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Achillea distans (Asteraceae) confirmed as native in the Bieszczady Mts (SE Poland)

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ABSTRACT: *Achillea distans* Waldst. *et* Kit. *ex* Willd., found in the Bieszczady Mts (SE Poland), is confirmed as a native species of the Polish flora, and several localities of this taxon in NE Slovakia and the NW part of the Ukrainian Carpathians are reported. The plants from the Bieszczady Mts are briefly described, and other records of the *A. distans* group from Poland are discussed. The hexaploid chromosome number $2n = 54$ was recorded in the Polish populations of *A. distans*.

KEY WORDS: *Achillea millefolium* group, taxonomy, chromosome number, distribution, Eastern Carpathians, Slovakia, Ukraine

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INTRODUCTION

During a field trip to the Bieszczady Mts in September 1995, specimens of *Achillea distans* Waldst. *et* Kit. *ex* Willd. were collected from five localities in montane to subalpine meadows. The taxon has not been reported from Poland previously.

The *A. distans* group is a highly polymorphic complex closely related to the *A. millefolium* group (Ehrendorfer 1953; Saukel & Länger 1992). It is distributed in Central and SE Europe, mainly in the Alps, Carpathians, N Apennines, Dinarids, and in the mountains of the N Balkans.

Traditionally, three species are recognized within the *A. distans* group: *A. tanacetifolia* All., *A. distans* Waldst. *et* Kit. *ex* Willd., and *A. stricta* Schleich. *ex* Gremli, treated sometimes as intraspecific taxa of different ranks. The taxonomic treatment is based mainly on shape variation of the cauline leaves. According to Prodan (1931) and Dąbrowska (1982), into the typical *A. distans* are included plants with 1–2(–3)-pinnatisect, 0.5–4 cm wide middle cauline leaves with relatively less divided primary segments and 1–3(–5) mm wide rachis. Into *A. tanacetifolia* are included plants with 2–3-pinnatisect, 2–6 cm wide middle cauline leaves with less divided primary segments and narrow, 1–2(–3) mm wide rachis, while in *A. stricta* are placed those with 2(–3)-pinnatisect and

1–2(–3) cm wide middle cauline leaves with toothed, 1.0–1.5(–2.0) mm wide rachis. This general scheme was adopted by, for example, Ehrendorfer (1953), Mądalski and Ciaciura (1971), Richardson (1976), and Dostál (1950, 1989).

A modified taxonomic treatment of the group was suggested by Dubovik (1974), who also distinguished three species within the *A. distans* group from the Ukrainian Carpathians, but she came to the conclusion that *A. tanacetifolia* is replaced here by *A. carpatica* Błocki *ex* Dubovik. In her opinion, *A. distans* s. str. is a lowland species, while *A. stricta* and *A. carpatica* are montane species distributed in montane forest communities and in montane and subalpine meadows, respectively. This treatment was later adopted in a monograph on the genus *Achillea* in the Ukraine (Klokov & Kritskaya 1984). Recently the *A. distans* group has been studied morphologically and karyologically by Saukel and Länger (1992), but the taxonomical problems have not been solved yet.

In the Polish flora only *A. stricta* is reported as a native species of the *A. distans* group, growing in two localities in the Tatra and Sudety Mts (Pawłowska & Pawłowski 1970; Mądalski & Ciaciura 1971; Dąbrowska 1982, 1997), while *A. distans* and *A. tanacetifolia* are considered to be missing from the present territory of Poland (Mądalski & Ciaciura 1971; Dąbrowska 1982; Mirek *et al*. 1995).

Materials and methods

Seven living plants collected in the field from three localities in the Polish Bieszczady Mts (Table 1) were cultivated in the University Botanical Garden in Brno. Chromosome counts were made in root tips pretreated in para-dichlorobenzene and then fixed in a standard solution of ethanol and acetic acid. The rapid squash method was applied for counting. After about a two minute maceration in a mixture of ethanol and hydrochloric acid, the root tips were stained with lactopropionic orcein. The slides were observed immediately after preparation.

Table 1. Results of chromosome counts in *Achillea distans* Willd. from the Polish Bieszczady Mts.

