Chromosome numbers in selected species of *Hieracium* s. str. (*Hieracium* subgen. *Hieracium*) in the Western Carpathians

Počty chromozomů vybraných druhů rodu *Hieracium* s. str. (*Hieracium* podrod *Hieracium*) ze Západních Karpat

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Chromosome numbers of 23 species (including subspecies) of *Hieracium* s. str. from the Western Carpathians are presented. First chromosome numbers are reported for *Hieracium kuekenthalianum* (= *H. tephrosoma*, 2n = 36), *H. praecurrens* (2n = 27) and *H. virgicaule* (2n = 27); first counts from the Western Carpathians are given for *H. atratum* (2n = 27), *H. bifidum* (2n = 27, 36), *H. carpathicum* (2n = 36), *H. inuloides* (2n = 27), *H. jurassicum* (2n = 27), *H. macilentum* (= *H. epimedium*, 2n = 27), *H. nigritum* (2n = 36), *H. pilosum* (= *H. morisianum*, 2n = 27) and *H. silesiacum* (2n = 36). New ploidy level (tetraploid, 2n = 36) is reported for *H. bupleuroides*, hitherto published counts refer only to triploids (2n = 27). Previously published chromosome numbers were confirmed for several other species, i.e. *H. alpinum* (s.str., 2n = 27), *H. bupleuroides* (2n = 27), *H. crassipedipilum* (*H. fritzei* group, 2n = 27, 36), *H. lachenalii* (2n = 27), *H. murorum* (2n = 27), *H. prenanthoides* (2n = 27), *H. racemosum* (2n = 27), *H. sabaudum* (2n = 27), *H. slovacum* (*H. fritzei* group, 2n = 36), and *H. umbellatum* (2n = 18). Triploids and tetraploids predominate, diploids (2n = 18) were found in *H. umbellatum*. A comprehensive list of previously published chromosome numbers in *Hieracium* s. str. from the Western Carpathians is provided.

K e y w o r d s : *Asteraceae*, chromosome numbers, *Hieracium,* Slovakia

Introduction

The genus *Hieracium* L. in the narrow sense (*Hieracium* subgen. *Hieracium*) belongs to one of the taxonomically most intricate groups of vascular plants. It is well known as one in which agamospermy is widespread. Many more or less stabilized agamospermous strains (clones) have been described at specific or subspecific rank. The species concept in *Hieracium* has long been a matter of discussion (see e.g. Schuhwerk 2002). The Central European school of hieraciology (founded by Nägeli and Peter) follows a broad species definition (species are then divided into subspecies, varieties, etc.); on the other hand, Scandinavian and British botanists, together with those from the former Soviet Union follow a narrow species concept, i.e. almost every morphologically recognizable type is given specific rank ("microspecies").

Hieracium s. str. comprises an immense agamic complex with a base-number of x = 9. Triploids and tetraploids form the bulk of taxa investigated so far. Diploids (2n = 18) are

rather rare and supposed to be confined to certain geographical areas. They have been reported mostly from SW Europe, namely *H. cordifolium* Lapeyr. (Schuhwerk & Lippert 1998), *H. flocculiferum* Zahn (Schuhwerk & Lippert 1998), *H. rupicaprinum* Arv.-Touv. et Gautier (Schuhwerk & Lippert 1998), *H. eriophorum* St. Amans, *H. hispanicum* Arv.-Touv., *H. laniferum* Cav. s.l., *H. lucidum* Guss. (Merxmüller 1975), *H. cerinthoides* L. (Delay 1969), and from the Eastern and Southern Carpathians, namely *H. alpinum* L. (Chrtek 1997, Mráz 2001a, Mráz 2003c), *H. augusti-bayeri* (Zlatník) Chrtek f. (Chrtek 1997), *H. conicum* Arv.-Touv. (Chrtek 1996, Mráz 2003c ut *H. hryniawiense* Woł.), *H. pojoritense* Woł. (Ştefureac & Tăcină 1979, Mráz 2003c) and *H. transsilvanicum* Heuff. (Pashuk 1987, Chrtek 1996, Mráz 2003c; for diploid *H. transsilvanicum* see also Rosenberg 1927). A few diploids have been found in the Alps, i.e. *Hieracium porrifolium* L. (Favarger 1965), and *H. intybaceum* All. (Favarger 1997; apart from diploids, triploid and tetraploid cytotypes have also been reported in this species). Some diploids have been discovered in the Asian part of Russia, i.e. *Hieracium korshinskyi* Zahn (Rostovtseva 1983), *H. filifolium* Juxip (Krasnikov in Tupitsyna 1997), *H. narymense* Schischk. et Serg. (Krogulevič 1978), and *H. virosum* Pall. (Pulkina & Tupitsyna 2000), and in the Balkan Peninsula, i.e. *H. waldsteinii* Tausch (Schuhwerk & Lippert 1999), *H. sparsum* Friv. (Christoff 1942, Vladimirov & Szeląg 2001), and *H. kittanae* Vladimirov (Vladimirov 2003). Further diploid counts have also been reported from the geographically rather widespread and karyologically differentiated (two or three ploidy levels) species (in the broad sense), such as *H. umbellatum* L. (diploid cytotype seems to be common, apomictic triploids also reported), *H. sabaudum* L., *H. prenanthoides* Vill., *H. laevigatum* Willd. and *H. racemosum* Waldst. et Kit. ex Willd. (but polyploids most probably prevail in the last four species) (Schuhwerk 1996, Schuhwerk & Lippert 1999). Diploid cytotypes have also been found in the otherwise polyploid (3x, 4x) *Hieracium bifidum* Kit. ex. Hornem. (Rosenberg 1927), and *H. glaucinum* Jord. [Natarajan 1981, *H. jaubertianum* Timb. et Loret, *H. glaucinum* subsp. *jaubertianum* (Timb. et Loret)]. Diploid *H. speciosum* Hornem. was reported by Gentcheff & Gustafsson (1940).

Published chromosome numbers above the tetraploid level are very rare. Pentaploid counts (2n = 45) come from British Isles (Stace et al. 1995; unnamed taxon from *H.* sect. *Alpina* F. N. Williams), the Sudeten Mts, Czech Republic [Chrtek 1996; *Hieracium chrysostyloides* (Zahn) Chrtek f.], and Siberia (Pulkina & Tupitsyna 2000; *Hieracium virosum* Pall.). Hexaploids (2n = 54) and heptaploids (2n = 63) were found in *Hieracium virosum* (Pulkina & Tupitsyna 2000). Aneuploids are very rare (for references see Schuhwerk 1996).

As far as we are aware, the diploids are sexual, and the triploids, tetraploids and pentaploids agamospermous. Development of the unreduced embryo sac follows the "Antennaria type" of diplospory i.e. the female meiosis is fully omitted (e.g. Nogler 1984). All previously studied plants showed autonomous endosperm development, the plants not requiring pollination. However, irregularities were reported showing remnants of sexual processes in some *Hieracium* (s. str.) species (e.g. Bergman 1941). Irregularities were also detected in the course of microsporogenesis. While in the sexual diploid plants the reduction division of pollen mother cells is, not surprisingly, normal, in polyploid agamospermous plants a graded series of degeneration of meiosis has been observed (Rosenberg 1927, Gentcheff 1937, Gentcheff & Gustafsson 1940, Aparicio 1994). Thus, polyploid taxa differ markedly from each other in their ability to produce viable pollen grains.

As shown above, chromosome data can indicate breeding behaviour and patterns of variation in hawkweeds, and are therefore of great value. Unfortunately, our knowledge of chromosome numbers in this genus is still incomplete and much needs to be done to remedy this situation.

The genus *Hieracium* in the Western Carpathians

The Western Carpathians are in the eastern part of Central Europe. They lie mostly in the territory of Slovakia, the northernmost part is within the borders of Poland, westwards they extend to the Czech Republic and Austria, and southwards to Hungary. The highest mountain range are the Tatry Mts (highest peak Gerlachovský štít, 2654.4 m a.s.l.).

Zahn (1930–1939) in his account of Central European hawkweeds recognized 65 species (broad species concept = species groups) in the Western Carpathians. Later some groups of mountain hawkweeds were thoroughly revised and new taxonomic concepts were proposed. This concerns the *Hieracium alpinum* group (Chrtek 1997), the *H. fritzei* group (Chrtek & Marhold 1998), the *H. rohacsense* group (Mráz 2001a, 2002), and the *H. piliferum* group (Szeląg 2001, Mráz 2003a) (species groups correspond to species in a broad sense).

There have been relatively few chromosome studies on *Hieracium* in this region. Chromosome counts have been reported by Skalińska et al. (1959), Skawińska (1963), Májovský (1970a, 1970b, 1974, 1976, 1978), Uhríková & Feráková (1977), Hindáková & Májovský (1977), Mičieta (1978), Murín & Paclová (1979), Murín & Májovský (1987, 1992), Hrušovská-Osuská (1988), Chrtek (1996, 1997), Szeląg & Jankun (1997), Schuhwerk & Lippert (1999), Májovský et al. (2000) and Mráz (2001b, 2003a, 2003c). Karyotype analysis was given for several previously counted *Hieracium* taxa by Uhríková (1975). Chromosome counts are also included in the above mentioned taxonomic treatments of particular species groups.

