

TAXONOMY AND DISTRIBUTION
OF *MACROSCIADIUM ALATUM* (BIEB.) V. TICHOMIROV & LAVROVA (APIACEAE):
A NEW ALIEN SPECIES IN THE FLORA OF EUROPE

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ABSTRACT

The paper presents the taxonomical position and the description of the characteristic features of *Macrosciadium alatum* (= *Ligusticum alatum*). The species was recorded in the Western Bieszczady Mts (the northern part of the Carpathians) in July 2007 and is new to the flora of Europe. Its natural range comprises mainly the Caucasus region and the origin of *M. alatum* in south-east Poland is quite puzzling. The species has most likely been deliberately brought into the area. *M. alatum* spreads quite intensively. It penetrates semi-natural vegetation systems and seems to be expansive.

KEY WORDS: *Macrosciadium alatum*, distribution, taxonomy, kenophyte, Carpathians, Europe.

INTRODUCTION

A number of alien, previously unrecorded species have settled in Central Europe in recent years. Some of them begin to spread shortly after establishing, rapidly increasing their ranges of distribution. They may be very expansive and can penetrate both typically human-made habitats as well as semi-natural and natural vegetation communities (Pyšek and Prach 1993, 1995; Baryła et al. 2005; Tokarska-Guzik 2005; Nobis et al. 2006). In the near future, a similar phenomenon may be observed in the case of *Macrosciadium alatum* (Bieb.) V. Tichomirov & Lavrova, a species new to the flora of Europe, but already spreading fairly intensively.

Silaus Bernh. – *S. alatus* (Bieb.) Link or *Meum* L. – *M. alatum* (Bieb.) Baill. In the late 1980s, V. N. Tichomirov and T. V. Lavrova (1988) placed the species in a newly-described genus, *Macrosciadium* V. Tichomirov & Lavrova, as *Macrosciadium alatum* (Bieb.) V. Tichomirov & Lavrova. However, as stressed by Spalik et al. (2004), this placement should be considered in molecular analyses. Spalik et al. (2004) concluded that the genus *Macrosciadium* seems to be very closely related to the genus *Cnidiocarpa* Pimenov. Recently, the species *Ligusticum physospermifolium* Albov, once placed by Tichomirov and Lavrova (1988) in the genus *Macrosciadium* (Pimenov 2005; Valiejo-Roman et al. 2006), was also transferred to the genus *Cnidiocarpa* based on morphological and molecular similarities.

TAXONOMY

In 1808, M. Bieberstein described a plant he had collected in the northern Caucasus as *Athamantha alata* Bieb. Five years later, the species was transferred by C. Sprengel (1813) to the polyphyletic genus *Ligusticum*, as *L. alatum* (Bieb.) Spreng. Identical views on its taxonomical position were held by Candolle (1830), Ledebour (1844), Boissier (1872), Drude (1898), Shishkin (1950) and Leute (1970). Some researchers, however, differed, placing the species in the following genera: *Selinum* L. – *S. alatum* (Bieb.) Poir,

IDENTIFICATION

The identification of the species was based on the Flora Caucasia (Tamamshian 1967), Flora of Turkey (Hedge and Lamond 1972), Flora USSR (Shishkin 1950) and a study by Tichomirov and Lavrova (1988). The material collected and identified by us was compared with the herbarium material of *Ligusticum alatum* deposited in the Herbarium of the Polish Academy of Sciences (KRAM) in Kraków (a specimen from Georgia sheet 524630, 09.08.2002, leg. R. Gagnidze, S. Shetekauri) and the spe-

cimens from the Caucasus deposited in the Herbarium Komarov Botanical Institute (LE) in St. Petersburg, Russia (specimens from: Abhasia, 31.08.1901, leg. G. Woronov; Georgia, 25.08.1970, leg. Yu. Mienitskij; northern Osetia, 29.08.1989, leg. Yu. Mienitskij, S. Kuzmienkova, T. Vyshenskaya; Dagestanskaya, 09.07.1961, leg. N. N. Tsvelev, S. K. Cieriepanov, G. N. Niepli, A. E. Bobrov; Stavropol, 19.08.1990, leg. Yu. Mienitskij, T. Popova, O. Morozienco).