2*n*	Locality	Altitude	Cult. no.
54	Puszcza Bukowa, mountain meadows near top of Rabia Skała Mt., 17 Sept. 1995, *leg. J. Danihelka*	1180 m	A95/238, 240, 241
54	Połonina Bukowska, along hiking trail, about 0.5 km WSW of top of Kopa Bukowska Mt., 16 Sept. 1995, *leg. J. Danihelka*	1220 m	A95/243, 244
54	Połonina Bukowska, along hiking trail near shelter between Rozsypaniec Mt. and Ukrainian border, 16 Sept. 1995, *leg. J. Danihelka*	1120 m	A95/246, 248

Herbarium specimens were collected from both natural populations and cultivated plants. They are stored in the Herbarium of the Department of Botany of Masaryk University in Brno (BRNU). The abbreviations of herbaria given in the paper follow Holmgren *et al*. (1990) and Vozárová and Sutorý (2001).

Results and discussion

Morphological investigations indicated that the plants collected in the Bieszczady Mts (Fig. 1) undoubtedly can be assigned to the *A. distans* group. They are characterized by often conspicuously long rosette and lower stem leaves, lanceolate in outline, 2(–3)-pinnatisect, with primary segments usually stretched, often three times longer than wide, usually with pinnatifid to pinnatisect segments of the 2nd order and the leaf rachis often

Fig. 1. *Achillea distans* Willd. from Bieszczady Mts, specimen of population A95/246–248 (BRNU); for locality see Table 1. Scale bar: 5 cm.

distinctly dentate in its upper half; middle and upper cauline leaves usually lanceolate in outline, plane, 2-pinnatisect, with broadly winged (1.5–2.0 mm) dentate rachis (sometimes with teeth resembling small additional segments) and usually with lanceolate primary segments, the secondary segments of which are dentate to pinnatilobed; green involucral bracts with a narrow, pale or brownish to brown margin; and white, less frequently pink to purpurate ligules.

All plants from the Bieszczady Mts investigated were hexaploid with 2*n* = 54 (Fig. 2, Table 1). This number was first established within the *A. distans* group by Ehrendorfer (1953) in plants from Teufelstein near Mödling in Lower Austria, identified as *A. stricta*. The count was later confirmed by Baksay (1958) and Dąbrowska (1971) in *A. distans* from the outskirts of Budapest and Visegrad in Hungary, respectively. With the exception of tetraploid populations found recently in Austria (Saukel & Länger 1992) and the Czech Republic (Danihelka & Rotreklová, unpubl.), hexaploidy is characteristic of the *A. distans* group. For further information and comments on chromosome counts within the *A. millefolium* and *A. distans* groups see a review by Danihelka and Rotreklová (2001).

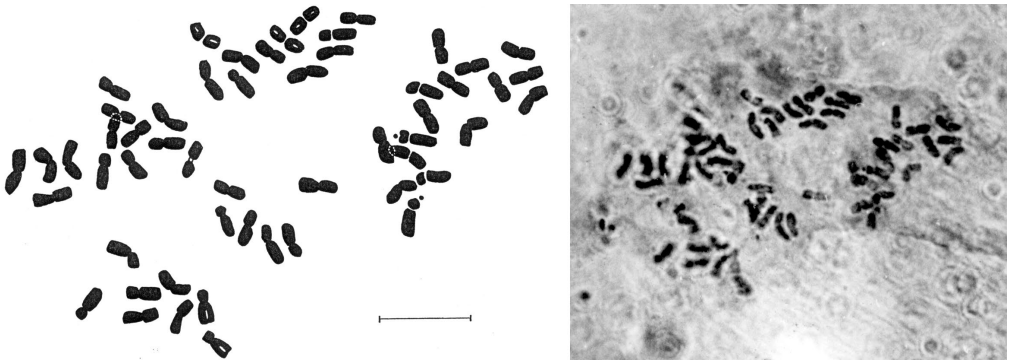

Fig. 2. Mitotic metaphase in root tip cells of *Achillea distans* Willd., 2*n* = 54 (plant A95/238; for locality see Table 1). Scale bar: 10 μm.

The precise taxonomic status of yarrows growing in the Bieszczady Mts is not yet entirely clear. Their morphological characters differ slightly from those of typical *A. distans* populations as known from, for example, western and central Slovakia, western Austria, Hungary and Romania. As postulated by Ehrendorfer (1953, 1959) and Saukel and Länger (1992), the *A. distans* group also includes local and/or regional populations which may have arisen via hybridization of *A. distans* s. str. with *A. millefolium*, but the real extent of hybridization requires further studies. It remains unclear whether these populations merit a formal taxonomic status.