To sum up, there have previously been counts for 16 species (in the broad sense) from the Western Carpathians. Nevertheless, most of these species (in the broad sense) can be split into morphologically more or less easily distinguishable units which often differ from each other with respect to their chromosome numbers (see e.g. Chrtek & Marhold 1998). On the other hand, there is probably little (if any) variation in chromosome number within each "unit" (subspecies, microspecies) (see also Stace et al. 1995).

In this paper we report the chromosome numbers of 23 species (in several cases subspecies are recognized) from the Western Carpathians (see also Append. 1, where both previously published and new counts from the Western Carpathians are summarized).

Material and methods

Plants

Plants were collected between 1996–2003 from their natural habitats in the Slovakian part of the Western Carpathians and transplanted into the experimental garden in Průhonice near Praha (J. Ch., M. S., Institute of Botany, Academy of Sciences of the Czech Republic)

and Košice (P. M., Botanical Garden of the P. J. Šafárik University). Pot grown plants were kept in either field conditions or in an unheated greenhouse. Voucher specimens are deposited in Herbarium of the Institute of Botany, Academy of Sciences of the Czech Republic, Průhonice (PRA, plants counted by J. Ch.), Herbarium of the Charles University, Praha (PRC, M. S.) and Herbarium P. Mráz, now at the Institute of Biology and Ecology, P. J. Šafárik University, Košice (P. M.). The numbers given in parentheses after each locality refer to cultivation numbers.

Chromosome numbers

The studies were made on the pot-grown plants. Two different methods were used:

1. Actively growing roots were placed into pretreatment solution of saturated p-dichlorbenzene and kept for 3–4 hours at room temperature, then fixed in a mixture of ethanol and acetic acid (3:1) and stored in 70% ethanol. The squash method and staining by lacto-propionic orcein were used (Dyer 1963; method used by J. Ch. and M. S.),

2. Root tips were pre-treated with 0.5% solution of colchicine for 1.5–3 hours at room temperature, subsequently fixative (absolute ethanol and glacial acetic acid, 3:1) replaced colchicine, roots were stored in 70% ethanol and hydrolysed for 7–10 minutes in 1N HCl at 60 °C. The squash and smear method with cellophane replacing the glass covers followed Murín (1960). Giemsa solution in phosphate buffer was used as a stain (method used by P. M.).

Taxonomic treatment

The state of knowledge of particular groups of hawkweeds of the Western Carpathians is not equal. Some groups (species in a broad sense, species collectivae sensu Zahn) were recently studied taxonomically and it seems justified to distinguish well defined and recognizable taxa at the species rank within them. Therefore, we use a term "species group" in such cases. On the other hand, classification of less known species (in a broad sense) follows that of Zahn (1930–1939), i.e. the studied plants are (whenever possible) determined to subspecies. Whenever recent taxonomic treatment of a group in the Western Carpathians is not available, we follow the monograph by Zahn (1930–1939).

The species and species groups are arranged alphabetically. The number of quadrats of grid mapping project of Central Europe (Niklfeld 1971) is given in parentheses after the geographic co-ordinates of each locality.

Results and discussion

Hieracium alpinum group: *H. alpinum* L. 2n = 27

Localities: **1**. Belianske Tatry Mts, Ždiar: Monkova dolina valley, 1780–1800 m a.s.l., 49°14'16" N, 20°12'55" E (6787c), coll. P. Mráz and V. Jurkovičová, 8 VIII 2000 (1 plant no. 842, 2n = ca 27, counted by P. M.). – **2**. Vysoké Tatry Mts, Štrbské Pleso: Mengusovská dolina valley, Satanov žľab, ca 1800 m a.s.l., 49°10'00" N, 20°03'27.8" E (6886a), coll. P. Mráz and V. Mrázová, 12 VIII 2001 (1 plant no. 1126, 2n = 27, counted by P.M.). – **3**. Vysoké Tatry Mts, Štrbské Pleso: Zlomisková dolina valley, 1900 m a.s.l., 49°09'47" N, 20°06'20" E (6886b), coll. P. Mráz and V. Jurkovičová, 7 VIII 2000 (1 plant no. 850, 2n = ca 27, counted by P. M.).

The counts presented here confirm references from the Western Carpathians (Skalińska in Skalińska et al. 1959, Skawińska 1963, Uhríková & Murín in Májovský 1970b, Murín in Murín & Májovský 1992, Chrtek 1997, Mráz 2001b, Chrtek in Štorchová et al. 2002). The only tetraploid count from the area was published by Szeląg & Jankun (1997), based on plants from Mt Ornak (Tatry Zachodnie Mts, Poland). On the other hand, diploid plants of *H. alpinum* have been reported from the Eastern Carpathians (Ukraine, Romania) (Chrtek 1997; Mráz 2001b, 2003c) and from Southern Carpathians (Romania) (Mráz 2003c). In the Carpathians, the diploid and triploid cytotypes are non-overlapping (strictly confined to the eastern, southern and western parts, respectively).

Triploids have been reported from other parts of the distribution area. The counts come from the Krkonoše Mts (the Sudeten Mts, Czech Republic) (Měsíček in Měsíček & Jarolímová 1992, Chrtek 1994), the Alps (Huber & Baltisberger 1992), Scandinavia (Engelskjön & Knaben 1971), British Isles (Stace et al. 1995), Iceland (Löve 1970), Greenland (Böcher & Larsen 1950, Jørgensen et al. 1958, Gadella & Kliphuis in Löve 1971), and from the Usa river basin in the Komi Republic, NW Russia (Sokolovskaya 1970). Aneuploidy (2n = 26) derived from a triploid cytotype was reported by Sokolovskaya & Strelkova (1960) from the Khibiny Mts, NW Russia.

However, due to varied use of the name *Hieracium alpinum* (in both broad and narrow sense) some counts may refer to another closely related species (microspecies).

Hieracium atratum Fr. 2n = 27

(*H. alpinum* < *H. murorum*)

Localities: **1**. Vysoké Tatry Mts, Štrbské Pleso: Mengusovská dolina valley, by the marked path, 1600 m a.s.l., 49°09'50" N, 20°04'40" E (6886a), coll. P. Mráz and V. Jurkovičová, 6 VIII 2000 (1 plant no. 835, 2n = 27, counted by P. M.). – **2**. Západné Tatry Mts, Roháče mountain group, Zuberec: Roháčske plesá mountain lakes, near the marked path above the lowest lake, 11 km SE of the village, 1590 m a.s.l., 49°12'26" N, 19°44'31" E (6784c), coll. J. Chrtek jun., 12 VII 2003 (2 plants no. H 854/1, H 854/2, 2n = 27, counted by J. Ch.).

Hieracium atratum belongs to the taxonomically most complex groups of mountain hawkweeds. Zahn (1930–1939) recognized 8 subspecies in the Western Carpathians, 6 being endemic to this area. However, there remain many unresolved taxonomic questions and the species needs a detailed revision, not only in the Western Carpathians.

Our plants belong to grex *atratum*. The plants conform well to herbarium specimens from the Tatry Mts deposited in BP and determined by K. H. Zahn as *H. atratum* subsp. *atrellum*, *H. atratum* subsp. *atrellum* var. *furkotanum* Zahn and *H. atratum* subsp. *atrellum* var. *greineri* Korb et Zahn (the latter names seem to be synonyms) (P. Mráz, pers. observ.). The counts are the first from the Western Carpathians. Based on hitherto published counts, *H. atratum* includes both triploids and tetraploids. Triploids have been reported from Greenland (Jørgensen et al. 1958) and from the Krkonoše Mts (the Sudeten Mts, Czech Republic) (Chrtek 1994). Tetraploid counts come from the Krkonoše Mts (Chrtek 1994) and British Isles (Mills & Stace 1974; microspecies *H. chrysolorum* P. D. Sell et C. West).

Hieracium bifidum Kit. ex Hornem. 2n = 27, 36

Localities: **1**. Veľká Fatra Mts, Turecká: Malá Ramžiná valley, southern slope below the elevation 1497 m a.s.l., ca 1 km WSW of Mt. Krížna (1574), 1340 m a.s.l., 48°52'34" N, 19°04'02" E (7180a), coll. P. Mráz, 12 VII 1997 (2 plants no. 376, 377, 2n = 36, counted by P. M.). – **2**. Slovenský raj, distr. Spišská Nová Ves, Spišské Tomášovce: "Prielom Hornádu" river valley, near the confluence with the Biely potok brook, 2 km SSW of the

village, 530 m a.s.l., 48°56'42" N, 20°27'23" E (7088d), coll. J. Chrtek jun., 12 VIII 2003 (3 plants no. H 883/1–3 , 2n = 36, counted by J. Ch.). – **3**. Slovenský raj, distr. Spišská Nová Ves, Spišské Tomášovce: near the marked path between settlements of Čingov and Ďurkovec, 2 km SSE of the village, 540 m a.s.l., 48°56'40" N, 20°28'45" E (7088d), coll. J. Chrtek jun., 12 VIII 2003 (3 plants no. H 884/1–3 , 2n = 36, counted by J. Ch.). – **4**. Slovenský raj, distr. Spišská Nová Ves, Dedinky: "Glac" plateau, above the Veľký Sokol valley, 4.5 km N of the village, near marked path in a beech forest, 930 m a.s.l., 48°54'25" N, 20°22'55" E (7088c), coll. J. Chrtek jun., 5 VIII 2002 (3 plants no. H 838/1–3 , 2n = 36, counted by J. Ch.). – **5**. Západné Tatry Mts, Sivý vrch mountain group: Radové skaly calcareous rocks, 5.3 km SSE of Zuberec, 1620 m a.s.l., 49°12'43" N, 19°37'53" E (6783d), coll. J. Chrtek jun., 11 VII 2003 (3 plants no. H 856/1–3 , 2n = 27, counted by J. Ch.).

