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CHROMOSOME NUMBERS IN *HIERACIUM* AND *PILOSELLA* (ASTERACEAE) FROM CENTRAL AND SOUTHEASTERN EUROPE

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Chromosome numbers of 46 *Hieracium* L. and *Pilosella* Vaill. taxa from Austria, Bulgaria, Czech Republic, Macedonia, Montenegro, Poland, Romania, Serbia and Slovakia are presented. Chromosomes numbers are given for the first time for *Hieracium amphigenum* Briq. 2n = 3x = 27, *H. bohatschianum* Zahn 2n = 4x = 36, *H. borbasii* R. Uechtr. 2n = 4x = 36, *H. cernuum* Friv. 2n = 2x = 18, *H. hazslinszkyi* Pax 2n = 3x = 27, *H. mirekii* Szeląg 2n = 4x = 36, *H. polyphyllobasis* (Nyár. & Zahn) Szeląg 2n = 3x = 27, *H. porphyriticum* A. Kern. 2n = 4x = 36, *H. racemosum* Waldst. & Kit. ex Willd. subsp. *racemosum* 2n = 3x = 27, *H. scardicum* Borm. & Zahn 2n = 4x = 36, *H. sparsum* subsp. *ipekanum* Rech. fil. & Zahn 2n = 4x = 36, *H. sparsum* subsp. *peristeriense* Behr & Zahn, *H. sparsum* subsp. *squarrosobracchiatum* Behr & al. 2n = 3x = 27, *H. tomosense* Simk. 2n = 4x = 36, *H. tubulare* Nyár. 2n = 4x = 36, *H. werneri* Szeląg 2n = 3x = 27 and *Pilosella fusca* subsp. *subpedunculata* (Zahn) Szeląg, as well as five species of *Hieracium* sect. *Cernua* R. Uechtr. not described to date and a hybrid between *H. bifidum* s. lat. and *H. pojoritense* Woł.

Key words: Asteraceae, chromosome numbers, Europe, *Hieracium*, karyotypes, *Pilosella*.

INTRODUCTION

Hieracium L. and *Pilosella* Vaill. are taxonomically complicated vascular plant genera which form agamic complexes with a base chromosome number of x = 9. Their taxonomic difficulties are due to the coexistence of sexual diploids as well as facultative and obligatory apomicts, resulting in very complicated patterns of morphological variation. Knowledge of ploidy level, which especially in the genus *Hieracium* indicates the mode of reproduction, is of particular interest in understanding taxonomic and phylogenetic relationships.

Both genera are dominated by polyploid, hybridogenous taxa characterized by agamospermous reproduction (gametophytic apomixis) (Skawińska, 1963; Stace, 1989). In the genus *Hieracium*, triploids and tetraploids are most frequent and pentaploids only occasionally have been found (Stace et al., 1995; Chrtek, 1996). Sexual diploids in *Hieracium* are very rare and restricted mainly to refugial areas of Southern Europe (Merxmüller, 1975; Schuhwerk and Lippert, 1998).

In the genus *Pilosella*, determining the mode of reproduction on the basis of ploidy level is more complicated, because facultative apomixis (apospory of *Hieracium* type) and even full sexuality of polyploids are known (Krahulcová et al., 2000). So far, seven ploidy levels (diploids to octoploids) have been recognized in *Pilosella* (see, e.g., Krahulcová et al. 2000).

During several years of studies on *Hieracium* and *Pilosella* in Southeastern Europe, the second author (ZS) collected many living plants and transplanted them to an experimental garden. Many of them have never been analyzed karyologically to date. The present paper gives chromosome numbers for 46 taxa of *Hieracium* and *Pilosella*. The ploidy levels of 17 taxa are published for the first time.

MATERIAL AND METHODS

The chromosomes were analyzed in wild-collected plants grown in the experimental garden of the second author (ZS). The root tips were incubated in a saturated water solution of α-bromonaphthalene

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overnight at 4°C, fixed in 1:3 acetic alcohol and then hydrolyzed with 1N HCl at 60°C for 10 min and squashed in a drop of 45% acetic acid between cover slip and slide. Cover slips were removed using the dry-ice method. The chromosomes were stained with 0.1% aqueous solution of toluidine blue, counted at mitotic metaphase and photographed with a Nikon Optiphot 2 microscope.

The taxonomic treatment of *Hieracium* sect. *Cernua* R. Uechtr. follows Szeląg (2003).

Vouchers are stored in the herbarium of the second author (Herb. Hierac. Z. Szeląg).

RESULTS AND DISCUSSION

Hieracium alpinum L.; 2n = 2x = 18

1. Romania, Southern Carpathians, Retezat Mts., Mt. Retezat, 2230 m a.s.l., in *Juncus trifidus* communities.
2. Romania, Southern Carpathians, Bucegi Mts., Mt. Coştila, 2250 m a.s.l., alpine meadows above Cabana Babele hut.

Hieracium alpinum L.; 2n = 3x = 27

1. Bosnia and Herzegovina, Vranica Mts., Mt. Nadkrstac, 2100 m a.s.l., in *Caricetum curvulae*.
2. Poland, Tatry Zachodnie Mts., Mt. Ornak, 1810 m a.s.l., in *Juncus trifidus* communities.

The counts well support the putative geographic distribution of diploid and triploid cytotypes. While the diploids are most likely confined to the Eastern and Southern Carpathians (Chrtek, 1997; Mráz, 2001; Mráz and Szeląg, 2004), the triploids were repeatedly reported from the remaining parts of the extensive arcto-alpine range of the species (Goldblatt and Johnson, 1979--), incl. the Vranica Mts. (Mráz et al., 2009, without a precise station).

Hieracium alpinum s. lat.; 2n = 3x = 27
Poland, Tatry Zachodnie Mts., Mt. Ornak, 1830 m a.s.l., in *Juncus trifidus* communities.