Set out below is a description of characteristic features of the species based on the authors' own observation of specimens found at different localities in the Western Bieszczady Mts (Polish Eastern Carpathians), also supported by the descriptions given in the above floras.

Macrosciadium alatum (synonym *Ligusticum alatum*) is a rhizomatous plant, producing one to several straight, top-branched and slightly S-shaped bare stems, 50-150 cm tall, purple-coloured (whole or almost to the top) with distinct wings. The wings are 1-2 mm-wide, intensely purple (or green but only at the top of the stem). Basal leaves broad-triangular to triangular-ovate, 15-50×5-20 cm, segments ± ovate, coarsely serrate or with serrated lobes, teeth apiculate, glabrous or minutely asperulous on the margin and veins below, veins often winged. Rays 20-40, asperuus, aggregating at base at maturity, 1-6 cm, outer longer than the inner. Bracts narrow-lanceolate, numbering from 0-10 (13), 2-3 times lower than the rays of the umbel, caducous. Pedicels similar to rays, 2-10 mm. Flowers primarily pink, then white, fruit glabrous, ovate, 3-5 mm long, with 5 distinct wings (Fig. 1).

GENERAL DISTRIBUTION

A great majority of *Macrosciadium alatum* locations are situated within the Caucasus, which is the centre of its distribution. Its locations are known from the following countries: Russia (south-eastern part), north-eastern and eastern parts of Turkey, Georgia, Armenia, Azerbaijan and the north-western part of Iran (Fig. 2).

DISTRIBUTION AND SIZE OF POPULATIONS IN THE CARPATHIANS

Macrosciadium alatum was found in the Western Bieszczady Mts in south-east Poland (ca. 4 km north of the border with Slovakia) in July 2007. The first locations were found in the Strzebowiska village near Cisna. Further targeted searches yielded findings at other locations in the region, around the villages of Krzywe and Przysłup. Groups of up to a hundred individuals were discovered at particular sites, while only the population around the Krzywe village was larger and comprised ca. 500 individuals. A detailed description of the locations of *M. alatum* found in the Bieszczady Mts is given below.

The herbarium material collected is deposited in the Herbarium of the Jagiellonian University in Kraków (KRA).

List of localities

1. Strzebowiska – in a meadow, along a gravel road and on abandoned land, 49°10'58.0''N/22°23'58.0''E, alt. 640 m, 16.07.2007, leg. A. Nobis & M. Nobis; near the tracks of a di-

sused narrow-gauge railway, 49°10'51.3''N/22°23'50.5''E, alt. 640 m, 16.07.2007, leg. A. Nobis & M. Nobis; a rubble heap near buildings in the northern part of the village, 49°11'10.6''N/22°24'04.4''E, alt. 620 m, 18.07.2007, leg. M. Nobis; roadside escarpment, between the wood and buildings in the southern part of the village (close to a stream) 49°10'35.0''N/22°23'47.4''E, alt. 680 m, 17.07.2007, leg. M. Nobis; roadside and slope of a stream bank (near fencing) in the central part of the village, 49°10'42.5''N/22°23'54.3''E and 49°10'45.0''N/22°23'55.7''E, 16.07.2007, rec. M. Nobis, A. Nobis & M. Kozak; unused meadow on a slope, south of the railway tracks, 49°10'48.5''N/22°23'30.0''E, 17.07.2007, rec. M. Nobis, A. Nobis & M. Kozak.

2. Krzywe – side of the main road, 49°12'08.6''N/22°21'52.5''E, alt. 580 m, 19.07.2007, leg. A. Nobis & M. Nobis; fresh meadow and scrub edge, west of the village, 49°11'54.9''N/22°21'41.8''E, alt. 610 m, 19.07.2007, leg. M. Nobis, A. Nobis & M. Kozak.