Hieracium bifidum is a morphologically extremely variable taxon. Zahn (1930–1939) reported 39 subspecies from the Western Carpathians, their taxonomic value needs confirmation. Our plants differ morphologically from each other, and can be placed into two different groups of subspecies (greges). While plants from localities 1 and 5 belong to a group of subspecies (grex) *bifidum* (Zahn 1930–1939, phyllaries and peduncles with dense stellate hairs, whitish, shortly dark-based simple eglandular hairs and only occasional glandular hairs), the remaining plants (localities 2–4) share some characters of *Hieracium murorum* and obviously belong to a group of subspecies (grex) *subcaesium* (Zahn 1930–1939, phyllaries and peduncles with scattered to numerous stellate hairs, rather dark simple eglandular hairs, and scattered, sometimes numerous glandular hairs).

A triploid count for *H. bifidum* from the subalpine part of Mt Pilsko (the Západné Beskydy Mts) was reported by Murín & Uhríková in Májovský (1970a). However, it was searched for by P. M. in 1997, 1998, and 2000 without success (P. Mráz et al., unpubl.). The report is probably based on misidentified plants of *H. lachenalii.* This taxon was recently karyologically analysed from summit part of Mt Pilsko (see this species below).

Triploid and tetraploid counts were found by P. Mráz & Z. Szeląg (unpubl.) in the Romanian Carpathians. Diploids, triploids and tetraploids are among the counts previously published from different parts of the distribution area (for counts published until 1996 see Schuhwerk 1996, for recently published ones see Schuhwerk & Lippert 1999). However, the only diploid count comes from a plant cultivated in a botanical garden (Rosenberg 1927, see also above). Among the polyploids, triploids are the most common.

Hieracium bupleuroides C.C. Gmel. 2n = 27, 36

L o c a l i t i e s : **1**. Nízke Tatry Mts, Ilanovo: Machnaté sedlo saddle, ca 2 km NW of Mt. Krakova hoľa (summit), 1473 m a.s.l., 48°59'38.8" N, 19°37'20.7" E (7083b), coll. P. Mráz and V. Mrázová, 13 VII 2001 (1 plant no. 1083 2n = 36; 1084 2n = ca 36, counted by P. M.). – **2**. Západné Tatry Mts, Sivý vrch mountain group: Biela skala, 4.8 km S of Zuberec, calcareous rocks, 1300 m a.s.l., 49°12'57" N, 19°37'00" E (6783d), coll. J. Chrtek jun., 11 VII 2003 (2 plants no. H 850/1,2, 2n = 27, counted by J. Ch.). – **3**. Slovenský raj, distr. Spišská Nová Ves, Hrabušice: Veľký Sokol valley, lower part near the marked path, 7.5 km SW of the village, 640 m a.s.l., 48°55'55" N, 20°20'08" E (7088c), coll. J. Chrtek jun. and K. Chrtková, 5 VIII 2002 (3 plants no. H 837/1–3 , 2n = 27, counted by J. Ch.). – **4.** Revúcka vrchovina highlands, distr. Rožňava, Vyšná Slaná, Mt. Veľký Radzim (998.5), calcareous rocks on the southern slopes, ca 970 m a.s.l., 48°45'30" N, 20°20'23" E (7288a), coll. P. Mráz and J. Mráz, 26 VIII 2003 (1 plant no. 1440, 2n = 27, counted by P. M.). – **5**. Muránska planina plateau, Závadka nad Hronom: Mt. Malá Stožka (1204), calcareous rocks E of the summit, 1970 m a.s.l., 48°46'30" N, 19°55'55" E (7285b), coll. M. Severa, 5 VII 2000 (3 plants no. MSB 13/1–3, 2n = 27, counted by M. S.). – **6**. Belianske Tatry Mts, Ždiar: Monkova dolina valley, near the marked path 4.2 km SW of the village, 1500 m a.s.l., 49°14'55" N, 20°13'33" E (6787c), coll. M. Severa & J. Chrtek jun., 6 VII 2000 (3 plants, MSB 17/1–3, 2n = 27, counted by M. S.).

Hieracium bupleuroides is a somewhat variable species in the Western Carpathians. Zahn (1930–1939) recognized 7 subspecies in the area; the taxonomic value of some of them requires further confirmation. Our material can be identified with at least two different sub-

species. Plants from localities 2, 5 and 6 belong to subsp. *gmelinianum* Zahn (distinct basal rosette of leaves, few to 15 (–20) stem leaves, involucral bracts with stellate hairs, scattered simple eglandular hairs and towards the top with occasional glandular hairs). On the other hand, plants from the localities 3 and 4 can be identified with subsp. *tatrae* (Griseb.) Nägeli et Peter (basal leaves often withering at the time of flowering, rather numerous stem leaves, involucral bracts with stellate hairs, without simple eglandular and glandular hairs). The tetraploid count from the locality no. 1 (the Nízke Tatry Mts) is new for the species. The plant is almost glabrous, stellate hairs are dense on peduncles and scattered on involucral bracts, the simple eglandular and glandular trichomes are missing; the leaves are almost entire.

This is the second reference on ploidy level in *H. bupleuroides* from the Western Carpathians. A triploid accession has been reported from southern Slovakia, from a relic locality at a very low altitude (Slovenský kras, Zádielska dolina valley) (Murín & Uhríková in Májovský 1970a). Outside of the Western Carpathians, triploid counts come from the Alps (Polatschek 1966, Schuhwerk & Lippert 1999); the same chromosome number has been published by Christoff & Popoff (1933, locality not given).

Hieracium carpathicum Bess. 2n = 36

(*H. caesium – H. prenanthoides*)

Locality: **1.** Vysoké Tatry Mts, Tatranská Javorina: Bielovodská dolina valley, W slopes of Mt. Holica, spruce forest, ca 1260 m a.s.l., 49°14'01.7" N, 20°06'37.0" E (6786d), coll. P. Mráz and V. Mrázová, 15 VIII 2001 (2 plants no. 1149, 1150, 2n = 36, counted by P. M.).

This is the first chromosome number record from the Western Carpathians. Mills & Stace (1974) have reported the same number in plants from Mid Perth in Central Scotland. Sell & West (1965) identified the Scottish plant, originally described as *H. perthense* F. N. Williams with those from the Western Carpathians. Thus, according to these authors, *H. carpathicum* s. str. (*H. carpathicum* subsp. *carpathicum*) occurs in two geographically remote areas, namely in the Western Carpathians and Scotland. On the other hand, Zahn (1921–1923) reported *H. carpathicum* s. str. (as subsp. *carpathicum*) from the Tatry Mts only. Later on, he enlarged the range of distribution adding the localities situated in the Nízke Tatry Mts, the Slovenské rudohorie Mts and the Veľká Fatra Mts (Zahn 1930–1939).

Hieracium fritzei group (*H. alpinum* > *H. prenanthoides*): *H. crassipedipilum* (Pawł. et Zahn) Chrtek f. 2n = 27, 36

Localities: **1**. Západné Tatry Mts, Roháče mountain group, Zuberec: Mt. Roh, ca 10.5 km ENE of Zuberec, S exp., 1550 m a.s.l., 49°14'20" N, 19°45'38" E (6784d), coll. P. Mráz and V. Jurkovičová, 22 VIII 2000 (2 plants no. 864, 2n = ca 27; 865, 2n = 27, counted by P. M.). – **2**. Nízke Tatry Mts, Iľanovo: Mt. Krakova hoľa, 1745 m a.s.l., 48°59'05.5" N, 19°37'58.5" E (7083b), coll. P. Mráz and V. Mrázová, 13 VII 2001 (1 plant no. 1072, 2n = 36, counted by P. M.). – **3**. Západné Tatry Mts, Pribylina: Gáborove sedlo saddle in the upper part of Gáborova dolina valley, 1900 m a.s.l., 49°12'05" N, 19°49'53" E (6884b), coll. P. Mráz and V. Jurkovičová, 26 VII 1999 (2 plants no. 605, 2n = ca 27; no. 610, 2n = 27, counted by P. M.).

Hieracium fritzei group (*H. alpinum* > *H. prenanthoides*): *H. slovacum* Chrtek f. 2n = 36

Locality: **1**. Belianske Tatry Mts, Ždiar: Kopské sedlo saddle, calcareous bedrock, ca 1740 m a.s.l., 49°14'23" N, 20°13'14" E (6787c), coll. P. Mráz and V. Jurkovičová, 8 VIII 2000 (1 plant no. 844, 2n = 36, counted by P. M.).

A taxonomic revision of the *H. fritzei* group was published by Chrtek & Marhold (1998). They recognized 4 taxa at the species rank in the Western Carpathians (all endemics), i.e. *H. crassipedipilum* (Pawł. et Zahn) Chrtek f., *H. krivanense* (Woł. et Zahn) Shlyakov, *H. pinetophilum* (Degen et Zahn) Chrtek f. and *H. slovacum* Chrtek f. First chromosome counts originated at the same time; Chrtek in Chrtek & Marhold (1998) found 2n = 27 in *H. pinetophilum*, and 2n = 36 in *H. crassipedipilum* and *H. slovacum*. Later on, the triploid level was confirmed in *H. pinetophilum* (Mráz 2001b, Chrtek in Štorchová et al. 2002), tetraploid in *H. slovacum* (Chrtek in Štorchová et. al. 2002) and a new chromosome number, 2n = 27, was discovered in *H. crassipedipilum* (Chrtek in Štorchová et al. 2002). The first reported chromosome number in *H. krivanense* (2n = 36) was published by Mráz (2001b), later on this ploidy level was confirmed by Chrtek (in Štorchová et al. 2002).