The present study based on 12 analyzed wild-collected plants does not confirm a tetraploid chromosome number published for this taxon from the same population (Szeląg and Jankun, 1997). On the other hand, the occurrence of two different cytotypes within the same population is possible. The plants from Mt. Ornak differed from *H. alpinum* s.str. in having spathulate rosette leaves, glabrous on the upper surface and relatively small capitula. This taxon is the subject of ongoing studies to be presented separately.

Hieracium amphigenum Briq.; 2n = 3x = 27

1. Montenegro, Prokletije Mts., Mt. Starac, 2130 m a.s.l., rocky places on granite.
2. Bosnia and Herzegovina, Vranica Mts., Mt. Nadkrstac, 2100 m a.s.l., *Caricetum curvulae* on summit.

This is the first chromosome number for this species, which belongs to *H. piliferum* agg.

Hieracium austrotatricum Szeląg; 2n = 4x = 36
Slovakia, Western Carpathians, Nízke Tatry Mts., Mt Lajštroch, 1550 m a.s.l. (*locus classicus* of the species), grassy places in *Pinus mugo* communities on silicate bedrock.

This chromosome number confirms the number previously published for the species (Ronikier and Szeląg, 2008).

Hieracium bifidum s. lat.; 2n = 3x = 27
Romania, Southern Carpathians, Retezatul Mic Mts., calcareous rocks below Jiu-Cerna pass, 1260 m a.s.l., calcareous rocks along road.

Hieracium bifidum s. lat.; 2n = 4x = 36

1. Romania, Southern Carpathians, Retezat Mts., Zlătuia valley, 1620 m a.s.l., *Picea abies* forest on granite.
2. Romania, Southern Carpathians, Retezat Mts., Cascada Mării waterfall, 1120 m a.s.l., granite rock.
3. Romania, Apuseni Mts., Cheile Ordâncuşei gorge, 810 m a.s.l., calcareous rocks along road.

Our chromosome counts well match those previously published (e.g., Goldblatt and Johnson, 1979--; Schuhwerk and Lippert, 1999; Mráz and Szeląg, 2004).

Hieracium bifidum s. lat. × *H. pojoritense* Woł.; 2n = 3x = 27 (Fig. 7)
Romania, Eastern Carpathians, Ceahlău Mts., above Cabana Fântânele chalet, 1350 m a.s.l., calcareous rock crevices.

Hieracium bohatschianum Zahn; 2n = 4x = 36
Romania, Banat, Mt. Treskovac, 680 m a.s.l., dry pasture on quartzite.

This is the first chromosome number for this species known only from the *locus classicus* on Mt. Treskovac (Zahn, 1910).

Hieracium borbasii R. Uechtr.; 2n = 4x = 36 (Fig. 10)
Romania, Southern Carpathians, Retezat Mts., Saua ciurila pass, 1800 m a.s.l., grassy places in *Pinus mugo* communities on granite.

This is the first chromosome number for this species.

Hieracium cernuum Friv.; 2n = 2x = 18
Bulgaria, Rhodope Mts., between Perelik chalet and Mt. Goliam Perelik, 2050–2100 m a.s.l., rocky grasslands on granite.

Plants from two disjunct populations (A and B) were examined. This is the first chromosome number for this species. Until now, the only known diploid in *H.* sect. *Cernua* as redefined by Szeląg (2003) was *H. sparsum* Friv. (Vladimirov and Szeląg, 2001b).

Hieracium grisebachii A. Kern.; 2n = 3x = 27 (Fig. 1)
Austria, Tirol, Oetztal valley, Sölden, between Gaislachalm and Gaislach, 1890 m a.s.l., *Larix europaea* forest.

This chromosome number confirms the number previously published for the species (Schuhwerk and Lippert, 1999).

Hieracium hazslinszkyi Pax; 2n = 3x = 27
Romania, Apuseni Mts., Mt. Bihar, *Picea abies* forest on northern slope on granite.

This is the first chromosome number of this species recognized by Zahn (1938) as a variety of *Hieracium barbatum* Tausch.

Hieracium kotschyanum Heuff.; 2n = 4x = 36 (Fig. 5)
1. Romania, Southern Carpathians, Țarcu Mts., Mt. Tomeasa, 1800 m a.s.l., rocky slope on granite.
2. Romania, Southern Carpathians, Retezat Mts., Mt. Butea, 1770 m a.s.l., grassy slope with *Pinus mugo* communities on granite.
3. Romania, Apuseni Mts., Muntele Mare Mts., Maguri-Răcătău, 600 m a.s.l., on granite rock with *Spiraea ulmifolia*.
4. Romania, Apuseni Mts., Mt. Dobrin, 1550 m a.s.l., grassy slope on *Picea abies* forest margin.

This tetraploid chromosome number does not confirm the triploid count previously published for the species from the same population on Mt. Tomeasa (Mráz and Szeląg, 2004).

Hieracium magocsyanum Jáv.; 2n = 3x = 27 (Fig. 2)
Romania, Southern Carpathians, Retezat Mts., Mt. Butea, 1770 m a.s.l., grassy slope with *Pinus mugo* communities on granite.

This chromosome number confirms the number previously published for the species (Mráz and Szeląg, 2004).

Hieracium mirekii Szeląg; 2n = 4x = 36
Romania, Southern Carpathians, Retezat Mts., Saua ciurila pass, 1800 m a.s.l., open grassy places in *Pinus mugo* communities on granite (*locus classicus* of the species).

This is the first chromosome number for this recently described species (Szeląg, 2006a).

Hieracium naegelianum Pančić; 2n = 3x = 27
Montenegro, Komovi Mts., Mt. Kom Vasojevićki (*locus classicus* of the species), 2310 m a.s.l.

