729	Strážné, Lahrovy Boudy	50°41'16.4'N', 15°38'31.1"E	1070	23 VII 2009	FK		5x	n. d.	
355	Rýchory, Sněžné Domky	50°39'10"N, 15°52'10"E	1050	29 V 2000	FK	45		n. d.	Mentioned by Krahulec et al. (2004), without locality
P. bauhini* (Schult.) Arv.-Touv. subsp. *bauhini									
568	Černý Důl, NW margin of the limestone quarry of Biener	50°38'15"N, 15°41'50"E	700	7 VII 2001	FK, SB	45 (MC)		apomictic	
***P. caespitosa* (Dumort.) P. D. Sell et C. West**									
425	Víchovská Lhota, N of the house No. 43	50°39'00"N, 15°29'20"E	569	28 VI 2000	FK, AK, JCH	45 (MC)		apomictic	
426/2						45 (MC)		n. d.	
566/2	Víchovská Lhota, N of the house No. 43	50°39'00"N, 15°29'20"E	569	7 VII 2001	FK, SB	45 (MC)		n. d.	
452	Velká Úpa, under the cableway to Portášovy Boudy	50°41'50"N, 15°46'10"E	900	29 VI 2000	FK, AK, JCH	36 (MC)		n. d.	
525	Rýchory, Sklenařovice	50°38'40"N, 15°51'20"E	850	8 VI 2001	FK	36 (MC)		n. d.	
563	Velká Úpa, Prostřední Výsluní	50°41'40"N, 15°47'10"E	910 –920	6 VII 2001	FK, SB	36 (MC)		n. d.	
***P. cymosa* subsp. *vaillantii* (Tausch) S. Bräut. et Greuter**									
722	Víchovská Lhota	50°39'53.6"N, 15°29'16.6"E	582	14 VI 2002	FK	45 (MC)		n. d.	New chromosome number for the Krkonoše Mts

Sample code	Locality	Coordinates	Altitude	Date	Collector	2n	DNA ploidy level	RS	Remark
***P. lactucella* (Wallr.) P. D. Sell et C. West**									
436	Pomezní Boudy, Mokré jámy	50°44'20"N, 15°48'25"E	995	29 VI 2000	FK, AK, JCH	18		n. d.	
1437				VIII 2007	FK		2x	n. d.	
***P. officinarum* (L.) Vaill.**									
419	Víchovská Lhota, grassland margin above the road	50°38'45"N, 15°29'20"E	550	28 VI 2000	FK, AK, JCH	36		n. d.	
423	Víchovská Lhota, N of Studený kopec hill	50°38'50"N, 15°29'00"E	600	28 VI 2000	FK, AK, JCH	36		n. d.	
435	Víchovská Lhota, NNE of Studený kopec hill	50°38'55"N, 15°29'15"E	600	28 VI 2000	FK, AK, JCH	36		n. d.	
426/1	Víchovská Lhota, N of the house No. 43	50°39'00"N, 15°29'20"E	569	28 VI 2000	FK, AK, JCH	36		n. d.	
427						36		n. d.	
428						36		n. d.	
429/2						36		sexual	
565	Víchovská Lhota, N of the house No. 43	50°39'00"N, 15°29'20"E	569	7 VII 2001	FK, SB	36	4x	sexual	3 plants, RS determined at one of them
721	Víchovská Lhota	50°39'53.6"N, 15°29'16.6"E	582	14 VI 2002	FK		4x	n. d.	
441	Dolní Malá Úpa, above the church	50°43'20"N, 15°48'40"E	980	29 VI 2000	FK, AK, JCH	36		n. d.	
442						36		n. d.	
457	Přední Výsluní, above the challet Borůvka	50°41'05"N, 15°47'30"E	875	30 VI 2000	FK, AK, JCH	36		n. d.	
Hybrids and hybridogenous species									
P. aurantiaca* (7x) or *P. aurantiaca* × *P. rubra									
433	Horní Mísečky, near the Kovo challet	50°44'10"N, 15°34'00"E	1020	28 VI 2000	FK, AK, JCH	63		apomictic	New chromosome number and hybrid, haplotype of the "rubra" subtype
***P. blyttiana* (Fr.) F. W. Schultz et Sch. Bip.**									
438	Pomezní Boudy, Mokré jámy	50°44'20"N, 15°48'20"E	1000	29 VI 2000	FK, AK, JCH	36		n. d.	
***P. floribunda* (Wimm. et Grab.) Fr.**									
571	Velká Úpa, Javoří Boudy, near the Dakota challet	50°40'55"N, 15°44'50"E	960	6 VII 2001	FK, SB	36 (MC)		n. d.	
574						36 (MC)		n. d.	
522	Rýchory, Sklenařovice	50°38'40"N, 15°51'20"E	850	8 VI 2001	FK	36 (MC)		n. d.	