3. Przysłup – an abandoned plot of land near the railway tracks, 49°11'01.1''N/22°23'23.0''E, alt. 670 m, 21.08.2007, leg. M. Nobis & A. Nobis.

OCCURRENCE IN PLANT COMMUNITIES

Five relevés were performed in patches where *Macrosciadium alatum* occurred (Table 1) using the standard Braun-Blanquet (1964) methodology to illustrate its habitat requirements in the Bieszczady Mts. A phytosociological analysis shows that the species occurs mostly in patches of ruderal communities representing the Artemisietea class (relevé 3). Floristically, these communities are often composed of a large number of common meadow species that penetrate them from the surrounding phytocoenoses of the Molinio-Arrhenatheretea class. *Macrosciadium alatum* finds the most favourable conditions to establish and develop in those habitats that have been greatly disturbed and are therefore open to newcomers. Plants attain considerable sizes in such locations, often form compact concentrations through vegetative reproduction and cover up to several square metres.

Macrosciadium alatum was also recorded in other types of habitats. The species penetrates patches of semi-natural communities relatively often. These are mostly abandoned, overfertilised and disturbed fresh meadows of the order Arrhenatheretalia (relevé 1). In one such habitat, the species occurs near an old graveyard in the Krzywe village, where it grows in high numbers and forms separated patches, covering more than 100 m² (relevé 4). Single individuals were also noted in patches of slightly wetter meadows, resembling the phytocoenoses of the Molinietalia order (relevé 2). This species also emerges at the edges of scrubs and on escarpments of stream banks (relevé 5), but always near buildings, roads or railway tracks.

DISCUSSION

The origin of *Macrosciadium alatum* in this part of Europe is quite puzzling. As the plant is fairly tall and morphologically characteristic, it is not very likely to go unnoticed or be incorrectly identified. Given that its nearest localities