Hieracium naegelianum is known only from triploid populations (Merxmüller, 1975; Grau and Erben, 1988; Buttler, 1991; Vladimirov and Szeląg, 2001b; Niketić et al., 2006; Chrtek et al., 2007). Recently a diploid ploidy level was found in the closely related *H. renatae* Szeląg (Szeląg, 2010).

Hieracium pannosum Boiss. subsp. *pannosum*; 2n = 3x = 27 (Fig. 9)
Macedonia, Šarplanina Mts., Mt. Šija, 1710 m a.s.l., calcareous rocks on road to Mt. Ljuboten.

The same chromosome number was reported in plants from the Stara Planina Mts. in Bulgaria (Chrtek et al., 2007) and from Greece (Strid and Franzén in Löve, 1981; Papanicolaou in Löve, 1984; Schuhwerk and Lippert, 1998). Tetraploids are known from Bulgaria (Vladimirov and Szeląg, 2001b) and Greece (Papanicolaou in Löve, 1984). The only known diploid in *Hieracium pannosum* agg. is *H. petrovae* Vladimirov & Szeląg described from the Rhodope Mts. in Bulgaria (Vladimirov and Szeląg, 2006).

Hieracium polyphyllobasis (Nyár. & Zahn) Szeląg; 2n = 3x = 27
Romania, Retezat Mts., Saua Ciurila pass, 1800 m a.s.l., open grassy places in *Pinus mugo* communities on granite.

This is the first chromosome number for this species.

Hieracium porphyriticum A. Kern.; 2n = 4x = 36
Romania, Apuseni Mts., Mt. Cornul Muntilor, 1460 m a.s.l., open grassy places in *Juniperus alpina* communities (*locus classicus* of the species).

This is the first chromosome number for this species.

Hieracium prenanthoides s. lat.; 2n = 3x = 27 (Fig. 6)
1. Romania, Southern Carpathians, Retezat Mts., Zlătuia valley, 1500 m a.s.l. *Fagus sylvatica* forest on granite.
2. Montenegro, Prokletije Mts., Mt. Vrteno, 1900 m a.s.l. *Picea abies* forest on northern slope.

Further evidence that triploids are the prevailing ploidy level in this collective species (cf. Chrtek, 1996, Chrtek et al., 2007). Diploids seem to be common in the French Alps (Favarger, 1969; Favarger in Löve, 1969; Chrtek et al., 2009), and most likely do not extend beyond this area. Tetraploids were reported from Iceland (Löve, 1970).

Hieracium racemosum Waldst. & Kit. ex Willd. subsp. *racemosum*; 2n = 3x = 27
Serbia, Suva Planina Mts., Mt. Mosor, *Fagus sylvatica-Carpinus orientalis* forest on limestone, 850 m a.s.l.

Triploids prevail among the published chromosome counts for *H. racemosum* s.lat. (Chrtek et al.,

2004) and for *H. barbatum* Tausch [*H. racemosum* subsp. *barbatum* (Tausch) Zahn] (Szeląg and Vladimirov, 2005). Diploids were reported from Austria in a mixed population with triploids, in plants placed in *H. racemosum* subsp. *leiopsis* Murr & Zahn (Schuhwerk and Lippert, 1999). A tetraploid chromosome count was published by Merxmüller (in Moore, 1982) for *H. racemosum* subsp. *crinitum* (Sibth. & Sm.) Zahn.

Hieracium scardicum Borm. & Zahn; 2n = 4x = 36 (Fig. 8)

1. Macedonia, Šarplanina Mts., Mt. Kobelica (*locus classicus* of the species), 2120 m a.s.l., calcareous rock crevices.
2. Macedonia, Šarplanina Mts., Mt. Ljuboten, 2030 m a.s.l., calcareous scree.
3. Macedonia, Korab Mts., Mt. Ništrovski Korab, 2050 m a.s.l., calcareous scree.

This is the first chromosome number for this species.

Hieracium silesiacum E. Krause; 2n = 4x = 36
Czech Republic, Eastern Sudetes, Hrubý Jeseník Mts., Velká Kotlina valley (one of two stations cited in the protologue of the species, cf. Szeląg, 2004a), 1210 m a.s.l., grassy slope on silicate bedrock.

This chromosome number confirms the numbers previously published for the species from the Eastern Sudetes (Chrtek, 1996) and Western Carpathians (Chrtek at al., 2004; Mráz, 2005).

Hieracium sparsum subsp. *ipekanum* Rech. fil. & Zahn; 2n = 4x = 36
Montenegro, Prokletije Mts., Mt. Vreteno, 1570 m a.s.l., *Picea abies* forest on northern slope.

This is the first chromosome number for this taxon known from a few localities in the Prokletije Mts.

Hieracium sparsum subsp. *peristeriense* Behr & Zahn; 2n = 3x = 27
Macedonia, Baba Mts. (*locus classicus* of the species), Mt. Kozji Kamen, 2120 m a.s.l., subalpine grassland on schist.

This is the first chromosome number for this taxon.

Hieracium sparsum subsp. *squarrosobracchiatum* Behr & al.; 2n = 3x = 27
Macedonia, Korab Mts., along road from Stirovica valley to Dlaboka Reka valley, 1790 m a.s.l. (*locus classicus* of the subspecies), rocky slope on *Fagus sylvatica* forest margin.

This is the first chromosome number for this taxon.

Hieracium stygium R. Uechtr 2n = 4x = 36
Poland, Eastern Sudetes, Mt. Śnieżnik Kłodzki, Hala pod Śnieżnikem, 1270 m a.s.l., subalpine meadows with *Festuca supina* and *Nardus stricta*.

Hieracium stygium is the most frequent mountain *Hieracium* species in the Śnieżnik Kłodzki massif (cf. Szeląg, 2000 under *H. chlorocephalum* R. Uechtr.). This is the first chromosome number for the species from Poland, which confirms previously published counts from the Hrubý Jeseník Mts. (Chrtek, 1996) and the Western Carpathians (Chrtek, 1996; Mráz, 2001).