Sample code	Locality	Coordinates	Altitude	Date	Collector	2n	DNA ploidy level	RS	Remark
***P. fusca* (Vill.) Arv.-Touv.**									
777	Pomezní Boudy, Mokré jámy	50°44'20"N, 15°48'30"E	1000	11 VII 2002	FK, AK, HCH	36		apomictic	New taxon for the Krkonoše Mts and the Czech Republic
***P. glomerata* (Froel.) Fr.**									
393/1	Velká Úpa, stone wall at the challet Měchurka	50°41'24"N, 15°46'00"E	720	21 VII 2000	FK	46 (MC)		n. d.	
393/2	Velká Úpa, stone wall at the challet Měchurka	50°41'24"N, 15°46'00"E	720	V 2004	FK	45 (MC)		n. d.	
420	Víchovská Lhota, grassland margin above the road	50°38'45"N, 15°29'20"E	550	28 VI 2000	FK, AK, JCH	45 (MC)		n. d.	
424	Víchovská Lhota, N of the house No. 43	50°39'00"N, 15°29'20"E	569	28 VI 2000	FK, AK, JCH	45 (MC)		n. d.	
429/1						45 (MC)		n. d.	
566/1	Víchovská Lhota, N of the house No. 43	50°39'00"N, 15°29'20"E	569	7 VII 2001	FK, SB	45 (MC)		apomictic	
566/3						45 (MC)		n. d.	
724	Víchovská Lhota	50°39'53.6"N, 15°29'16.6"E	582	14 VI 2002	FK	45 (MC)		n. d.	
728						45 (MC)		n. d.	
518	Velká Úpa, Javoří Boudy, near the Dakota challet	50°40'55"N, 15°44'50"E	950	9 VI 2001	FK	45 (MC)		n. d.	
573	Velká Úpa, Javoří Boudy, near the Dakota challet	50°40'55"N, 15°44'50"E	960	6 VII 2001	FK, SB	45 (MC)		n. d.	
567	Černý Důl, W margin of the limestone quarry of Biener	50°38'05"N, 15°42'00"E	690	7 VII 2001	FK, SB	45(MC)/44(MC)		n. d.	
2034	Rokytnice nad Jizerou, Lysá hora Mt, Červená sjezdovka ski slope	50°44'57.7"N, 15°29'34.5"E	1045	VII 2012	FK		4x	n. d.	
***P. iserana* (R. Uechtr.) Soják**									
421	Víchovská Lhota, grassland margin above the road	50°38'45"N, 15°29'20"E	550	28 VI 2000	FK, AK, JCH	35+fragm. (MC)		n. d.	
422	Víchovská Lhota, grassland margin above the road	50°38'45"N, 15°29'20"E	550	28 VI 2000	FK, AK, JCH	36 (MC)		n. d.	
723	Víchovská Lhota	50°39'53.6"N, 15°29'16.6"E	582	14 VI 2002	FK	36 (MC)		n. d.	