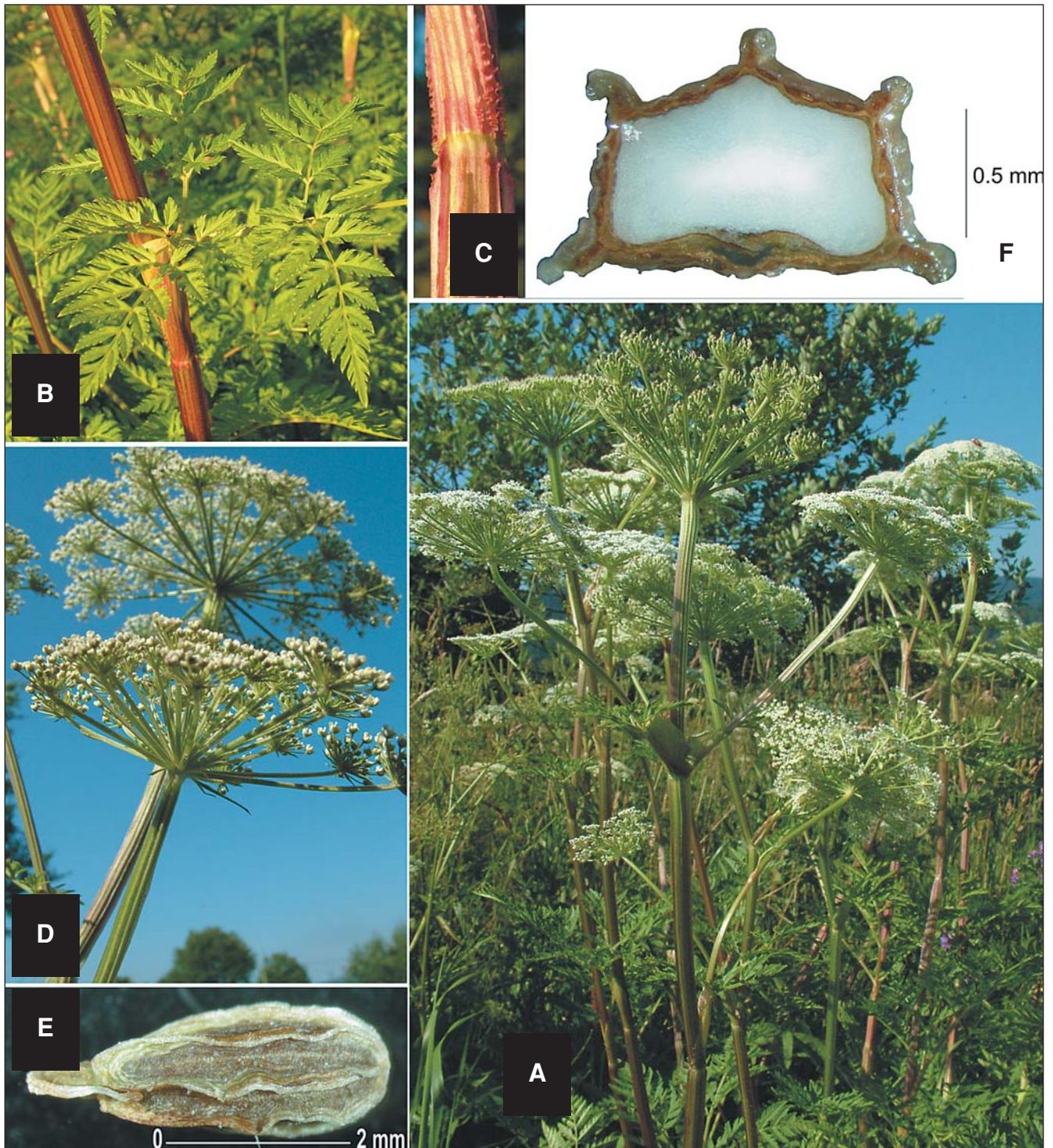


Fig. 1. *Macrosciadium alatum*: A – general habit of the plant; B – leaf on the stem; C – stem fragment with distinct purple wings; D – inflorescences; E – habit of the fruit; F – transverse section of the fruit.

are as far away as in the Caucasus, i.e. they are separated by over 1000 km as in a straight line, the following questions could be posed: Where did the species come from? How could it have arrived in the Western Carpathians without any documented locations over the vast area that extends between the two massifs?

The manner and timing of the arrival of *Macrosciadium alatum* in the Bieszczady Mts are very difficult to explain unambiguously. *M. alatum* was most likely deliberately brought in by former inhabitants of the Bieszczady Mts as a plant with medicinal properties or of ritual importance. When mashed, its fruits have a fairly ethereal smell of tur-

pentine. Because of the content of the latter substance, *M. alatum* fruits may have been used as a component in a medicine (an ointment) for treating neuralgias or rheumatoid pains, similarly to fruits of other plants containing turpentine (Skarżyński 1994). However, despite literature search, we failed to identify any records detailing curative properties of the plant. Because the largest population of *M. alatum* was observed in the vicinity of an old graveyard, the plant may have been treated as a ritual plant. This is supported by aromatic properties of the species as many aromatic herbs used to be recognised for their ritual importance. Bringing this species exclusively for ornamental purposes