Hieracium tomiasae (Nyár. & Zahn) Nyár.; 2n = 3x = 27 (Fig. 4)
Romania, Southern Carpathians, Țarcu Mts., Mt. Tomeasa, 1800 m a.s.l., rocky slope on granite (*locus classicus* of the species).

This chromosome number confirms the number previously published for the species (Mráz and Szeląg, 2004).

Hieracium tomosense Simk.; 2n = 4x = 36
(*H. transylvanicum* > *H. murorum*)
Romania, Southern Carpathians, Retezat Mts., Zlătuia valley, 1620 m a.s.l., *Picea abies* forest on granite.

This is the first chromosome number for this species, which belongs to *H. praecurrens* agg. morphologically intermediate between *H. murorum* s. lat. and *H. transylvanicum* Heuff. Previously a triploid chromosome count was reported for *H. praecurrens* s. lat. from the Tatra Mts. in the Western Carpathians (Chrtek at al., 2004) and from the Hargita Mts. in the Eastern Carpathians (Mráz and Szeląg, 2004).

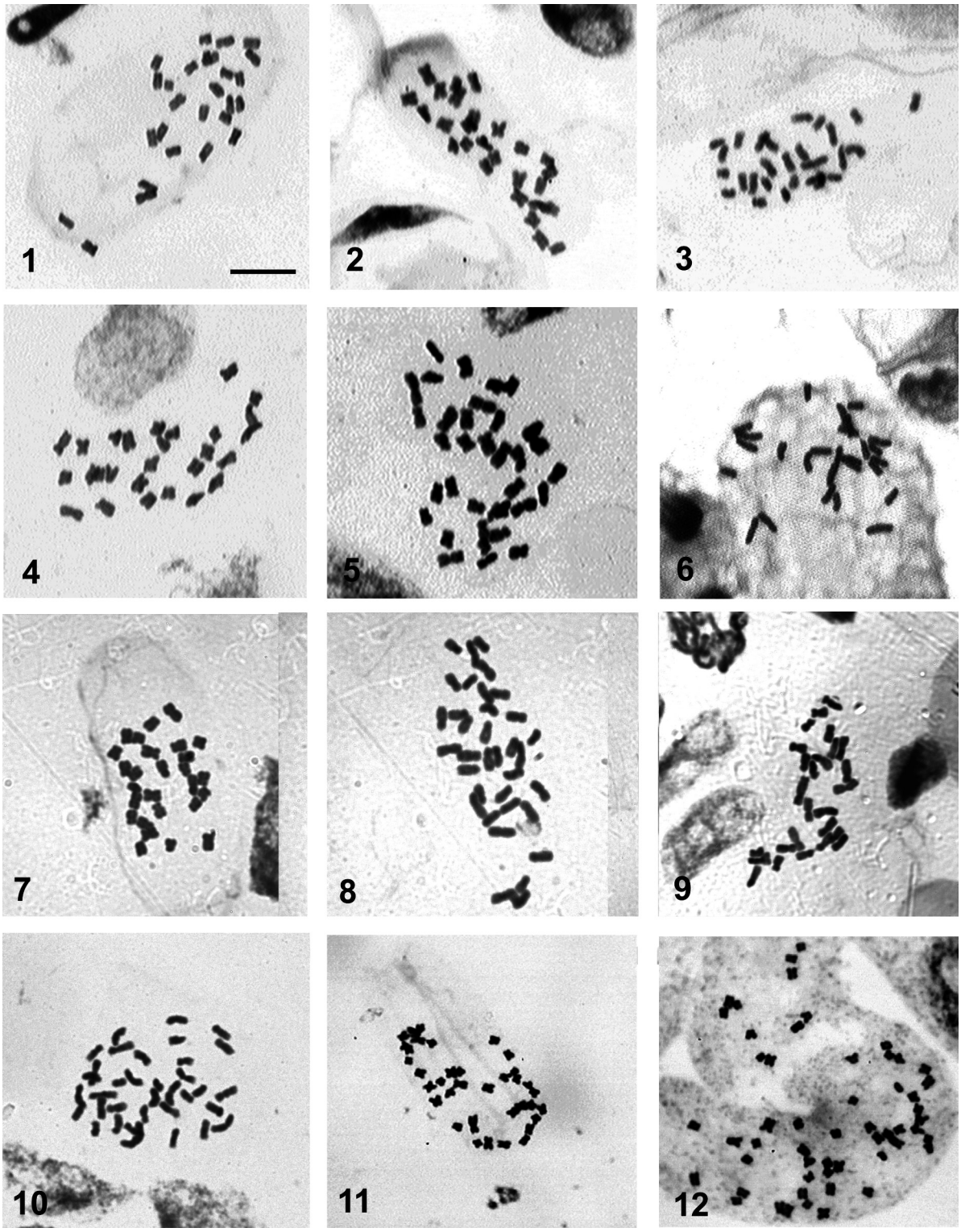
Hieracium transylvanicum Heuff.; 2n = 2x = 18

1. Bosnia and Herzegovina, Vranica Mts., Prokošsko jezero lake, 1570 m a.s.l., *Picea abies* forest on silicate bedrock.
2. Bosnia and Herzegovina, Maglič Mts., Dragaš pass, 1330 m a.s.l., *Picea abies* forest on metamorphic bedrock.
3. Croatia, Samoborska gora Mts., Rude, 300 m a.s.l., *Carpinus betulus* forest on loess
4. Romania, Southern Carpathians, Piatra Craiului Mts., Valea Crâpâturii gorge, 1300 m a.s.l., *Fagus sylvatica* forest on limestone.
5. Slovenia, Macelj Mts., Mt. Donačka gora, 800 m a.s.l., *Fagus sylvatica* forest on metamorphic bedrock,

This chromosome number confirms the number previously published for the species from many parts of its geographical range (Szeląg et al., 2007; Ilnicki et al., 2010).