Sample code	Locality	Coordinates	Altitude	Date	Collector	2n	DNA ploidy level	RS	Remark
448	Dolní Malá Úpa, near the challet Náchod	50°43'00"N, 15°48'40"E	920	29 VI 2000	FK, AK, JCH	36 (MC)		n. d.	
521	Rýchory, Sklenařovice	50°38'40"N, 15°51'20"E	850	8 VI 2001	FK		4x	n. d.	
564	Velká Úpa, Prostřední Výsluní	50°41'40"N, 15°47'10"E	915	6 VII 2001	FK, SB	36 (MC)		apomictic	
1308	Pomezní Boudy – Mokré jámy	50°44'20"N, 15°48'30"E	1000	21 VI 2007	FK,AK		4x	n. d.	
***P. piloselliflora* (Nägeli et Peter) Soják**									
430	Horní Mísečky, above the parking place	50°44'05"N, 15°34'05"E	1020	28 VI 2000	FK, AK, JCH	36		n. d.	
443	Dolní Malá Úpa, above the church	50°43'20"N, 15°48'40"E	980	29 VI 2000	FK, AK, JCH	36		n. d.	
444						36		n. d.	
460	Pec pod Sněžkou, near the Kamor challet	50°41'21.7"N, 15°43'34.1"E	800	11 VII 2000	FK	36		n. d.	
1879	Velká Úpa	50°44'20"N, 15°48'30"E	834	VI 2010	FK		5x	n. d.	
***P. rubra* (Peter) Soják**									
446	Dolní Malá Úpa, N margin of the village	50°43'35"N, 15°49'00"E	1000	29 VI 2000	FK, AK, JCH	54		n. d.	
***P. schultesii* (F. W. Schultz.) F. W. Schultz et Sch. Bip.**									
431	Horní Mísečky, above the parking place	50°44'10"N, 15°34'10"E	1020	28 VI 2000	FK, AK, JCH	36		n. d.	
432						36		n. d.	
***P. rothiana* (Wallr.) F. W. Schultz et Sch. Bip.**									
1730	Modrý důl, near the bridge on the bottom of the valey	50°41'41.1"N, 15°46'15.2"E	1013	23 VII 2009	FK	36		apomictic	New for the Krkonoše Mts, published by Křišťálová et al. (2010)
***P. scandinavica* (Dahlst.) Schljakov**									
519	Velká Úpa, Javoří Boudy, near the Dakota challet	50°40'55"N, 15°44'50"E	960	9 VI 2001	FK	36 (MC)		apomictic	New for the Krkonoše Mts, mentioned by Krahulec et al. (2004), without locality
520						36 (MC)		apomictic	
572				6 VII 2001	FK, SB	36 (MC)		apomictic	
570	Velká Úpa, Javoří Boudy, near the Dakota challet	50°40'55"N, 15°44'50"E	960	6 VII 2001	FK, SB	36 (MC)		n. d.	
575						36 (MC)		n. d.	

Fig. 1. – *Pilosella aurantiaca*, tetraploid (2n = 36).

Fig. 2. – *Pilosella aurantiaca*, pentaploid (2n = 45).

Fig. 3. – *Pilosella scandinavica*.

Fig. 4. – *Pilosella aurantiaca* × *P. blyttiana* (*P. fusca*).

Pilosella cymosa subsp. *vaillantii* (Tausch) S. Bräut. et Greuter
(syn.: *Hieracium cymosum* subsp. *cymigerum* Peter)

There is no previous report of a chromosome number for this taxon from the Krkonoše Mts. We found it only once, in the southern foothills (Electronic Appendix 1: Fig. 3). The pentaploid chromosome number (2n = 45) is different from the tetraploid one given by Fehrer et al. (2005).

Pilosella glomerata (Froel.) Fr.
(*P. caespitosa – P. cymosa*; syn.: *Hieracium glomeratum* Froel.)

In the new material it is represented by two cytotypes, tetraploid and pentaploid, the latter being more common. However, we also found one aneuploid (hyperpentaploid) plant. Additionally, a pentaploid/aneuploid somatic mosaic (2n = 44/45) was recorded in one plant (sample 567 in Table 1).

Pilosella scandinavica (Dahlst.) Schljakov
(*P. floribunda – P. glomerata*; syn.: *H. scandinavicum* Dahlst.)

Only one population of this hybridogenous species was found. At this locality the cytotype of *Pilosella glomerata* is pentaploid and that of *P. floribunda* and *P. scandinavica* tetraploid (Fig. 3). With respect to parental and hybrid cytotypes, the situation is the same as in the Šumava Mts but these two mountain ranges differ in the frequency of occurrence of *P. scandinavica*, which is rather common in the Šumava Mts, where there are several clones (three different isozyme phenotypes represented in the ten plants studied – cf. Krahulec et al. 2008: 8, their Table 1). This fact suggests that at least some of the plants in the Šumava Mts are recent hybrids.

It is surprising that in the recent edition of the Red List of vascular plants (Grulich 2012) this species is placed in category A2, Missing taxa (?EX), in spite of the fact that Chrtek (2004) cites its occurrence in several regions and we have recorded it in the Krkonoše Mts (Krahulec et al. 2004) and at several localities in the Šumava Mts (Krahulec et al. 2008).