The chromosome numbers presented here confirm karyological differentiation in *H. crassipedipilum*, this species contains both triploids and tetraploids. Tetraploids have been found on calcareous bedrocks, while triploid on granite or calcareous bedrocks.

Apart from the Western Carpathians, members of the *Hieracium fritzei* group occur in the Eastern Carpathians and in the highest parts of the Sudeten Mts (N Czech Republic, S Poland). The *H. fritzei* group is also found in the Southern Carpathians (cf. Zahn 1930–1939, Nyárády 1965), however taxa occurring in this mountain range morphologically resemble the plants between *H. alpinum* and *H. sparsum* groups. The *H. prenanthoides* group is not very common here.

Hieracium inuloides Tausch 2n = 27 (Fig. 1)

(*H. laevigatum – H. prenanthoides*)

Localities: **1**. Nízke Tatry Mts, eastern part, Telgárt: below the saddle between Mt. Kráľova hoľa and Mt. Kráľova skala, S slopes, ca 0.5 km SE of Mt. Kráľova hoľa, ca 1600 m a.s.l., 48°53'21" N, 20°09'44" E (7186b), coll. P. Mráz, 21 VIII 1999 (1 plant no. 715, 2n = 27, counted by P. M.). – **2**. Nízke Tatry Mts, central part, Vyšná Boca: subalpine meadows W of the Kumštové sedlo saddle, *Calamagrostietum villosae*, 1650 m a.s.l., 48°55'19.1" N, 19°41'01.3" E (7084c), coll. P. Mráz and V. Mrázová, 14 VII 2001 (1 plant no. 1096, 2n = 27, counted by P. M.).

Zahn (1930–1939) recognized 6 subspecies of *H. inuloides* in the Western Carpathians, three of them were described from this area.

Our counts are the first for the Western Carpathians. The same chromosome number (2n = 27) was found by P. Mráz & Z. Szeląg (unpubl.) in plants from the Romanian Eastern Carpathians. Triploids have also been reported by Morton (1974) and Finch in Moore [1982, ut *H. latobrigorum* (Zahn) Roffey] and Jørgensen et al. (1958).

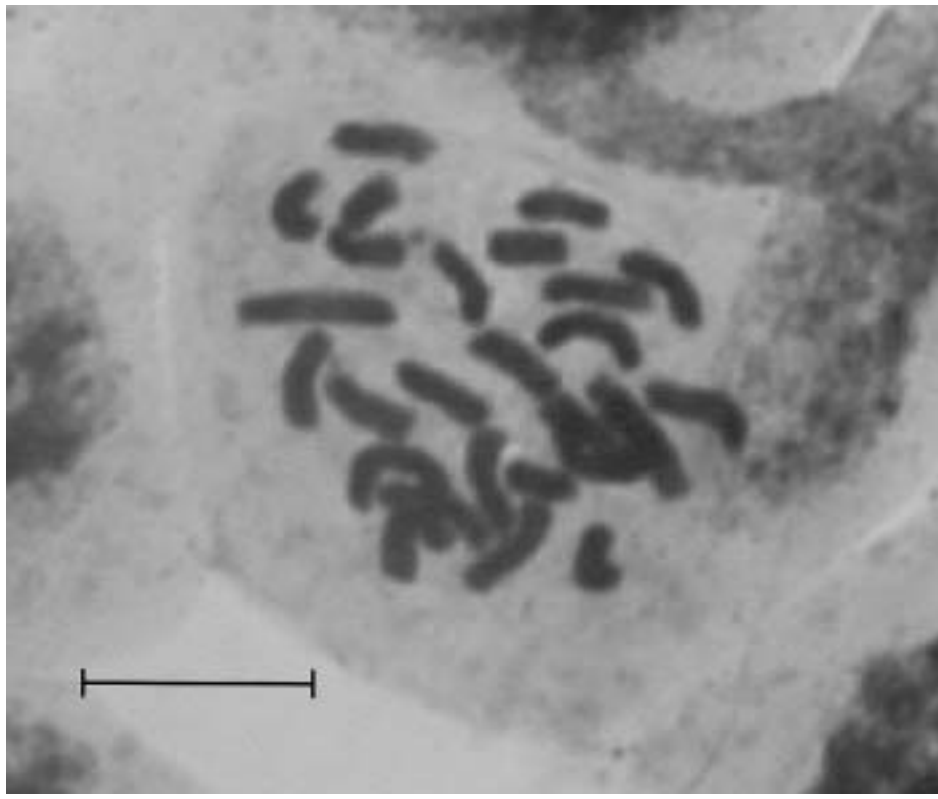

Fig. 1. – *Hieracium inuloides* Tausch, somatic metaphase, 2n = 27 (cult. no. 1096). Scale bar = 10μm.

Hieracium jurassicum Griseb. (s.l.) 2n = 27

(Syn.: *Hieracium juranum* Fr., *H. murorum* < *H. prenanthoides*)

L o c a l i t y : **1.** Nízke Tatry Mts, central part, distr. Liptovský Mikuláš: Mt. Krakova hoľa, near the marked path to the Machnaté sedlo saddle, 6.5 km S of Iľanovo, 1509 m a.s.l., 48°59'28.5" N, 19°37'23.3" E (7083b), coll. J. Chrtek jun. et al., 13 VII 2001 (3 plants no. H 780/1–3 , 2n = 27, counted by J. Ch.).

The present chromosome number is the first from the Western Carpathians. It coincides with triploids found in the Alps (Schuhwerk & Lippert 1999).

Hieracium kuekenthalianum Zahn 2n = 36

(Syn.: *Hieracium tephrosoma* Nägeli et Peter, *H. bocconei – H. villosum*)

L o c a l i t y : **1**. Nízke Tatry Mts, eastern part, Telgárt: below the saddle between Mt. Kráľova hoľa and Mt. Kráľova skala, S slopes, ca 0.5 km SE of Mt. Kráľova hoľa, ca 1600 m a.s.l., 48°53'21" N, 20°09'44" E (7186b), coll. P. Mráz, 29 VIII 1996 (1 plant no. 335, 2n = 36, counted by P. M.).

Our plants correspond to subsp. *pseudoglandulosodentatum* (Rech. f. et Zahn) (*H. tephrosoma* subsp. *pseudoglandulosodentatum* Rech. f. et Zahn), described from the Vysoké Tatry Mts. First chromosome number in this taxon.

Hieracium lachenalii Suter (s.l.) 2n = 27

Localities: **1**. Západné Beskydy Mts, Sihelné: Mt. Pilsko, rocks on the cote 1492 m, ca 1.2 km SE of the summit, 49°31'25" N, 19°19'35" E (6481d), coll. P. Mráz and V. Jurkovičová, VIII 2000 (1 plant no. 924, 2n = 27, counted by P. M.). – **2**. Volovské vrchy Mts, Rožňava: Mt. Skalisko (1293), ca 0,2 km E of the rocky summit, ca 1280 m a.s.l., 48°44'43" N, 20°34'40" E (7289c), coll. P. Mráz and V. Jurkovičová, 13 VI 2000 (2 plants: no. 760, 2n = 27; 761, 2n = ca 27, counted by P. M.).

Hieracium lachenalii represents a taxonomically very difficult entity. For most of the distribution area, it has been found to be a triploid taxon (Schuhwerk 1996, Schuhwerk & Lippert 1998). From Central Europe, the chromosome count 2n = 27 was published by Uhríková in Májovský (1974) from Slovak part of the Western Carpathians and by Krahulcová (1990) from Czech Republic. The tetraploid level (2n = 36) was reported by Lavrenko & Serditov (1987), and hypertriploid (2n = 28) by Rostovtseva (1979) (ut *H. tilingii* Juxip). The chromosome number of 2n = 27 published for allegedly *H. bifidum* from Mt Pilsko (cf. Májovský 1970a) probably relates to *H. lachenalii* s.l. (see comments on *H. bifidum* above).

Hieracium macilentum Fr. 2n = 27

(Syn.: *Hieracium epimedium* Fr., *H. bifidum* > *H. jurassicum*)

Locality: **1.** Vysoké Tatry Mts, Starý Smokovec: Veľká Studená dolina valley, near the marked path in dwarf pine stands, 3.5 km NW of the village, 1460 m a.s.l., 49°10'18" N, 20°12'00" E (6887a), coll. J. Chrtek jun. and K. Chrtková, 8VIII 2000 (3 plants no. 836/1,2,4, 2n = 27, counted by J. Ch.).

This is the first chromosome number ascertained for this species in the Western Carpathians. Our accessions are referable to subsp. *tornatoris* (Nyár. et Zahn) (*H. epimedium* subsp. *tornatoris* Nyár. et Zahn); altogether 6 subpecies were recognized by Zahn (1930–1939) in the area studied.