Hieracium tubulare Nyár., 2n = 4x = 36

1. Romania, Southern Carpathians, Țarcu Mts., Mt. Tomeasa, 1800 m a.s.l., rocky slope on granite.



Figs. 1–12. Metaphase plates of: **Fig. 1.** *Hieracium grisebachii*, 2n = 27. **Fig. 2.** *Hieracium magocsyanum*, 2n = 27. **Fig. 3.** *Hieracium werneri*, 2n = 27. **Fig. 4.** *Hieracium tomiasae* 2n = 27. **Fig. 5.** *Hieracium kotschyanum* (Mt. Dobrin) 2n = 36. **Fig. 6.** *Hieracium prenanthoides* s. lat. (Zlătuia valley) 2n = 27. **Fig. 7.** *Hieracium bifidum* × *H. pojoritense* 2n = 27. **Fig. 8.** *Hieracium scardicum* (Mt. Kobelica) 2n = 36. **Fig. 9.** *Hieracium pannosum* 2n = 27. **Fig. 10.** *Hieracium borbasii* 2n = 36. **Fig. 11.** *Pilosella rothiana* 2n = 36. **Fig. 12.** *Pilosella officinarum* 2n = 54. Bar in Fig. 1 = 10 μm and corresponds to all figures.

2. Romania, Southern Carpathians, Retezat Mts., eastern slope of Mt. Radeşu Mare, 1700 m a.s.l., open places in *Pinus mugo* communities on granite. The *locus classicus* of *H. sparsum* subsp. *chlorocaesioides* Nyár. & Zahn, which was recognized to be conspecific with *H. tubulare* Nyár. (Szeląg, 2006b).

This is the first chromosome number for this species. The triploid chromosome count published by Mráz and Szeląg (2004) belongs to another species (cf. Szeląg, 2006b).

Hieracium vierhapperi (Zahn) Szeląg; 2n = 4x = 36
Austria, Kärnten, Kareck massif (*locus classicus* of the species), Saraberger Wiesen, 1770 m a.s.l., grassy slope with *Juniperus alpina*.

This chromosome number confirms the number previously published for the species from the Alps and the Western Carpathians (Szeląg, 2004b, 2006a).

Hieracium werneri Szeląg; 2n = 3x = 27 (Fig. 3)
Bulgaria, Central Rhodope Mts., Mt. Snežanka, 1860 m a.s.l., along forest road from Pamparovo (*locus classicus* of the species).

This is the first chromosome number for this recently described species (Szeląg, 2006c).

Hieracium sp. 'Aleko'; 2n = 3x = 27
Bulgaria, Vitosha Mts., Aleko, 1800 m a.s.l.

A new, undescribed species of *H.* sect. *Cernua*, morphologically similar to *H. grisebachii* A. Kern. from the Eastern Alps in Austria.

Hieracium sp. 'Mt. Cherni Vrah'; 2n = 3x = 27
Bulgaria, Vitosha Mts., Mt. Cherni Vrah, 2100 m a.s.l.

A new, undescribed species of *H.* sect. *Cernua*, morphologically similar to *H. silesiacum* R. Uechtr. from the Eastern Sudetes and the Western Carpathians in the Czech Republic and Poland.

Hieracium sp. 'Mt. Tomeasa'; 2n = 4x = 36
Romania, Southern Carpathians, Ţarcu Mts., Mt. Tomeasa, 1800 m a.s.l., rocky slope on granite.

A new, undescribed species of *H.* sect. *Cernua*, morphologically similar to *H. tomiasae* from the Retezat Mts. in Romania.

Hieracium sp. 'Mt. Vučak'; 2n = 4x = 36
Serbia, Kopaonik Mts., SE slope of Mt. Vučak, 1770 m a.s.l., grassy places in *Juniperus alpina* communities.
A new, undescribed species of *H.* sect. *Cernua*, morphologically similar to *H. tubulare* from the Retezat Mts. in Romania.

Hieracium sp. 'Mt. Željin'; 2n = 3x = 27
Serbia, Kopaonik Mts., Mt. Željin, 1760 m a.s.l., rocky grassland on granodiorite.

A new, undescribed species of *H.* sect. *Cernua*, morphologically similar to *H. lubricicaule* (Nyár.) Borza from the Retezat Mts. in Romania.

The five above-enumerated undescribed taxa of *H.* sect. *Cernua* are the subject of ongoing studies to be presented separately (Szeląg, in prep.).

Pilosella aurantiaca (L.) F. W. Schultz & Schultz-Bip.; 2n = 3x = 27
Romania, Southern Carpathians, Retezat Mts., Mt. Butea, 1810 m a.s.l., grassy places in *Pinus mugo* communities on granite.

A triploid chromosome number has been published only from Poland (Skalińska, 1967) and New Zealand (Bicknell, 1997). Tetraploids are likely most widespread in this species; pentaploids are less common but repeatedly reported throughout Europe. Higher ploidy levels are rare (for detailed overview see Rotreklová et al., 2002).

Pilosella fusca (Vill.) Arv.-Touv.; 2n = 4x = 36
Romania, Eastern Carpathians, Rareu Mts., below Piatra Doamnei rock, 1500 m a.s.l., damp meadow with *Caltha laeta* in *Picea abies* forest.

This is the first chromosome count from the Carpathians. Tetraploid and pentaploid cytotypes are known from the Bavarian Alps (Schuhwerk and Lippert, 1997). We adopt the name *Pilosella fusca* (= *Hieracium fuscum* Vill.) for plants of the morphological formula *P. aurantiaca* > *P. lactucella*, according to Zahn's (1921–1923) species concept.