Pilosella rubra (Peter) Soják × *P. aurantiaca*

The heptaploid (2n = 63) plant of *P. aurantiaca* described by Krahulec at al. (2004) is currently thought to be of hybrid origin. Considering only the ploidy level and haplotype found (rubra subtype) there are only two possible alternative origins of this heptaploid plant. The first is a combination of an unreduced female gamete of a pentaploid cytotype with a reduced male gamete of tetraploid cytotype of *P. aurantiaca*. The second is that of a reduced female gamete of a hexaploid cytotype of *P. rubra* with an unreduced male gamete of tetraploid cytotype of *P. aurantiaca* (cf. Krahulec et al. 2004). Because it has a rather high density of stellate hairs on the under surface of its leaves and a deeply branched stem (Electronic Appendix 1: Fig. 4) we consider that the second alternative is the most likely (*P. rubra* is a stabilized hybridogenous type including *P. officinarum* and for this reason it has many stellate hairs on the under surface of its leaves). No pentaploid cytotype of *P. aurantiaca* or *P. rubra* was found by us at this locality or in the surrounding area.

Pilosella fusca (Vill.) Arv.-Touv.
[syn.: *P. aurantiaca* × *P. blyttiana* (Fr.) F. W. Schultz et Sch. Bip., *Hieracium fuscum* Vill.]

In the complex of wet meadows at Mokré jámy by Pomezní Boudy we found a type morphologically close to *P. aurantiaca*, which corresponds to *P. fusca*: some of the rosette leaves are acute, with few stellate hairs; involucral bracts densely hairy; inflorescence with many capitula (Fig. 4). It has dark green and rigid leaves. Because this is the richest locality for *P. blyttiana* we think it is a hybrid of these two species (in fact, the product of backcrossing *P. blyttiana* with one of its parents, *P. aurantiaca*). There are no plants corresponding to *P. fusca* in the Czech Republic (Chrtek 2004, Zahn 1922–1930).

Pilosella rothiana (Wallr.) F. W. Schultz et Sch. Bip.
(*P. echioides* > *P. officinarum*; syn.: *Hieracium rothianum* Wallr.)

This hybridogenous species is rather thermophilous occurring in the Czech Republic mostly in central and northern Bohemia and southwestern Moravia (Peckert 2002, Chrtek 2004). It occurs in xerothermic grasslands and currently is also spreading along highways in central Bohemia (Křišťálová et al. 2010) and probably also in other areas. It was a great surprise to find a well developed population of this hybridogenous species at Modrý důl, at an altitude of above 1000 m. It has the same genotype (isozyme phenotype) as plants occurring along new roads in Prague (Křišťálová et al. 2010). It is highly probable that this species was introduced by cars, because there is an unofficial parking place close by (Electronic Appendix 1: Fig. 5).

Discussion

This paper presents some new data on basic and hybridogenous species in the Krkonoše Mts. Most surprising is the new data on the distribution of some taxa: the occurrence of *P. rothiana* at high altitudes is probably the most interesting. It is evident that this hybridogenous species can grow at least for several seasons at an altitude of about 1000 m. Because it is an apomictic species it can easily spread to other localities.

Rare occurrence of *P. scandinavica* in the Krkonoše Mts is strange, especially as the parental taxa, *P. floribunda* and *P. glomerata*, are common there and in the Šumava Mts these species frequently hybridize. The population at Javoří důl is rather rich and its ploidy level corresponds to that of plants found in the Šumava Mts.

In this paper we report the rare occurrence in populations of individual plants of hybrid origin: heptaploid plants very close to *P. aurantiaca* or plants corresponding to *P. fusca*. They are the result of rare crosses and previously recorded in this mountain range: pentaploid plants, which probably originated from hybridization between *P. officinarum* and *P. rubra* (pentaploid *P. stoloniflora*, cf. Krahulcová et al. 2001), diploid hybrid between extremely rare *P. onegensis* and *P. lactucella* (Krahulcová et al. 2001) and plants corresponding to *P. tubulascens* (*P. glomerata* – *P. lactucella*, Krahulcová et al. 2001). It is likely that these rare hybrids occur rather regularly within populations and therefore the recording of their occurrence is dependent on their being found and identified. The origin and temporary occurrence of most polyploid and hybridogenous species is assured because they are facultatively apomictic and produce a large number of progeny. This could explain the

