DISTRIBUTION OF *VULPIA* SPECIES (POACEAE) IN POLAND

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ABSTRACT

The distribution of four species of the genus *Vulpia* [*V. myuros* (L.) C.C. Gmel., *V. bromoides* (L.) S.F. Gray, *V. ciliata* Dumort. and *V. geniculata* (L.) Link] reported in Poland has been studied. Currently, *V. myuros* and especially *V. bromoides* are very rare species, and their greatest concentration can be found only in the Lower Silesia region. The number of their localities decreased after 1950 and it seems resonable to include both species in the „red list" of threatened plants in Poland: *V. myuros* in the EN category, *V. bromoides* in the CR category. *V. ciliata* and *V. geniculata* are very rare ephemerophytes and their localities not confirmed during ca 60 years are of historical interest only.

KEY WORDS: *Vulpia*, distribution, taxonomy, hybrids, Lower Silesia, Poland.

INTRODUCTION

The species of the *Vulpia* genus are distributed mainly in temperate and subtropical regions of the northern hemisphere. They are also introduced to the southern hemisphere (e.g. Australia), although perhaps several endemic species occur in South America. Over the whole area of their distribution the species of *Vulpia* grow on dry, open places (Clayton and Renvoize 1986; Watson and Dallwitz 1992).

The purpose of the present paper is the verification of distribution of four *Vulpia* species reported hitherto in Poland: *V. myuros* (L.) C.C. Gmel., *V. bromoides* (L.) S.F. Gray, *V. ciliata* Dumort. and *V. geniculata* (L.) Link and their threat. The verification is based on revised herbarium materials, data from the reliable literature and unpublished data.

TAXONOMY, KARYOLOGY AND HYBRIDS

In its widest historical sense the genus *Vulpia* contains ca 30 species divided into several groups treated at various times either as distinct genera or as subgenera or sections. Currently, the species of *Vulpia* are placed in 5 or 6 sections. The studied species belong to two sections: *Vulpia* – *V. myuros* C.C. Gmel., *V. bromoides* (L.) S.F. Gray, *V. ciliata* Dumort. and *Loretia* – *V. geniculata* (L.) Link (Cotton and Stace 1976, 1977; Stace 1981; Clayton and Renvoize 1986; Conert et al. 1998).

Vulpia myuros and *V. bromoides* were originally placed in the genus *Festuca* L., and to-day certain authors still follow this practice. However, both species differentiate distictly from representatives of *Festuca* in respect of habit, florets and lemmas (Cotton and Stace 1977; Auquier and Stace 1980). Most close to the *Festuca* species (from the section *Ovinae*) is *Vulpia geniculata* (Bulińska-Radomska and Lester 1986). The morphological differences between the four studied species are fairly significant (Conert et al. 1998; Rutkowski 1998).

In the genus there are three ploidy levels (diploid to hexaploid). The most frequent chromosome number is 2n = 14 (e.g. *V. bromoides*, *V. geniculata*). The numbers 2n = 28 (*V. ciliata*) and 42 (*V. myuros*) have been also found (Cotton and Stace 1976, 1977; Goldblatt 1985; Goldblatt and Johnson 1994). In Poland the number 2n = 42 for *V. myuros* has been established in plants from the southern part of the country (Mizianty et al. 1981).

Vulpia is closely related to *Festuca* L., and both genera easily hybridize each other. Natural, rare intergeneric hybrids have been found (Stace and Cotton 1974; Ainscough et al. 1986). No natural interspecific *Vulpia* hybrids are known.

DISTRIBUTION OF STUDIED SPECIES

General distribution

The area of greatest genetic diversity of the genus is the western Mediterranean region, especially the Italian and Iberian Peninsulas and adjacent parts of North Africa. The most widely distributed are species of the *Vulpia* section, which occur throughout most of Europe, North Africa and western Asia. The representatives of other sections have a rather restricted area of distribution (Cotton and Stace 1976).

Vulpia myuros is widespread in western, central and southern Europe (reaching as far north as Ireland and central England), and reaching as far east as central Asia. In America, Australia, eastern Asia and southern Africa it is distributed as an introduced plant (Cotton and Stace 1976; Stace and Cotton 1980). In the opinion of Zając and Zając (2001b) this species belongs to Mediterranean-Irano-Turanian connective element. The maps of its general distribution are presented by Hultén (1962), Meusel et al. (1965) and Conert et al. (1998).

Vulpia bromoides occurs in northern Scotland and in southern Sweden, where it is a threatened species, but the centre of its distribution is the north-western part of the European continent. It is very occasionally found in Russia and western Asia. The species is well naturalized in North and South America and in Australia (Cotton and Stace 1976; Stace and Cotton 1980; Ingelög et al. 1993). Its geographical range is presented by Meusel et al. (1965) and Hultén and Fries (1986)

Vulpia ciliata occurs mainly in western and southern Europe, northwards to 53˚ in eastern England (Stace and Auquier 1978; Stace and Cotton 1980; Lambinon et al. 1992).