Pilosella fusca subsp. *subpedunculata* (Zahn) Szeląg, comb. nova; 2n = 5x = 45.
Basionym: *Hieracium fuscum* subsp. *subpedunculatum* Zahn, Ann. Mus. Nat. Hung. 8: 40. 1910. Holotypus: Flora Hungar. austro-orient. In montibus Szemenik ad Temes-Szlatina, Jul. 1889, V. Borbás (BP s.n.).

Romania, Banat, Semenic Mts., Mt. Semenic, 1400 m a.s.l., grassy places along *Fagus sylvatica* forest margin on summit.

This is the first contribution on the chromosome number for this taxon known from the Semenic Mts. Because *Pilosella* Vaill. and *Hieracium* L. represent two separate genera, a new generic combination is needed.

Pilosella hoppeana subsp. *testimonialis* (Peter) Sell & West; 2n = 2x = 18
Romania, Southern Carpathians, Retezat Mts., Mt. Butea, 1800 m a.s.l., open grassy places in *Pinus mugo* communities on granite.

The same chromosome number was found in this taxon from southwestern Romania (Krahulcová et al. 2009), Bulgaria (Suda et al., 2007; Krahulcová et al., 2009), Greece (Grau and Erben, 1988) and

other parts of Europe (Goldblatt and Johnson, 1979--; Schuhwerk and Lippert, 1997).

Pilosella officinarum F. W. Schultz & Schultz-Bip.; 2n = 6x = 54 (Fig. 12)
Romania, Banat, Mt. Treskovac, 680 m a.s.l., dry pasture on quartzite.

Recently, pentaploid and hexaploid chromosome numbers were published from Banat by Mráz et al. (2008) and Krahulcová et al. (2009).

Pilosella petraea F. W. Schultz & Schultz-Bip.; 2n = 2x = 18
Romania, Banat, Mehedinți Mts., Mt. Suscu, 1150 m a.s.l., calcareous rock crevices.

The species is also known as *Hieracium heuffelii* Janka (cf. Szeląg, 2007). Diploid chromosome counts were published by Mráz (2009) and Szeląg (2007).

Pilosella rothiana (Wallr.) F. W. Schultz & Schultz-Bip.; 2n = 4x = 36 (Fig. 11)
Poland, Lower Vistula valley, Wiosło Duże Reserve, 50 m a.s.l., thermophilous grassland on slope above Vistula River.

This is the first chromosome number for this species from Poland. Previously, tri- and tetraploid chromosome counts were reported for the species (Rotreklová et al., 2002, 2005; Suda et al., 2007). *Pilosella rothiana* is a morphologically intermediate species of presumably hybrid origin between *P. echioides* (Lumn.) F. W. Schultz & Schultz-Bip. and *P. officinarum*. Most recent studies (Trávníček et al., 2011) showed that the whole population of *P. echioides* in the Lower Vistula valley is represented by diploids (sexual), hence hybridogenous taxa are possible.

Pilosella sabina F. W. Schultz & Schultz-Bip.; 2n = 4x = 36
Romania, Mehedinți Mts., Mt. Domugled, 1090 m a.s.l., calcareous rock on summit.

The chromosome number published by Mráz and Szeląg (2004) for *P. cymosa* F. W. Schultz & Schultz-Bip. from Banat in Romania refers to *P. sabina* [= *Pilosella cymosa* subsp. *sabina* (Sebast. & Mauri) H. P. Fuchs]. Four ploidy levels (2x, 3x, 4x, 5x) were published in the *P. cymosa* agg. While the diploid count refers mostly to *P. cymosa* s.str., the rather common tetraploids and very rare pentaploids and hexaploids belong to other taxa within this group (Schuhwerk and Lippert, 1997, 2002; Vladimirov and Szeląg, 2001a; Rotreklová et al., 2005; Suda et al., 2007).

Pilosella ullepitschii (Błocki) Szeląg; 2n = 2x = 18
Poland, Tatra Mts., Przełęcz Liliowe pass below Mt. Świnica, 1970 m a.s.l. (*locus classicus* of the species, cf. Szeląg, 2008) rocky places on granite.

This first record from the Polish part of the Tatra Mts. confirmed data published from the Slovak Tatras (Murín et al., 1999; Mráz, 2003; Šingliarová et al., 2008; Šingliarová and Mráz, 2009) and Romanian Carpathians (Šingliarová et al., 2008; Šingliarová and Mráz, 2009).

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REFERENCES

Bicknell RA. 1997. Isolation of a diploid, apomictic plant of *Hieracium aurantiacum*. *Sexual Plant Reproduction* 10: 168–172.

Buttler KP. 1991. *Hieracium* L. In: Strid A, Tan K [eds.], *Mountain Flora of Greece* 2, 595–642. Edinburgh University Press, Edinburgh.

Chrtek J. 1996. Chromosome numbers in selected species of *Hieracium* (Compositae) in the Sudeten Mts. and the Western and Ukrainian Eastern Carpathians. *Fragmenta Floristica et Geobotanica* 41: 783–790.

Chrtek J. 1997. Taxonomy of the *Hieracium alpinum* group in the Sudeten Mts., the West and the Ukrainian East Carpathians. *Folia Geobotanica et Phytotaxonomica* 32: 69–97.

Chrtek J, Mráz P, and Severa M. 2004. Chromosome numbers in selected species of *Hieracium* s.str. (*Hieracium* subgen. *Hieracium*) in the Western Carpathians. *Preslia* 76: 119–139.

Chrtek J, Mráz P, Zahradníček J, Mateo G, and Szeląg Z. 2007. Chromosome numbers and DNA ploidy levels of selected species of *Hieracium* s.str. (Asteraceae). *Folia Geobotanica* 42: 411–430.