Previously published chromosome numbers correspond to two ploidy levels. Triplods (2n = 27) have been found in the Krkonoše Mts [*H. wimmeri* R. Uechtr., *H. epimedium* subsp. *wimmeri* (R. Uechtr.) Zahn; Chrtek 1994], in the Alps (Polatschek 1966), and in Zetland [Mills & Stace 1974, *H. zetlandicum* Beeby, *H. demissum* subsp. *zetlandicum* (Beeby) Zahn, *H. epimedium* subsp. *zetlandicum* (Beeby)].

Hieracium murorum L. (s.l.) 2n = 27

Locality: **1**. Biele Karpaty Mts, Bzince pod Javorinou: Mt. Maleník, ca 3 km NW of the village, 340 m a.s.l., 48°48'20" N, 17°45'10" E (7172d), coll. P. Mráz and V. Jurkovičová, IX 1999 (no. 724, 2n = 27, counted by P. M.).

Two ploidy levels, namely triploids and tetraploids, have been reported in this taxonomically very complex taxon (e.g. Schuhwerk 1996, and other standard reference manuals). Triploids prevail, diploids have not been found to date. Surprisingly (*H. murorum* is a widespread species), our count is the third from the Western Carpathians, the previous ones (2n = 27) were detected by Uhríková & Murín in Májovský [1970a, ut *H. silvaticum* (L.) Grufberg] and Mičieta (1978).

Hieracium nigritum R. Uechtr. 2n = 36 (Fig. 2)

(*H. fritzei – H. murorum*)

Localities: **1**. Nízke Tatry Mts, Vyšná Boca: subalpine grassland W of the Kumštové sedlo saddle, *Calamagrostietum villosae*, 1650 m a.s.l., 48°55'19.1" N, 19°41'01.3" E (7084c), coll. P. Mráz and V. Mrázová, 14 VII 2001 (1 plant no. 1097, 2n = 36, counted by P. M.). – **2**. Západné Tatry Mts, the Roháče mountain group, Zuberec: near the marked path from the Látaná dolina valley to the Zábrať saddle, open places in dwarf-pine stands, 10.5 km SEE of the village, 1520 m a.s.l., 19°45'03.5" E, 49°13'25.6" N (6784d), coll. J. Chrtek jun., 7 VII 2000 (2 plants no. H 604/1, 2, 2n = 36, counted by J. Ch.).

The first chromosome counts from the Western Carpathians. While the plants from locality 1 are identical with the nominate subspecies described from the Sudeten Mts, the plants from the Roháče Mts (loc. 2) correspond with subsp. *spalenae* Rech. f. et Zahn [peduncles and involucral bracts without simple eglandular hairs; in subsp. *nigritum* there are scattered simple eglandular hairs, both subspecies are reported to occur in the studied area, Zahn (1930–1939)]. The same chromosome number was found by Chrtek (1996) in plants of subsp. *nigritum* from the Hrubý Jeseník Mts (the Sudeten Mts, Czech Republic). In the light of the above results, the triploid count (2n = 27) of *H. nigritum* reported by Rosenberg (1926) seems to be somewhat spurious. The plant originated from a botanical garden and a misidentification cannot be excluded.

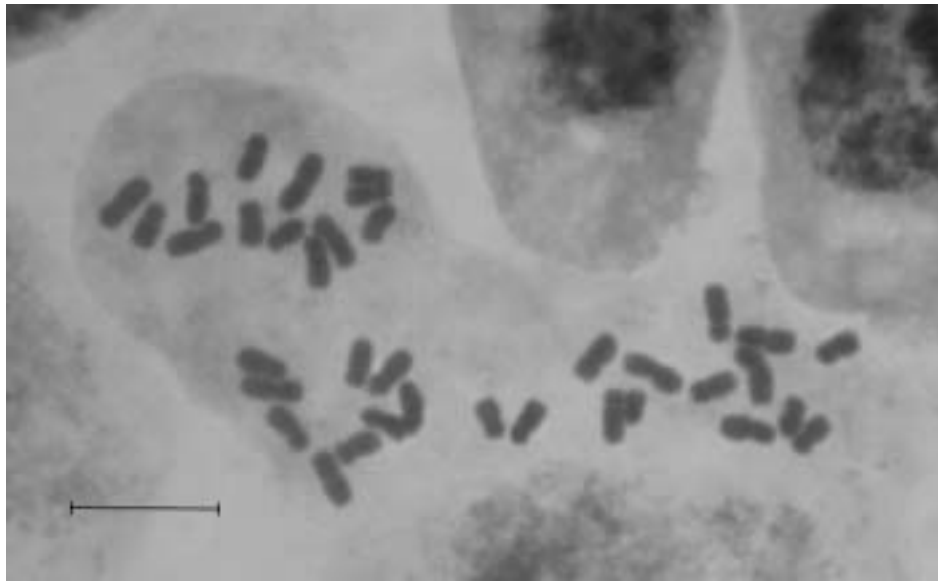

Fig. 2. – *Hieracium nigritum* R. Uechtr., somatic metaphase, 2n = 36 (cult. no. 1097). Scale bar = 10μm.

Hieracium pilosum Schleich. ex Froel. 2n = 27

(Syn.: *Hieracium morisianum* Rchb. f.)

Locality: **1**. Západné Tatry Mts, the Roháče mountain group, Zuberec: Sedlo pod Osobitou saddle, ca 0.5 km SE of Mt. Osobitá, ca 1570 m a.s.l., 49°15'30" N, 19°43'25" E (6784a), coll. P. Mráz, 23 VII 1999 (1 plant no. 579, 2n = 27, counted by P. M.).

Our report agrees with that of Moore (1982). Christoff & Popoff (1933) published a tetraploid chromosome number. Only a single locality of *H. pilosum* (ut subsp. *villosiceps* Nägeli et Peter; Mt Rozsutec in the Malá Fatra Mts) in the Western Carpathians is given by Zahn (1930–1939). Further records from subalpine belt of the Veľká Fatra Mts and the Malá Fatra Mts have been recently completed by Bernátová et al. (1995).

Hieracium praecurrens Vuk. (s.l.) 2n = 27

(*H. murorum – H. transsilvanicum*)

Locality: **1.** Vysoké Tatry Mts, Tatranská Javorina: Bielovodská dolina valley, W slopes of Mt. Holica, spruce forest, 1329 m a.s.l., 49°14'12.9" N, 20°06'42.3" E (6786d), coll. P. Mráz and V. Mrázová, 15 VIII 2001 (3 plants no. 1154, 1155, 1157, 2n = 27, counted by P. M.).

This is the first chromosome count in *H. praecurrens*, it coincides with yet unpublished report on triploids from Romania by P. Mráz & Z. Szeląg. Although five subspecies [from 27 recogized by Zahn (1930–1939)] were given from the Western Carpathians, *H. praecurren*s is a very rare species in the studied area.

Hieracium prenanthoides Vill. 2n = 27

Localities: **1**. Veľká Fatra Mts, Turecká: Mt. Krížna, S and W slopes below the top, ca 1550–1560 m a.s.l., 48°52'32" N, 19°064'40" E (7180b), coll. P. Mráz, 24 VII 1999 (1 plant no. 580, 2n = 27, counted by P. M.). – **2**. Veľká Fatra Mts, Turecká: Mt. Majerova skala, ca 1260 m a.s.l., 48°51'42" N, 19°06'25" E (7180b), coll. P. Mráz, 24 VII 1999 (1 plant no. 581, 2n = 27, counted by P. M.).

A highly critical species (species group) in the Western Carpathians. Zahn (1930–1939) distinguished 9 subspecies in the area, divided into two groups (greges), namely grex *prenanthoides* and grex *lanceolatum*. Our present plants can be placed into grex *prenanthoides*. However, we are unable to find a correct subspecific name for the plants.

Three ploidy levels, namely diploids (very rare), triploids and tetraploids, have been reported in this species (for references see e.g. Schuhwerk 1996, Chrtek 1996, and common reference manuals). Previous counts from the Western Carpathians come from the Veľká Fatra Mts (2n = 27, Uhríková in Májovský 1974), the Vysoké Tatry Mts, and the Belianske Tatry Mts (both accessions 2n = 27, Chrtek 1996).

Hieracium racemosum Waldst. et Kit. ex Willd. (s.l.) 2n = 27

Locality: **1.** Volovské vrchy Mts, Košice, Mt. Bankov, ca 4 km NW of the city centre, oak forest margin, 420 m a.s.l., 48°44'50" N, 21°13'00" E (7293c), coll. P. Mráz and V. Mrázová, 30 IX 2001 (2 plants no. 1172, 1173, 2n = 27, counted by P. M.).

The triploid chromosome number confirms the previous data from SW part of the Western Carpathians, locality Bôrik in Bratislava [firstly published by Uhríková in Májovský 1976; secondly from the same locality and with the same collector (Schwarzová) and counter (Uhríková) in Májovský 1978] and Bratislava (Hindáková in Hindáková & Májovský 1977). Ouside of the Western Carpathians, triploids were recorded in Austria (ut subsp. *leiopsis* Murr et Zahn) in a mixed population with diploids (Schuhwerk & Lippert 1999). Diploids were also reported from Italy (Selvi & Fiorini 1996). The first tetraploid chromosome count was published by Merxmüller (in Moore 1982, ut *H. crinitum* Sibth. et Sm.).