Among the names available within the *A. distans* group, *A. carpatica* unambiguously refers to the montane and subalpine populations of *A. distans* from the East Carpathians in Poland and Ukraine. Its type specimen was collected by Błocki in 1906 in the eastern part of the Ukrainian Carpathians (Dubovik 1974). It is clear from the original descrip-

tion and photograph that *A. carpatica* belongs to the *A. distans* group; this is additionally supported by specimens collected by Błocki housed in BRNU and PR. The specific status of *A. carpatica* seems, however, not to be justified. To avoid making new combinations at the intraspecific level before a comprehensive taxonomic revision of the *A. distans* group is presented, we propose to use the name *A. distans* for plants from the Bieszczady Mts. Plants similar to those from the Bieszczady Mts are also known from the Bukovské vrchy Mts in E Slovakia (reported as *A. stricta* by Hadač & Terray 1991) and from adjacent parts of the Ukrainian Carpathians (see *Additional specimens seen*).

The earliest records of the *A. distans* group from the Carpathians within the present borders of Poland are probably those of Wołoszczak (1894, 1896; reported as *A. stricta*): the former refers to higher altitudes of the Polish Carpathians and the latter (with a question mark) to the top of Jaworzyna Krynicka Mt. in the Beskid Niski Mts. Later both of them were more or less rejected by authors of local floras (Pawłowski 1925; Jasiewicz 1965). However, judging by the field experience of the senior author, many of the records of *A. millefolium* subsp. *millefolium* from montane and subalpine meadows of the Bieszczady Zachodnie Mts given by Jasiewicz (1965) should be assigned rather to *A. distans* than to *A. millefolium*. The record of *A. stricta* by Pawłowska and Pawłowski (1970) from the Western Tatra Mts seems to comply with the distribution pattern of the *A. distans* group in Slovakia and SE Poland, but the record by Dąbrowska (1982, 1997; reported as *A. stricta*) from Karpacz Górny in the Karkonosze Mts should be reevaluated. It does not correspond to our knowledge of the distribution of the *A. distans* group in the Czech Republic. As most of the records of the *A. distans* group given by Spudilová (1956) from the Czech Republic are erroneous, except those from the Vltava and Labe valleys and from the environs of the town of Znojmo in S Moravia, the locality in the Polish Karkonosze Mts would be a very remote outpost.

ADDITIONAL SPECIMENS SEEN – POLAND. **BIESZCZADY MTS**. Połonina Wetlińska, 0.5 km NNW of Hnatowe Berdo Mt., alt. 1100 m, 15 Sept. 1995, *leg. J. Danihelka* (BRNU); Wysoki Dział, 0.3 km NW of Sasów Mt., alt. 980 m, 13 Sept. 1995, *leg. J. Danihelka* (BRNU).

SLOVAKIA. **BUKOVSKÉ VRCHY MTS**. Ďurkovec Mt. above Runina, alt. 1190 m, 1 July 1957 & 6 Aug. 1957, *leg. J. Soják* (PR); *ibidem*, alt. 1180 m, 17 Sept. 1995, *leg. J. Danihelka* (BRNU); Velký Bukovec Mt., about 4 km NW of Zboj, 4 Aug. 1985, *leg. B. Trávníček* (OL); Hrúbky Mt., 6 Aug. 1957, *leg. J. Soják* (PR); mountain saddle E of Hrúbky Mt., about 5 km NNE of Nová Sedlica, 15 July 1972, *leg. D. Blažková* (PRA); mountain range 0.5 km E of Čierťaž Mt., about 5 km N of Nová Sedlica, 24 Aug. 1974, *leg. D. Blažková* (PRA); E slope of Príkry Mt., 3 km N of Nová Sedlica, 22 Sept. 1971, *leg. D. Blažková & J. Kolbek* (PRA); Príkry Mt., 3.2 km N of Nová Sedlica, 29 Aug. 1974, *leg. D. Blažková* (PRA); Along trail from Nová Sedlica towards Stužica Nature Reserve, 5 Sept. 1994, *leg. J. Bartoš* (BRNU); 3.8 km NE of Nová Sedlica, near Ukrainian border, 25 Aug. 1974, *leg. D. Blažková* (PRA); Valley of Stužická rieka stream, between Príkry Mt. and Kremenec Mt., alt. 750 m, 11 Aug. 1957, *leg. S. Hejný* (PR); Near Stužica stream, close to "Chyžka pri p. Stužica" chalet, about 3.5 km NNE of Nová Sedlica, 1 Aug. 1981, *leg. J. Štěpánková & J. Štěpánek* (PR); About 5 km ESE of Zboj, near Ukrainian border, 5 Aug. 1985, *leg. B. Trávníček* (OL); Stinská Mt. ("Stinky"), SE of Zboj, 9 Aug. 1957, *leg. J. Soják* (PR); *Ibidem*, ?, *leg. F. Weber* (PR); 23 June 1998, *leg. V. Tlusták* (LIM); Malý Bukovec Mt., 1973, *leg. J. Májovský & E. Králik* (SLO); [N part of] Nastaz Mt., near spot height 807, 1 Aug. 1957, *leg. J. Soják* (PR).