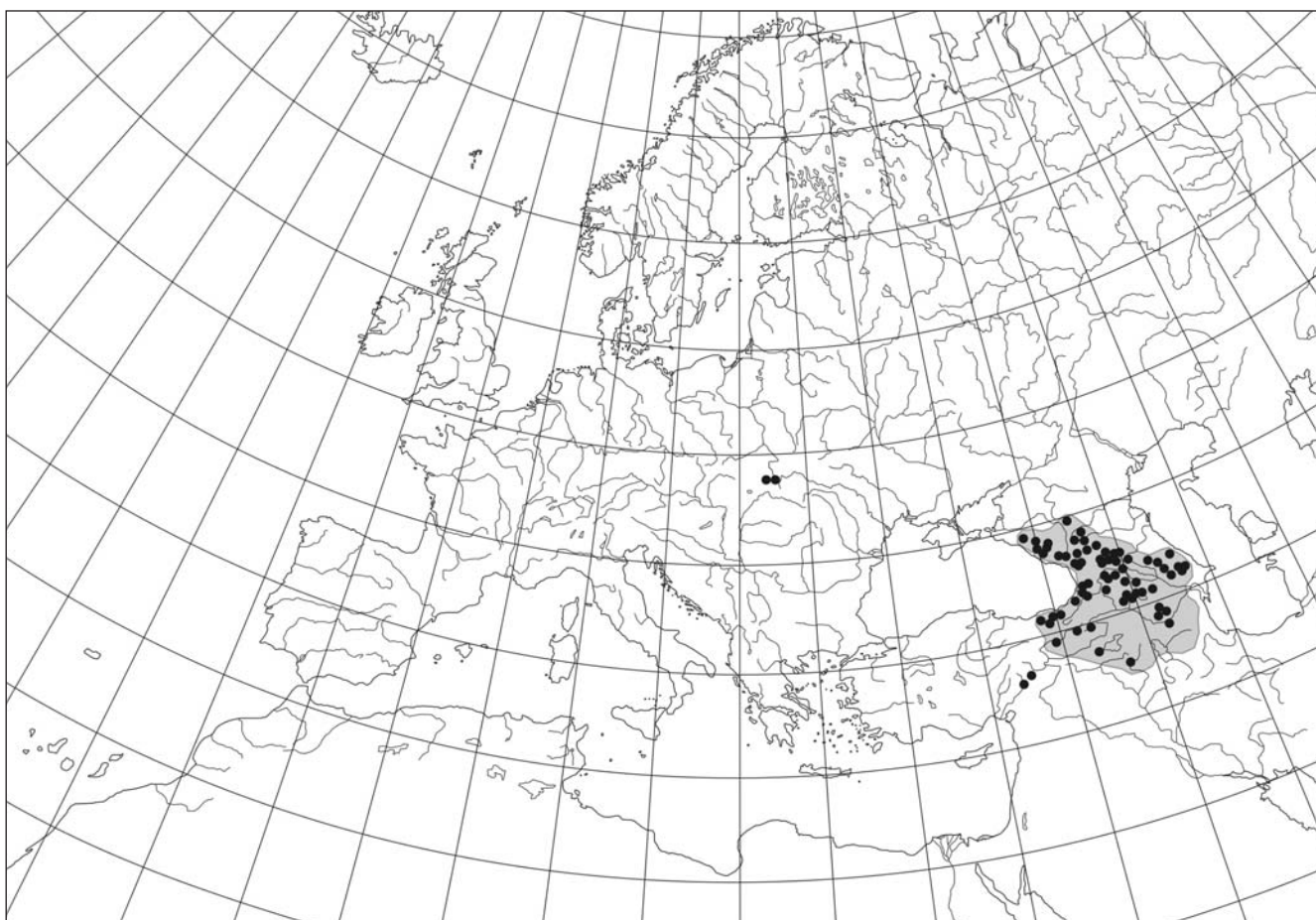


Fig. 2. General distribution map of *Macrosciadium alatum*.

seems unlikely as its appearance, typical of the family Apiaceae, is not particularly decorative.

It cannot be excluded that the species was brought into the area accidentally. A form of military transport may have been responsible for an accidental transfer of its diaspores. Large armies have passed through south-eastern Poland throughout its history, especially during World War II (e.g. withdrawal of German units from the Caucasus in 1943), but also later on when the Bieszczady Mts were home to Soviet units that were stationed there for over a few decades. However, if diaspore migration did occur, a number of other locations would also be found elsewhere, chiefly in Ukraine.

Despite the occurrence of *Macrosciadium alatum* along railway tracks, its accidental transportation by railway is not very likely either. This area does not have, and never had, an eastward railway and the Bieszczady narrow-gauge rail has always been only of local importance. Assuming the railway route of migration for the diaspores would require them to travel from Slovakia to Łupków in Poland. In

addition, *M. alatum* would perhaps have spread in the Łupków locality itself and further along the railway in the direction of Cisna and Komańcza, and such localities were not noted in this study. Its single locations along the railway escarpment in the Strzebowiska-Krzywe section are the likely effects of a later dispersion of the species in the area. At present, the main routes of migration are roadsides and, sporadically, stream valleys.