Hieracium sabaudum L. (s.l.) 2n = 27 (Fig. 3)

Localities: **1**. Volovské vrchy Mts, Košice: Mt. Bankov, ca 4 km NW of the city centre, meadow, 420 m a.s.l., 48°44'50" N, 21°13'00" E (7293c), coll. P. Mráz and V. Mrázová, 30 IX 2001 (2 plants no. 1174, 1175, 2n = 27, counted by P. M.). – **2**. Volovské vrchy Mts, Prakovce: "Walcwerk", ca 0.3 km NE of the Prakovce zastávka railway station, 395 m a.s.l., 48°53'50" N, 21°10'00" E (7191c), coll. P. Mráz, 20 X 2000 (1 plant no. 875, 2n = 27, counted by P. M.). – **3**. Volovské vrchy Mts, Jaklovce: along state route between Jaklovce and Margecany villages, ca 0.8 km SW of the Margecany catholic church, 320 m a.s.l., 48°49'50" N, 20°54'00" E (7192a), coll. P. Mráz, 16 X 2000 (1 plant no. 872, 2n = 27, counted by P. M.). – **4**. Volovské vrchy Mts, Rožňava: E slope of Mt. Sitárka, ca 4 km E of the town, 440 m a.s.l., 48°39'39" N, 20°35'14" E, coll. P. Mráz and V. Jurkovičová, 16 V 2000 (2 plants no. 738, 739, 2n = 27, counted by P. M.). – **5**. Biele Karpaty Mts, Bzince pod Javorinou: Mt. Maleník, ca 3 km NW of the village, 340 m a.s.l., 48°48'20" N, 17°45'10" E (7172d), coll. P. Mráz and V. Jurkovičová, IX 1999 (1 plant no. 723, 2n = 27, counted by P. M.).

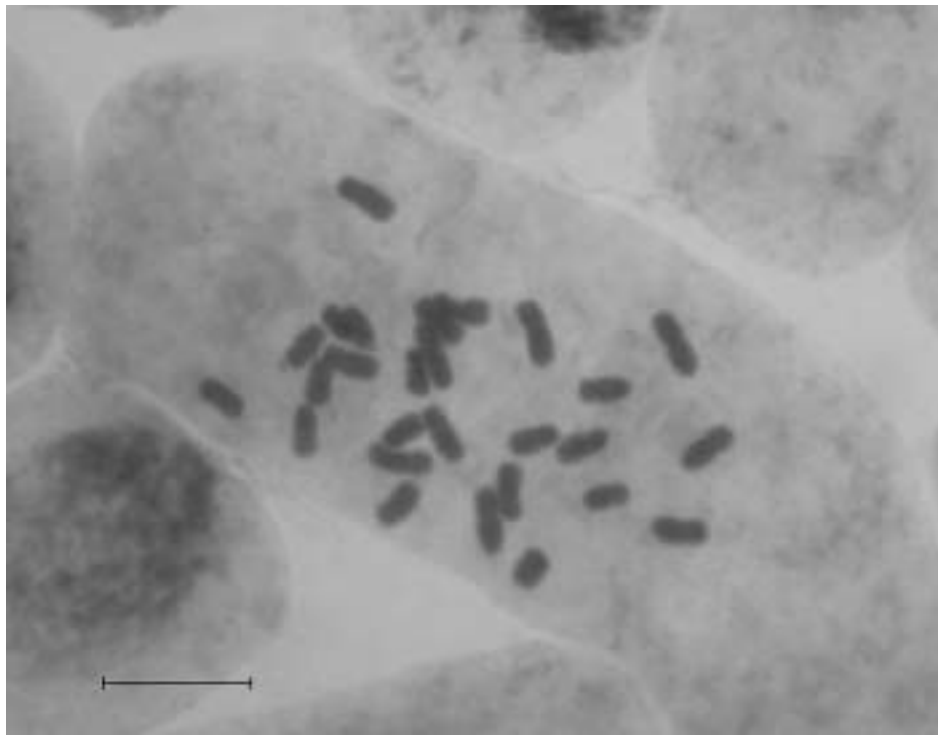

Fig. 3. – *Hieracium sabaudum* L., somatic metaphase, 2n = 27 (cult. no. 872). Scale bar = 10μm.

Morphological variation in the species (species group) is very complicated and extensive; Zahn (1930–1939) reported 11 subspecies from the Western Carpathians.

The present chromosome number (2n = 27) is in agreement with references from the Zemplínske vrchy Mts (Murín & Váchová in Májovský 1970a; the same chromosome number from the same locality, counted by the same people was also given in Májovský 1974, so we suppose that the same record was actually published twice), and the Malé Karpaty Mts (Uhríková & Králik in Májovský et al. 2000). However, diploids have also been reported from the Western Carpathians, from the SW part (Devínska Kobyla hills near Bratislava; Uhríková & Feráková 1977), and from the Považský Inovec Mts (N part, on the border with

the Strážovské vrchy Mts; Hrušovská-Osuská 1988). Májovský et al. (1987) also published the triploid counts from two mountain ranges (the Strážovské vrchy Mts and the Malé Karpaty Mts, without precise identification of the collection sites) based on reference "Feráková 1986". However, it is not given in the part References (Májovský et al. 1987).

Three ploidy levels, i.e. diploids, triploids, and tetraploids have been reported from other parts of the distribution range (for references see e.g. Schuhwerk 1996, Májovský et al. 1987, and other common chromosome number indexes). Triploids seem to prevail, geographically the nearest diploid count comes from the Pannonian lowland (Bratislava) in SW Slovakia (Feráková 1971, later treated as *H. vagum* Jordan, det. P. D. Sell, see Májovský et al. 1987), closely adjacent to the Carpathian arc.

Because the diploid level of *Hieracium sabadum* is unique within this aggregate species (see Schuhwerk 1996), the second author revised herbarium specimens deposited in SLO related to the published locality "Bratislava, Ostredky, ruderal habitat" (see above, Feráková 1971: 249). There are three specimens collected and determined by V. Feráková on 5 October 1969 as "*Hieracium sabaudum* L. subsp. *autumnale* Zahn". The one specimen with label "Bratislava, Ostredky" is morphologically undoubtedly *Hieracium umbellatum* s. str. The plant produces large amount of pollen grains of homogeneous size (observation of pollen in glycerol jelly by the second author). High amount of pollen with regular size and shape is a characteristic feature of all diploid species with normal meiosis studied so far, including *H. umbellatum* (Mráz et al. 2002). On the other hand, two other specimens belong morphologically to *H. sabaudum* s.l. Their labels read as follows "Bratislava, Ostredky, ruderálne stanovište, 2n=18" and "Bratislava, Ostredky – smetisko pri cintoríne". Both plants produce substantially lower amount of variably sized pollen typical of polyploid taxa (tri- and tetraploids studied so far, Mráz et al. 2002). Thus, just one possible and logical explanation of the published diploid chromosome number for *H. sabadum* (later treated as *H. vagum*, see above) is that *H. umbellatum* was counted instead of *H. sabaudum* s.l. (both taxa occurred at the locality). The fourth specimen was sent to P. D. Sell (V. Feráková, in lit.), who revised it as *H. vagum.* It belongs with high probability to *H. sabadum* s.l. The remaining diploid counts from Slovakia (see above: Devínská Kobyla and Považský Inovec) also probably refer to *H. umbellatum*.

Hieracium sparsum group: *H. silesiacum* Krause 2n = 36 (Fig. 4)

[Syn.: *Hieracium sparsum* subsp. *silesiacum* (Krause) Zahn

L o c a l i t i e s : **1**. Vysoké Tatry Mts, Štrbské Pleso: along the marked path on the S slopes of Mt. Kriváň, ca 1 km E of Mt. Jamy (1572.2), ca 1500–1550 m a.s.l., 49°08'10" N, 20°00'30" E (6886b), coll. P. Mráz and V. Mrázová, 16 VIII 2001 (2 plants no. 1159, 1160, 2n = 36, counted by P. M.). – **2**. Západné Tatry Mts, the Roháče mountain group, Zuberec: open place in dwarf-pine stand near a marked tourist path in the Smutná dolina valley, ca 150 m of the former Ťatliakova chata chalet, 11.5 km SE of Zuberec, 1410 m a.s.l., 49°12'45" N, 19°45'00" E (6784c), coll. J. Chrtek jun. (2 plants H 618/1, 2, 2n = 36, counted by J. Ch.). – **3**. Nízke Tatry Mts, central part: Vyšná Boca, Mt. Lajštroch (1602,1), E slope ("Rovienky"), 2,7 km SW of the village, open place in dwarf-pine stand near a marked tourist path, 1550 m a.s.l., 48°54'38" N, 19°43'12" E (7084c), 28VII 1999, coll. J. Chrtek jun. (2 plants, H 614/1,2, 2n = 36, counted by J. Ch.). – **4.** Nízke Tatry Mts, central part, Vyšná Boca: subalpine meadows W of the Kumštové sedlo saddle, *Calamagrostietum villosae*, ca 1630 m a.s.l., 48°55'19.1" N, 19°41'01.3" E (7084c), coll. P. Mráz and V. Mrázová, 14 VII 2001 (1 plant no. 1094, 2n = 36, counted by P. M.).