Chrtek J, Zahradníček J, Krak K, and Fehrer J. 2009. Genome size in *Hieracium* subgenus *Hieracium* (Asteraceae) is strongly correlated with major phylogenetic groups. *Annals of Botany* 104: 161–178.

Favarger C. 1969. Notes de caryologie Alpine V. *Bulletin de la Société Neuchâteloise des Sciences Naturelles*. 92: 13–30.

Goldblatt P, and Johnson DE. [eds.] 1979--. *Index to plant chromosome numbers*. Missouri Botanical Garden, St. Louis. (http://mobot.mobot.org/W3T/Search/ipcn.html)

Grau J, and Erben M. 1988. Chromosomenzahlen griechischer Hieracien. *Mitteilungen der Botanischen Staatssammlung München* 27: 97–98.

Ilnicki T, Hasterok R, and Szeląg Z. 2010. Cytogenetic analysis of *Hieracium transylvanicum* (Asteraceae). *Caryologia* 63: 192–196.

Krahulcová A, Krahulec F, and Chapman HN. 2000. Variation in *Hieracium* subgen. *Pilosella* (Asteraceae): What do we know about its sources? *Folia Geobotanica* 35: 319–338.

KRAHULCOVÁ A, VLADIMIROV V, KRAHULEC F, and BRÄUTIGAM S. 2009. The agamic complex of *Pilosella* (Asteraceae) in Bulgaria and SW Romania: variation in ploidy level and breeding systems. *Phytologia Balcanica* 15: 377–384.

LÖVE Á. 1969. IOPB Chromosome number reports XXII. *Taxon* 18: 433–442.

LÖVE Á. 1970. *Íslenzk ferðaflóra [Flora of Iceland]*. Almenna Bókafélagid, Reykjavík.

LÖVE Á. 1981. IOPB Chromosome number reports LXXIII. *Taxon* 30: 829–861.

LÖVE Á. 1984. IOPB Chromosome number reports LXXXII. *Taxon* 33: 126–134.

MERXMÜLLER H. 1975. Diploide Hieracien. *Anales del Instituto Botánico A. J. Cavanilles* 32: 189–196.

MOORE DM. 1982. *Flora Europaea Check-List and Chromosome Index.* Cambridge University Press, Cambridge.

MRÁZ P. 2001. Chromosome numbers in selected species of *Hieracium* sect. *Alpina* from Central and Eastern Europe. *Folia Geobotanica* 36: 321–332.

MRÁZ P. 2003. *Hieracium piliferum* group (Asteraceae) in the West Carpathians. *Biologia* 58: 29–36.

MRÁZ P. 2005. *Hieracium silesiacum* (Asteraceae) in Poland. *Polish Botanical Journal* 50: 65–68.

MRÁZ P. [ed.] 2009. Chromosome number and DNA ploidy level reports of vascular plants 4. *Biologia* 64: 1085–1088.

MRÁZ P, CHRTEK J, and ŠINGLIAROVÁ B. 2009. Geographical parthenogenesis, genome size variation and pollen production in the arctic-alpine species *Hieracium alpinum*. *Botanica Helvetica* 119: 41–51.

MRÁZ P, ŠINGLIAROVÁ B, URFUS T, and KRAHULEC F. 2008. Cytogeography of *Pilosella officinarum* (Compositae): Altitudinal and longitudinal differences in ploidy level distribution in the Czech Republic and Slovakia and the general pattern in Europe. *Annals of Botany* 101: 59–71.

MRÁZ P, and SZELĄG Z. 2004. Chromosome numbers and reproductive systems in selected species of *Hieracium* and *Pilosella* (Asteraceae) from Romania. *Annales Botanici Fennici* 41: 405–414.

MURÍN A, SVOBODOVÁ Z, MÁJOVSKÝ J, and FERÁKOVÁ V. 1999. Chromosome numbers of some species of the Slovak flora. *Thaiszia* 9: 31–40.

NIKETIĆ M, VLADIMIROV V, and MRÁZ P. 2006. Chromosome numbers and taxonomic-chorological notes on selected species of *Hieracium* s.str. (Asteraceae) from Montenegro. *Phytologia Balcanica* 12: 85–97.

RONIKIER M, and SZELĄG Z. 2008. Differentiation among disjunct populations of agamospermous species of *Hieracium* section *Cernua* (Asteraceae) in Central European subalpine habitats. *Botanical Journal of the Linnean Society* 158: 93–105.

ROTREKLOVÁ O, KRAHULCOVÁ A, VAŇKOVÁ D, PECKERT T, and MRÁZ P. 2002. Chromosome numbers and breeding systems in some species of *Hieracium* subgen. *Pilosella* from Central Europe. *Preslia* 74: 27–44.

ROTREKLOVÁ O, KRAHULCOVÁ A, MRÁZ P, MRÁZOVÁ V, MÁRTONFIOVÁ L, PECKERT T, and ŠINGLIAROVÁ B. 2005. Chromosome numbers and breeding systems of some European species of *Hieracium* subgen. *Pilosella*. *Preslia* 77: 177–195.

SCHUHWERK F, and LIPPERT W. 1997. Chromosomenzahlen von *Hieracium* (Compositae, Lactuceae) Teil 1. *Sendtnera* 4: 181–206.

SCHUHWERK F, and LIPPERT W. 1998. Chromosomenzahlen von *Hieracium* (Compositae, Lactuceae) Teil 2. *Sendtnera* 5: 269–286.

SCHUHWERK F, and LIPPERT W. 1999. Chromosomenzahlen von *Hieracium* (Compositae, Lactuceae) Teil 3. *Sendtnera* 6: 197–214.

SCHUHWERK F, and LIPPERT W. 2002. Chromosomenzahlen von *Hieracium* (Compositae, Lactuceae) Teil 4. *Sendtnera* 8: 167–194.