The presence of *Macrosciadium alatum* in Central Europe is noteworthy. Its fairly broad distribution range in the Carpathians and a high number of individuals in its populations indicate that this species is fully established and constitutes a permanent component of the local flora (kenophyte, hemiagriophyte). Moreover, it can be expected that the plant could spread further in the near future. This is supported first by the biology of the species: it grows in tussocks, produces great numbers of wind-dispersed seeds (sometimes as many as 1500 in one umbel) and shows a tendency for fast, vegetative, expanding growth. Secondly, *M. alatum* has a significant expansion potential: its re-

Sporadic: **Ch. Arrhenatheretalia:** *Alchemilla acutiloba* 3; *Centaurea phrygia* 4(1); *Knautia arvensis* 1; *Lotus corniculatus* 2; *Trisetum flavescens* 4(1). **Ch. Molinietalia:** *Betonica officinalis* 4; *Cirsium rivulare* 2(2); *Glechoma hederacea* 5; *Juncus effusus* 2; *Lychnis flos-cuculi* 1; *Lysimachia vulgaris* 2; *Selinum carvifolia* 4; *Stachys palustris* 4; *Symphytum officinale* 3(1). **Ch. Molinio-Arrhenatheretea:** *Carex hirta* 1(1); *Festuca pratensis* 3; *Lysimachia nummularia* 5(1); *Mentha longifolia* 3; *Prunella vulgaris* 2(1); *Ranunculus repens* 3; *Rumex acetosa* 1(1); *R. crispus* 2. **Ch. Artemisietea vulgaris:** *Anthriscus sylvestris* 3(1); *Calamagrostis epigeios* 4(1); *Chaerophyllum aureum* 5(3); *Cirsium arvense* 2(1); *C. vulgare* 5; *Galium aparine* 5. **Ch. Quercu-Fagetea:** *Agropyron caninum* 5; *Alnus incana* B 2; *Astrantia major* 5; *Cerasus avium* A 5(3), B 3(1); *Stellaria nemorum* 5. **Others:** *Acer pseudoplatanus* A 4(1); *Betula pendula* B 3; *Carduus personata* 5; *Carex brizoides* 3(2); *C. pallescens* 1; *C. contigua* 4; *Chaerophyllum hirsutum* 3(2); *Clinopodium vulgare* 1; *Convolvulus arvensis* 5; *Dianthus deltoides* 4; *Equisetum sylvaticum* 4; *Fragaria vesca* 3; *Fraxinus excelsior* B 3(1); *Galeopsis bifida* 2(2); *G. speciosa* 4; *Geum rivale* 2; *Juniperus communis* B 1; *Ononis arvensis* 1; *Parnassia palustris* 2; *Petasites hybridus* 5(2); *Pimpinella saxifraga* 2; *Populus tremula* B 3; *Prunus spinosa* B 4(1); *Ribes nigrum* B 5; *Rosa canina* B 1(1); *Rubus idaeus* 3(1); *Salix purpurea* B 2(1), C 2; *S. sp.* B 5; *Sambucus nigra* 2; *Senecio fuchsii* 3.

TABLE 1. Plant communities with *Macrosciadium alatum* in the Carpathians.