The investigated plants come from the both main distribution areas of *H. silesiacum* in the Western Carpathins, i.e. from the Tatry Mts (accessions no. 1, 2), and from the Nízke Tatry

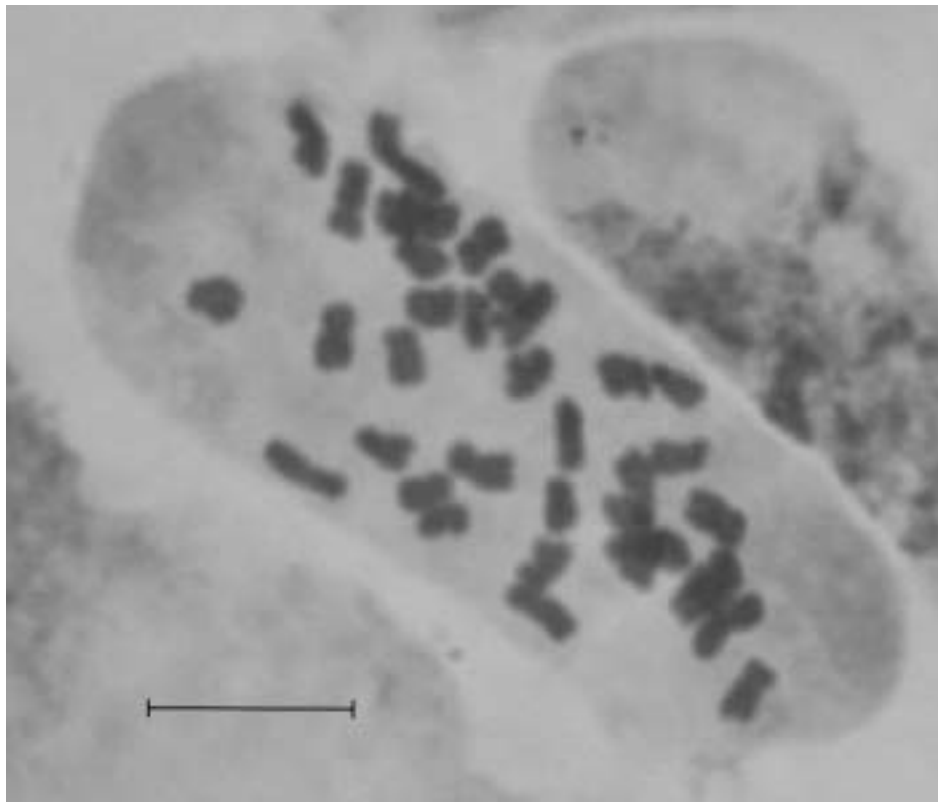

Fig. 4. – *Hieracium silesiacum* Krause, somatic metaphase, 2n = 36 (cult. no. 1160). Scale bar = 10μm.

Mts (accessions no. 3, 4). Comprehensive list of localities along with comments on ecology and morphological variation of the species in the Western Carpathians was published elsewhere (Chrtek et al. 2002).

The same chromosome number has been found in plants from the Hrubý Jeseník Mts (the Sudeten Mts, Czech Republic; Chrtek 1996). It seems that *H. silesiacum* is the only known tetraploid species from the *Hieracium sparsum* group, the remaining taxa are either diploid (*H. sparsum* s. str.) or triploid (Christoff 1942, Schuhwerk & Lippert 1999, Vladimirov & Szeląg 2001).

Hieracium umbellatum L. 2n = 18

L o c a l i t y : **1**. Volovské vrchy Mts, Prakovce: "Walcwerk", ca 0.3 km NE of the Prakovce zastávka railway station, 395 m a.s.l., 48°53'50" N, 21°10'00" E (7191c), coll. P. Mráz, 20 X 2000 (1 plant no. 873, 2n = 18, counted by P. M.).

Both sexual diploids (2n = 18) and apomictic triploids (2n = 27) are known in this species (for references see e.g. Schuhwerk 1996, Májovský al. 1987, and other standard chromosome number indexes). Surprisingly, the present accession is the only third from the Western Carpathians; it confirms the previously published diploid counts from the Devínska

Kobyla hill near Bratislava (Uhríková & Feráková 1977) and from another site at Prakovce village (Volovské vrchy Mts) (Mráz 2003c).

Hieracium villosum Jacq. 2n = 27

Localities: **1**. Veľká Fatra Mts, Liptovské Revúce: Mt. Čierny kameň (1479.4), calcareous rocks on the south peak, 3 km NW of the village, 1450 m a.s.l., 48°55'55" N, 19°08'20" E (7080d), coll. M. Severa, 6 VIII 1999 (3 plants, MS 20/1–3 , 2n = 27, counted by M. S.). – **2**. Malá Fatra Mts, Terchová: Mt. Steny (between Mt. Hromové and Mt. Poľudňový grúň), calcareous rocks E and SE of the south peak, 7 km SSW of the village, 1520 m a.s.l., 49°11'45" N, 19°03'47" E (6880a), coll. M. Severa, 4 VIII 1999 (4 plants MS 2/1–4, 2n = 27, counted by M. S.). – **3**. Malá Fatra Mts: Zázrivá: Mt. Veľký Rozsutec (1610), calcareous rocks at the peak, 6.3 km SW of the village, 1590 m a.s.l., 49°13'55" N, 19°05'55" E (6780d), coll. M. Severa, 4 VIII 1999 (3 plants, MS 4/1–3 , 2n = 27, counted by M. S.). – **4**. Veľká Fatra Mts, Vyšná Revúca: Mt. Suchý vrch (1549), calcareous rocks at the peak, 5.7 km W of the village, 1540 m a.s.l., 48°54'35" N, 19°06'57" E (7080d), coll. M. Severa, 6 VIII 1999 (4 plants, MS 5/1–4, 2n = 27, counted by M. S.). – **5**. Nízke Tatry Mts, central part, Závažná Poruba: Mt. Krakova hoľa (1751), rocky outcrops (limestones) ca 1 km SSE of the peak, ca 8 km S of the village, ca 1600 m a.s.l., 48°58'37" N, 19°38'17" E (7083b), coll. M. Severa, 4 VII 2000 (3 plants, MS 14/1–3 , 2n = 27, counted by M. S.). – **6**. Nízke Tatry Mts, central part, Nižná Boca: Mt. Ohnište (1538), calcareous rocks S of the peak, 5.5 km NW of the village, 1520 m a.s.l., 48°58'28" N, 19°42'20" E (7084a), coll. M. Severa 5 VII 2000 (3 plants, MS 15/1–3 , 2n = 27, counted by M. S.). – **7**. Belianske Tatry Mts, Tatranská Kotlina: Mt. Skalné vráta (1619,8 m), calcareous rocks near a small path above the chalet Plesnivec, 3 km W of the village, ca 1450 m a.s.l., 49°13'39" N, 20°16'42" E (6787d), coll. M. Severa & J. Chrtek jun., 6 VII 2000 (11 plants, MS 16A/1–11, 2n = 27, counted by M. S.). – **8**. Belianske Tatry Mts, Ždiar: Monkova dolina valley, near the marked path 4.2 km SW of the village, 1500 m a.s.l., 49°14'55" N, 20°13'33" E (6787c), coll. M. Severa & J. Chrtek jun., 6 VII 2000 (2 plants, MS 17/1,2, 2n = 27, counted by M. S.).

Our samples refer to *H. villosum* subsp. *villosum*. *Hieracium villosum* belongs, together with its intermediate taxa, to the most interesting group of mountain hawkweeds in the Western Carpathians. Based on morphology, chromosome numbers and multilocus isozyme genotypes, 5 types were recognized within *H. villosum* in the target area (Severa 2001). Nevertheless, some of them might perhaps be placed in *H. pilosum*. The most widespread type, identical with *H. villosum* subsp. *villosum*, was shown to be an apomictic triploid (2n = 27) with aborted pollen; no genetic variation was discovered. The remaining types are apomictic tetraploids (2n = 36) with viable pollen grains, each confined to rather small geographic areas. Both intra- and interpopulation genetic variation was detected in two of them, the remainig two are homogeneous in this respect (Severa 2001). Whether they are worth recognizing taxonomically, and if so, at what ranks, are moot points.

Tetraploid *H. villosum* has been reported from several localities in the Western Carpathians (Skalińska et al. 1959, Murín in Murín & Paclová 1979, Murín in Murín & Májovský 1987). Outside of our area tetraploid counts also strongly prevail (for references see Schuhwerk 1996). Aneuploids (2n = ca 28) were reported by Polatschek (1966) from the Alps (but see notes in Dobeš & Vitek 2000).

Hieracium virgicaule Nägeli et Peter 2n = 27

(*H. bupleuroides – H. umbellatum*)

Locality: **1.** Chočské vrchy Mts, Prosiek: Prosiecka dolina valley, 684 m a.s.l., 48°59'38.8" N, 19°37'20.7" E (6882b), coll. P. Mráz and V. Mrázová, 13 VIII 2001 (1 plant no. 1085, 2n = 27, counted by P. M.).

First karyological report for this species, which is considered to be endemic to the Western Carpathians. Its occurrence, based on a single locality in the Eastern and Southern Carpathians, respectively, is doubtful (cf. Zahn 1930–1939).