UKRAINE. **BESKIDI MTS.** Pliszka Mt. (1068 m), above Verhovyna-Bystra ("Bystrý"), 28 July

1937, *leg. V. Jirásek* (PR); Połonina Bukowska, between spot height 1273 m and Stinska Mt. (1207 m), 24 July 1937, *leg. V. Jirásek* (PR); Kińczyk Bukowski Mt. ("Kinčík Bukowský"), above Verhovyna-Bystra ("Bystrý"), alt. 1252 m, 13 July 1938, *leg. V. Jirásek* (PR).

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References

BAKSAY L. 1958. The chromosome numbers in Ponto-Mediterranean plants. – Ann. Hist.-Nat. Mus. Nat. Hung. **50**: 121–125.

DĄBROWSKA J. 1971. Korelacja między liczbą chloroplastów w komórkach szparkowych i poziomem poliploidalności czternastu taksonów *Achillea* L. [Correlation between the number of chloroplasts in stomata guard cells and the degree of polyploidy in 14 taxa of *Achillea* L.]. – Herba Polon. **17**: 201–208 (in Polish with English summary).

DĄBROWSKA J. 1982. Systematic and geographic studies of the genus *Achillea* L. in Poland with special reference to Silesia. – Acta Univ. Wratislav. **419**, Pr. Bot. **24**: 1–223.

DĄBROWSKA J. 1997. Rozmieszczenie rodzaju *Achillea* L. w Polsce ze szczególnym uwzględnieniem Śląska (spis stanowisk i mapy) [Distribution of the genus *Achillea* in Poland with special reference to Silesia (list of localities and maps)]. – Acta Univ. Wratislav. **1892**, Pr. Bot. **71**: 1–99 (in Polish with English summary).

DANIHELKA J. & ROTREKLOVÁ O. 2001. Chromosome numbers within the *Achillea millefolium* and the *A. distans* groups in the Czech Republic and Slovakia. – Folia Geobot. **36**: 163–191.

DOSTÁL J. 1948–1950. Květena ČSR ["Flora of the Czechoslovak Republic"]. **1–2**. 2269 pp., Přírodovědecké nakladatelství, Praha (in Czech).

DOSTÁL J. 1989. Nová květena ČSSR ["New flora of the Czechoslovak Socialist Republic"]. **2**. 765–1548 pp. Academia, Praha (in Czech).

DUBOVIK O. 1974. O vidovoï samostoyatelnosti tysyachelistnika karpatskogo ["On the species status of *Achillea carpatica*"]. – Nov. Sist. Vyssh. Nizsh. Rast. (1974): 92–98 (in Russian and Latin).

EHRENDORFER F. 1953. Systematische und zytogenetische Untersuchungen an europäischen Rassen des *Achillea millefolium*-Komplexes. – Österr. Bot. Z. **100**: 583–592.

EHRENDORFER F. 1959. Differentiation-hybridization cycles and polyploidy in *Achillea*. – Cold Spring Harbor Symp. Quant. Biol. **24**: 141–152.

HADAČ E. & TERRAY J. 1991. Kvetena Bukovských vrchov ["Flora of the Bukovské vrchy Mts"]. 184 pp. Príroda, Bratislava (in Slovak).