occurrence of many of the types reported earlier, such as, *P. rubripilosella* described from these mountains but found only once (Schneider 1888-1895). Similar red flowering plants with one capitulum were recorded among the pentaploid progeny of hexaploid *P. rubra* and tetraploid *P. officinarum* (our unpublished results). Plants with a single capitulum were also found in an hybrid swarm of *P. aurantiaca* and *P. officinarum* in Westphalia (Gottschlich & Raabe 1992, Krahulcová et al. 2012). The other examples of such rarities reported in this area more than one century ago are given by Schneider (1888–1895), Zahn (1922–1930) and summarized in Krahulec et al. (2004: Table 2).

The hyperpentaploid *P. glomerata* is in fact the second finding of an aneuploid plant in the Krkonoše Mts. The first was hypopentaploid (2n = 44) *P. piloselliflora* (Krahulcová & Krahulec 1999). Aneuploid plants are very rare in the Krkonoše Mts and only detected twice among more than four hundred plants, so the frequency is lower than 0.5%. The same order of occurrence was recorded in the Šumava Mts, one aneuploid among 34 plants (ploidy level of the other plants was determined using flow cytometry and no irregular peaks corresponding to aneuploidy were observed). It seems that the selection against aneuploids is rather strong because hybridization between plants with even and odd ploidy levels is common. On the other hand, we recorded more than 15% aneuploids in a hybrid swarm between *Pilosella officinarum* and *P. bauhini* at a locality where seedling survival was high (Krahulcová et al. 2009).

The data on the difference in the morphology of tetraploid and pentaploid *P. aurantiaca* is limited because both ploidy levels are represented by a single clone. However, a similar difference was recorded in the Šumava Mts, but the tetraploid clone there is the same as that in the Krkonoše Mts. Evidently, more representative material from regions with more clones should be compared.

See www.preslia.cz for Electronic Appendix 1.

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Souhrn

Tato práce je třetím pokračováním údajů o počtech chromozomů či ploidii (přesněji DNA ploidní úrovně – DNA PL) a reproduktivních systémech (RS) druhů, hybridogenních druhů a kříženců rodu *Pilosella* z Krkonoš. Jde o tyto taxony: *P. aurantiaca* (2n = 36, 2n = 45, DNA-PL tetraploidní, pentaploidní, RS apomiktický); *P. bauhini* (2n = 45, s dlouhým hemizygotním markerovým chromozomem – MC, RS apomiktický); *P. caespitosa* (2n = 36, 2n = 45, RS apomiktický, oba cytotypy MC); *P. cymosa* subsp. *vaillantii* (2n = 45, MC); *P. lactucella* (2n = 18, DNA-PL diploidní); *P. officinarum* (2n = 36, RS sexuální); *P. blyttiana* (2n = 36); *P. floribunda* (2n = 36, MC); *P. glomerata* (DNA-PL tetraploidní, 2n = 45 MC, RS apomiktický, 2n = 46); *P. iserana* (2n = 35 + fragment, MC, 2n = 36, MC, DNA-PL tetraploidní, RS apomiktický); *P. piloselliflora* (2n = 36, DNA-PL pentaploidní); *P. rubra* (2n = 54); *P. schultesii* (2n = 36); *P. rothiana* (2n = 36, RS apomiktický); *P. scandinavica* (2n = 36, MC, RS apomiktický). Dále byly zjištěny jednotlivé rostliny pravděpodobně hybridního původu: heptaploid (2n = 63, RS apomiktický), pravděpodobný hybrid mezi *P. rubra* (2n = 54, redukovaná gameta) a *P. aurantiaca* (2n = 36, neredukovaná gameta). Další hybrid morfologicky odpovídá *P. fusca* (2n = 36, RS apomiktický); pravděpodobně jde o hybrid mezi *P. aurantiaca* and *P. blyttiana.* Výskyt *P. fusca* dosud nebyl udáván z Krkonoš ani z České republiky. Data o *P. cymosa* subsp. *vaillantii*, *P. rothiana* and *P. scandinavica* jsou nová pro Krkonoše. V práci je dále

ukázáno, že tetraploidní a pentaploidní rostliny *P. aurantiaca* je možno odlišit podle počtu a tvaru listů na lodyze a typu výběžků.

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