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Souhrn

Západokarpatské jestřábníky z podrodu *Hieracium* (*Hieracium* subgen. *Hieracium*) jsou zatím karyologicky málo známé. V tomto příspěvku jsou poprvé uvedeny počty chromozomů u druhů *Hieracium kuekenthalianum* (= *H. tephrosoma*, 2n = 36), *H. praecurrens* (2n = 27) a *H. virgicaule* (2n = 27); u *H. bupleuroides* byla poprvé zjištěna tetraploidní úroveň (2n = 36), všechny doposud publikované údaje se vztahují k triploidním rostlinám (2n = 27). U několika druhů jsou poprvé zveřejněny počty chromozomů ze Západních Karpat; jedná se o *H. atratum* (2n = 27), *H. bifidum* (2n = 27, 36), *H. carpathicum* (2n = 36), *H. inuloides* (2n = 27), *H. jurassicum* (2n = 27), *H. macilentum* (= *H. epimedium*, 2n = 27), *H. nigritum* (2n = 36), *H. pilosum* (= *H. morisianum*, 2n = 27) a *H. silesiacum* (2n = 36). Dříve publikované počty byly potvrzeny u *H. alpinum* (s. str., 2n = 27), *H. bupleuroides* (2n = 27), *H. crassipedipilum* (okruh *H. fritzei*, 2n = 27, 36), *H. lachenalii* (2n = 27), *H. murorum* (2n = 27), *H. prenanthoides* (2n = 27), *H. racemosum* (2n = 27), *H. sabaudum* (2n = 27), *H. slovacum* (okruh *H. fritzei*, 2n = 36), a *H. umbellatum* (2n = 18). Celkově příspěvek přináší počty chromozomů 22 druhů v širším smyslu (species collectivae sensu Zahn, okruhy). Při zahrnutí druhů v užším pojetí rozlišovaných v okruhu *H. fritzei* se údaje vztahují k 23 druhům, v některých případech jsou počty vztaženy ke spolehlivě rozlišovaným subspeciím. V současné době jsou se zahrnutím údajů z této práce známy počty chromozomů u 28 druhů v širším pojetí (okruhů) z celkového počtu 65 druhů uváděných ze Západních Karpat. Téměř všechny studované taxony jsou polyploidní (tri- a tetraploidní), diploidní počet byl zjištěn pouze u *Hieracium umbellatum*. Publikovaná data o diploidních populacích *H. sabaudum* ze Slovenska jsou zřejmě mylná a vztahují se s největší pravděpodobností k velice proměnlivému a sexuálně se rozmnožujícímu druhu *H. umbellatum*. U mnoha druhů v širším pojetí (okruhů) jsou v Západních Karpatech známy 2 ploidní úrovně (tri- a tetraploidi). Karyologická diferenciace často odpovídá taxonomicky významným morfologickým znakům a podporuje spíše užší pojetí druhů přijímané u některých okruhů.

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Appendix 1. – Chromosome numbers in the genus *Hieracium* s. str. published from the Western Carpathians (and from adjacent region of the Pannonian lowland – marked by *). Nomenclature follows original references.

Taxon	Chromosome number	Reference
H. alpinum L.	27	Skalińska et al. 1959
H. alpinum L.	27	Skawińska 1963
H. alpinum L.	27	Májovský et al. 1970b
H. alpinum L.	27	Murín & Májovský 1992
H. alpinum L.	27	Chrtek 1997
H. alpinum L.	36	Szeląg & Jankun 1997
H. alpinum L.	27	Mráz 2001b
H. alpinum L.	27	Štorchová et al. 2002
H. alpinum L.	27	this study
H. atratum Fr.	27	this study[1]
H. bifidum Kit. ex Hornem.	27	Májovský et al. 1970a
H. bifidum Kit. ex Hornem.	27, 36	this study
H. bupleuroides C. C. Gmel.	27	Májovský et al. 1970a[2]
H. bupleuroides C. C. Gmel.	27, 36	this study[3]
H. carpathicum Bess.	36	this study
H. crassipedipilum (Pawł. et Zahn) Chrtek f. (*H. fritzei* group)	36	Chrtek & Marhold 1998
H. crassipedipilum (Pawł. et Zahn) Chrtek f. (*H. fritzei* group)	27	Štorchová et al. 2002
H. crassipedipilum (Pawł. et Zahn) Chrtek f. (*H. fritzei* group)	27, 36	this study
H. halleri Vill. (*H. alpinum* group)	27	Chrtek 1997
H. halleri Vill. (*H. alpinum* group)	27	Mráz 2001b
H. halleri Vill. (*H. alpinum* group)	27	Štorchová et al. 2002
H. inuloides Tausch	27	this study
H. jurassicum Griseb. (s.l.)	27	this study
H. krivanense (Woł. et Zahn) R. N. Shlyakov (*H. fritzei* group)	36	Mráz 2001b
H. krivanense (Woł. et Zahn) R. N. Shlyakov (*H. fritzei* group)	36	Štorchová et al. 2002
H. kuekenthalianum Zahn	36	this study[4]
H. lachenalii subsp. *sciaphilum* Zahn	27	Májovský et al. 1974
H. lachenalii Suter (s.l.)	27	this study
H. lingelsheimii Pax	36	Schuhwerk & Lippert 1999
H. macilentum Fr.	27	this study[5]
H. murorum L.[6] (s.l.)	27	Mičieta 1978
H. murorum L.[6] (s.l.)	27	this study
H. nigrescens Willd. (s.l.)	36	Mráz 2001b[7]
H. nigrescens subsp. *koprovanum* Rech.f. et Zahn	36	Mráz 2001b
H. nigritum R. Uechtr.	36	this study[8]
H. pilosum Schleich. ex Froel.	27	this study
H. pinetophilum (Degen et Zahn) Chrtek f. (*H. fritzei* group)	27	Chrtek & Marhold 1998
H. pinetophilum (Degen et Zahn) Chrtek f. (*H. fritzei* group)	27	Mráz 2001b
H. pinetophilum (Degen et Zahn) Chrtek f. (*H. fritzei* group)	27	Štorchová et al. 2002
H. piliferum Hoppe	36	Mráz 2003a

H. praecurrens Vuk. (s.l.)	27	this study
H. prenanthoides subsp. *lanceolatum* (Vill.) Zahn	27	Májovský et al. 1974
H. prenanthoides Vill.	27	Chrtek 1996
H. prenanthoides Vill.	27	this study[9]
H. rohacsense Kit.	36	Mráz 2001b
H. racemosum Waldst. et Kit. ex Willd.	27	Májovský et al. 1976
H. racemosum Waldst. et Kit. ex Willd.	27	Hindáková & Májovský 1977
H. racemosum Waldst. et Kit. ex Willd. (s.l.)	27	this study
H. sabaudum L.	27	Májovský et al. 1970a
H. sabaudum L.	18	Feráková 1971*
H. sabaudum L. subsp. *sabaudum*	27	Májovský et al. 1974
H. sabaudum L.	18	Uhríková & Feráková 1977[10]
H. sabaudum agg.	18	Hrušovská-Osuská 1988[10]
H. sabaudum L.	27	Májovský et al. 2000
H. sabaudum L. (s.l.)	27	this study
H. silesiacum Krause (*H. sparsum* group)	36	this study
H. slovacum Chrtek f. (*H. fritzei* group)	36	Chrtek & Marhold 1998
H. slovacum Chrtek f. (*H. fritzei* group)	36	this study
H. stygium R. Uechtr. (*H. chlorocephalum* group)	36	Chrtek 1996
H. stygium R. Uechtr. (*H. chlorocephalum* group)	36	Mráz 2001b
H. sylvaticum (L.) Grufberg (= *H. murorum* L.)	27	Májovský et al. 1970a
H. umbellatum L.	18	Májovský et al. 1970a
H. umbellatum L.	18	Uhríková & Feráková 1977
H. umbellatum L.	18	Mráz 2003c
H. umbellatum L.	18	this study
H. valdepilosum Vill. (s.l.)	36	Mráz 2003c[11]
H. villosum Jacq.	36	Skalińska et al. 1959
H. villosum Jacq.	36	Murín & Paclová 1979
H. villosum Jacq.	36	Murín & Májovský 1987
H. villosum Jacq.	27	this study[12]
H. virgicaule Nägeli et Peter	27	this study

[1] At least two names can be accepted for plants from the Western Carpathians (both seem to be synonyms): *H. atratum* subsp. *atrellum* var. *furkotanum* Zahn and var. *greineri* Korb et Zahn. See notes in the text part.

[2] This report is related, with high probability to *H. lachenalii* s.l. See notes on *H. bifidum* in the text part.

[3] The triploid counts are referable to two subspecies: subsp. *tatrae* (Griseb.) Nägeli et Peter and subsp. *gmelinianum* Zahn. See notes in the text part.

[4] Plants from the Western Carpathians belong to subsp. *pseudoglandulosodentatum* (Rech. f. et Zahn). See notes in the text part.

[5] The counted plants belong to subsp. *tornatoris* (Nyár. et Zahn).

[6] See also *H. sylvaticum.*

[7] Two conspecific names can be used for the counted plants: *H. pietroszense* subsp. *jarzabcynum* Pawł. et Zahn (cf. Mráz 2003b) and *H. nigrescens* subsp. *mlynicae* Hruby et Zahn.

[8] The counts comprise two distinct taxa: *H. nigritum* subsp. *nigritum* and *H. nigritum* subsp. *spalenae* Rech. f. et Zahn. See notes in the text part.

[9] Our plants can be placed into grex (group of subspecies) *prenanthoides.*

[10] This report is related, with high probability to *H. umbellatum.* See notes on *H. sabaudum* in the text part.

[11] Based on herbarium revision by J. Chrtek jun., the plants belong to the *H. dentatum* group.

[12] The plants belong to subsp. *villosum.*