HOLMGREN P. K., HOLMGREN N. H. & BARNETT L. C. 1990. Index herbariorum. Part I: The herbaria of the world. Ed. 8. – In: Regnum Vegetabile **120**. x + 693 pp. New York Botanical Garden, Bronx, New York.

JASIEWICZ A. 1966. Rośliny naczyniowe Bieszczadów Zachodnich [Vascular plants of the Bieszczady Zachodnie Mts]. – Monogr. Bot. **20**: 1–340 (in Polish with English summary).

KLOKOV M. K. & KRITSKAYA L. I. 1984. Sistematika i geograficheskoe rasprostranenie predstaviteleï rodov *Ptarmica* Mill. i *Achillea* L. flory USSR ["Systematics and geographic distribution of the genera *Ptarmica* Mill. and *Achillea* L. of the Ukrainian flora"]. – In: K. M. SYTNIK (ed.), Tysyachelistniki ["Yarrows"], pp. 190–249. Naukova Dumka, Kiev (in Russian).

MĄDALSKI J. & CIACIURA M. 1971. *Achillea* L., Krwawnik. – In: B. PAWŁOWSKI & A. JASIEWICZ (eds), Flora polska. Rośliny naczyniowe Polski i ziem ościennych ["Polish flora. Vascular plants of Poland and adjacent territories"]. **12**, pp. 234–256. Państwowe Wydawnictwo Naukowe, Warszawa – Kraków (in Polish).

MIREK Z., PIĘKOŚ-MIRKOWA H., ZAJĄC A. & ZAJĄC M. 1995. Vascular plants of Poland: a checklist. – Polish Bot. Stud. Guideb. Ser. **15**: 3–303.

PAWŁOWSKI B. 1925. Geobotaniczne stosunki Sądeczyzny ["Geobotanical relations of the Sądeczyzna region"]. – Pr. Monogr. Komis. Fizjogr. Pol. Akad. Umiej. **1**: 1–342 (in Polish).

PAWŁOWSKA S. & PAWŁOWSKI B. 1970. O kilku roślinach w polskiej części Karpat dotąd nie znanych lub niepewnych [De aliquot plantis in parte Carpatorum polonica adhuc ignotis vel incertis]. – Fragm. Flor. Geobot. **16**: 295–305 (in Polish with Latin summary).

PRODAN J. 1931. Achileele Românieі [Achilleae Romaniae]. – Bul. Acad. Stud. Agron. Cluj, Memorii **2**: 1–68 + 37 tab. (in Latin and Romanian).

RICHARDSON I. B. 1976. *Achillea* L. – In: T. G. TUTIN, V. H. HEYWOOD, N. A. BURGES, D. M. MOORE, D. H. VALENTINE, S. M. WALTERS & D. A. WEBB (eds), Flora Europaea. **4**, pp. 159–165. Cambridge University Press, Cambridge – London – New York – Melbourne.

SAUKEL J. & LÄNGER R. 1992. Die *Achillea millefolium*-Gruppe (*Asteraceae*) in Mitteleuropa. **1**–**2**. – Phyton (Horn) **31**: 185–207 & **32**: 47–78.

SPUDILOVÁ V. 1956. Studie k monografii rodu *Achillea* v Československu [A Study towards a monograph on the genus *Achillea* in Czechoslovakia]. II. – Přírod. Sborn. Ostrav. Kraje **17**: 367–377 (in Czech with Russian and English summaries).

VOZÁROVÁ M. & SUTORÝ K. 2001. Index herbariorum Reipublicae bohemicae et Reipublicae slovacae. – Zprávy Čes. Bot. Společ. **36**(Suppl. **1**): 1–95.

WOŁOSZCZAK E. 1894. O roślinności Karpat między górnym biegem Sanu i Osławą ["On the vegetation of the Carpathians between the upper San River and the Osława River"]. – Spraw. Komis. Fizyogr. Akad. Umiej. w Krakowie **29**: 39–69 (in Polish).

WOŁOSZCZAK E. 1896. Z granicy flory zachodnio- i wschodnio-karpackiej ["From the boundary between the West and East Carpathian flora"]. – Spraw. Komis. Fizyogr. Akad. Umiej. w Krakowie **31**: 119–159 (in Polish).