No. of relevé	1	2	3	4	5	
Location	Strzebowiska	Przysłop	Strzebowiska	Krzywe	Strzebowiska	
Date	17.07.2007	21.08.2007	17.07.2007	19.07.2007	17.07.2007	C
Area of relevé [m ²]	100	20	20	100	30	o
Latitude [N]	49°10'48''	49°11'01''	49°10'35''	49°11'55''	49°10'45''	n
Longitude [E]	22°23'30''	22°23'23''	22°23'47''	22°21'42''	22°23'55''	s
Cover of tree layer 'A' [%]		–		5	40	t
Cover of shrub layer 'B' [%]	5	10	10	5	5	a
Cover of herb layer 'C' [%]	100	95	100	100	100	n
Cover of moss layer 'D' [%]	2	5	–	–	2	c
Slope (°)	3	–	50	–	20	y
Exposure	N	–	S	–	W	
No. of species	39	49	49	38	31	
<i>Macrosciadium alatum</i>	2	2	1	5	3	V
Ch. Arrhenatheretalia						
<i>Dactylis glomerata</i>	3	+	2	+	1	V
<i>Crepis biennis</i>	+	+	1	.	+	IV
<i>Veronica chamaedrys</i>	1	1	2	1	.	IV
<i>Galium mollugo</i>	3	1	.	1	.	III
<i>Pimpinella major</i>	2	.	+	1	.	III
<i>Achillea millefolium</i>	1	.	.	1	.	II
<i>Alectorolophus glaber</i>	+	1	.	.	.	II
<i>Heracleum sphondylium</i>	.	.	1	.	1	II
Ch. Molinietalia						
<i>Angelica sylvestris</i>	+	+	2	.	+	IV
<i>Deschampsia caespitosa</i>	+	2	1	+	.	IV
<i>Poa palustris</i>	.	+	2	1	+	IV
<i>Filipendula ulmaria</i>	+	.	.	+	+	III
<i>Cirsium palustre</i>	.	+	+	.	.	II
<i>Myosotis palustris</i>	.	+	+	.	.	II
<i>Trifolium hybridum</i>	.	2	1	.	.	II
Ch. Molinio-Arrhenatheretea						
<i>Centaurea jacea</i>	2	+	+	+	.	IV
<i>Lathyrus pratensis</i>	1	1	+	1	.	IV
<i>Phleum pratense</i>	4	1	+	+	.	IV
<i>Vicia cracca</i>	+	.	1	1	+	IV
<i>Alopecurus pratensis</i>	.	1	+	1	.	III
<i>Poa trivialis</i>	+	+	.	.	+	III
<i>Ranunculus acris</i>	+	+	+	.	.	III
<i>Elymus repens</i>	2	+	.	.	+	III
<i>Agrostis alba</i>	.	3	2	.	.	II
<i>Trifolium pratense</i>	.	1	1	.	.	II
<i>Holcus lanatus</i>	+	1	.	.	.	II
<i>Poa pratensis</i>	+	.	+	.	.	II
Ch. Artemisietea vulgaris						
<i>Chaerophyllum aromaticum</i>	.	1	3	1	1	IV
<i>Urtica dioica</i>	.	+	2	.	+	III
<i>Rudbeckia laciniata</i>	.	.	1	+	3	III
<i>Epilobium montanum</i>	.	.	+	+	.	II
Ch. Quercu-Fagetea						
<i>Festuca gigantea</i>	.	.	1	.	+	II
Others						
<i>Vicia sepium</i>	+	+	1	+	.	IV
<i>Cruciata glabra</i>	+	+	+	+	.	IV
<i>Stellaria graminea</i>	2	+	.	1	.	III
<i>Plagiomnium sp. D</i>	+	1	.	.	1	III
<i>Rubus plicatus</i>	2	.	.	+	.	II
<i>Agrostis capillaris</i>	2	.	.	1	.	II
<i>Epilobium sp.</i>	.	+	+	.	.	II
<i>Equisetum arvense</i>	.	+	+	.	.	II
<i>Geranium phaeum</i>	.	.	1	.	+	II
<i>Holcus mollis</i>	+	.	.	+	.	II
<i>Hypericum maculatum</i>	1	.	.	1	.	II
<i>Lapsana intermedia</i>	.	.	2	.	2	II
<i>Medicago lupulina</i>	.	1	1	.	.	II
<i>Potentilla erecta</i>	+	.	.	+	.	II
<i>Salix caprea B</i>	.	2	.	+	.	II
<i>Trifolium medium</i>	2	+	.	.	.	II
<i>Tussilago farfara</i>	.	+	2	.	.	II

latively broad ecological amplitude and migration manner allow it to penetrate various synanthropic and semi-natural plant communities and may ultimately consolidate its success to invade natural vegetation systems.

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