SKALIŃSKA M. 1967. Cytological analysis of some *Hieracium* species, subgenus *Pilosella*, from mountains of southern Poland. *Acta Biologica Cracoviensia Series Botanica* 10: 127–141.

SKAWIŃSKA R. 1963. Apomixis in *Hieracium alpinum* L. *Acta Biologica Cracoviensia Series Botanica* 5: 7–14.

STACE CE. 1989. *Plant Taxonomy and Biosystematics*. E. Arnold, Cambridge.

STACE CE, GORNALL LJ, SQUIRRELL J, and SHI Y. 1995. Chromosome numbers in *Hieracium* L. section *Alpina* (Fries) F. N. Williams [sic!]. *Watsonia* 20: 367–377.

SUDA J, KRAHULCOVÁ A, TRÁVNÍČEK P, ROSENBAUMOVÁ R, PECKERT T, and KRAHULEC F. 2007. Genome size variation and species relationships in *Hieracium* sub-genus *Pilosella* (Asteraceae) as inferred by flow cytometry. *Annals of Botany* 100: 1323–1335.

SZELĄG Z. 2000. Vascular plants of the Śnieżnik Massif and the Góry Bialskie Mts. *Fragmenta Floristica Geobotanica Polonica Supplementum* 3: 3–255 (in Polish with English summary).

SZELĄG Z. 2003. A Synopsis of *Hieracium* sect. *Cernua* (Asteraceae). *Polish Botanical Journal* 48: 87–95.

SZELĄG Z. 2004a. Taxonomic and nomenclatural notes on *Hieracium silesiacum* (Asteraceae). *Polish Botanical Journal* 49: 15–20.

SZELĄG Z. 2004b. Taxonomic and nomenclatural notes on *Hieracium* sect. *Cernua* (Asteraceae) in the Alps. *Polish Botanical Journal* 49: 111–115.

SZELĄG Z. 2006a. Taxonomic revision of *Hieracium* sect. *Cernua* (Asteraceae) in the Carpathians, Sudetes and Alps. *Polish Botanical Journal* 51: 97–153.

SZELĄG Z. 2006b. Taxonomic and nomenclatural notes on *Hieracium tubulare* (Asteraceae) with description of a new species from the Eastern Carpathians. *Annales Botanici Fennici* 43: 310–314.

SZELĄG Z. 2006c. Hieracia balcanica III. A new species in *Hieracium* sect. *Cernua* (Asteraceae) from Bulgaria. *Polish Botanical Journal* 51: 25–29.

SZELĄG Z. 2007. Hieracia balcanica IV. The correct names for *Hieracium oreades* Heuff. (Asteraceae). *Annales Botanici Fennici* 44: 463–464.

SZELĄG Z. 2008. Taxonomic and nomenclatural notes on *Pilosella alpicola* agg. (Asteraceae) in the Balkans and Carpathians. *Annales Botanici Fennici* 45: 301–306.

SZELĄG Z. 2010. Hieracia balcanica V. A new diploid species in *Hieracium* sect. *Naegeliana* (Asteraceae) from Macedonia. *Annales Botanici Fennici* 47: 315–319.

SZELĄG Z, ILNICKI T, NIKETIĆ M, and TOMOVIĆ G. 2007. Diploid chromosome numbers in five *Hieracium* species from

Serbia and Montenegro. *Acta Biologica Cracoviensia Series Botanica* 49: 119–121.

Szeląg Z, and Jankun A. 1997. Tetraploid *Hieracium alpinum* in the Polish Tatra Mts. *Fragmenta Floristica et Geobotanica* 42: 190–192.

Szeląg Z, and Vladimirov V. 2005. Chromosome numbers of Polish *Hieracia* (Asteraceae). *Polish Botanical Journal* 50: 139–143.

Šingliarová B, and Mráz P. 2009. A taxonomic revision of the *Pilosella alpicola* group (Asteraceae, Lactuceae) in the Carpathians. *Preslia* 81: 23–41.

Šingliarová B, Chrtek J, and Mráz P. 2008. Loss of genetic diversity in isolated populations of an alpine endemic *Pilosella alpicola* subsp. *ullepitschii*: effect of long-term vicariance or long-distance dispersal? *Plant Systematic and Evolution* 275: 181–191.

Trávníček P, Dočkalová Z, Rosenbaumová R, Kubátová B, Szeląg Z, and Chrtek J. 2011. Bridging global and microregional scales: ploidy distribution in *Pilosella echioides* (Asteraceae) in Central Europe. *Annals of Botany* 107: 443–454.

Vladimirov V, and Szeląg Z. 2001a. Chromosome numbers of six species of the genus *Hieracium*, subgenus *Pilosella* (Asteraceae) from Bulgaria. *Polish Botanical Journal* 46: 269–273.

Vladimirov V, and Szelag Z. 2001b. Reports (1271–1277). In: Kamari G, Blanché C, Garbari F [eds.] *Mediterranean chromosome number reports 11. Flora Mediterranea* 11: 478–483.

Vladimirov V, and Szeląg Z. 2006. A new diploid species of *Hieracium* sect. *Pannosa* (Asteraceae) from Bulgaria. Botanical *Journal of the Linnean Society* 150: 261–265.

Zahn KH. 1910. Die ungarischen Hieracien des Ungarischen National-Museums zu Budapest, zugleich V. Beitrag zur Kenntnis der Hieracien Ungarns und der Balkanländer. *Annales Musei Nationalis Hungarici* 8: 34–106.

Zahn KH. 1921–1923. *Hieracium* L. In: Engler A (ed.), *Das Pflanzenreich Regni Vegetabilis Conspectus* IV/280: 1–1705. Wilhelm Engelmann, Leipzig.

Zahn KH. 1938. *Hieracium* L. In: P. Graebner fil. [ed.], *Synopsis der Mitteleuropäischen Flora*. 12(3): 1–708. Borntraeger, Berlin.