Vulpia geniculata is distributed in the western and central parts of the Mediterranean area ranging from Portugal to southern France (Cotton and Stace 1976; Stace and Cotton 1980). In central, northern and eastern Europe and in the British Isles it is sporadically introduced mainly with wool and bird-seeds (Ryves et al. 1996; Conert et al. 1998).

Distribution in Poland

In the 19th and at the begining of the 20th century *Vulpia myuros* has been reported mainly in western Poland, from the lowland and foothills of the Sudeten (rarerly Carpathians) as a fairly frequent species (Berdau 1859; Rostafiński 1872; Abromeit et al. 1940; Ascherson and Graebner 1898-1899; Schube1903-1929; Zapałowicz 1906; Szafer 1919; Szafer et al. 1924). The majority of localities were found before 1950. In the second half of the 20th century, however, the number of localities of that species markedly decreased (Table 1, Fig. 1) (Szafer et al. 1953; Mowszowicz 1978; Falkowski 1982; Rutkowski 1998, 2002; Mirek and Piękoś-Mirkowa 2002). It should be emphasized that in the last 12 years (1991-2002) *V. myuros* was found in 18 localities only. According to Rutkowski (2002) it is an apophyte, but in some areas it should be treated rather as a kenophyte.

TABLE 1. Occurrence of *Vulpia myuros* in Poland before and after 1950 (number of localities).

Source of data \ Year	up to 1950	1951-2002
Herbarium	12	25
Literature	90	22
Unpublished	–	13

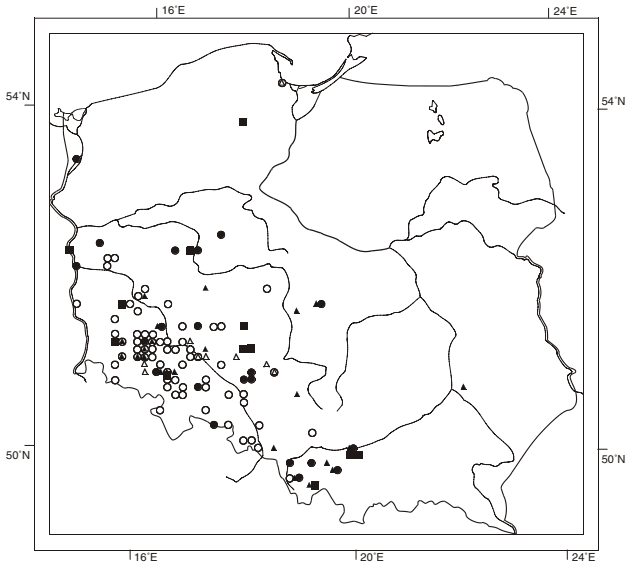

Fig. 1. Past and present distribution of *Vulpia myuros* in Poland: triangles – herbarium materials, circles – literature records, squares – unpublished data (white – localities before 1950, black – localities after 1950).

Vulpia bromoides is a rarer species than the former one. Its localities have been recorded most frequently before 1950.

TABLE 2. Occurrence of *Vulpia bromoides* in Poland before and after 1950 (number of localities).

Source of data \ Year	up to 1950	1951-2002
Herbarium	–	5
Literature	29	5
Unpublished	–	2

Fig. 2. Past and present distribution of *Vulpia bromoides* in Poland: triangles – herbarium materials, circles – literature records, squares – unpublished data (white – localities before 1950, black – localities after 1950).

In the second half of the 20th century the number of localities of the species has apparently diminished. Between 1951 and 2002 it was reported in a few sites only and in 12 last years (1991-2002) – merely in three (Szafer et al. 1924, 1953; Mowszowicz 1978; Falkowski 1982; Rutkowski 1998) (Table 2, Fig. 2). It is considered to be an ephemerophyte (Rostański and Sowa 1986-1987; Frey and Rutkowski 2002; Korniak 2002; Mirek et al. 2002; Rutkowski 2002).

Vulpia myuros and *V. bromoides* attain in Poland local eastern limits of their distribution (Ingelög et al. 1993; Żukowski and Jackowiak 1995; Piękoś-Mirkowa and Mirek 2002). They are character species of the *Vicio lathyroidis-Potentillion argenteae* Brzeg in Brzeg et M. Wojt. 1996 alliance and of *Filagini-Vulpietum*, the pioneer plant community, where *V. myuros* is the dominant species, while occurrence of *V. bromoides* is only ephemeral (Brzeg and Wojterska 1996; Matuszkiewicz 2001).

Vulpia ciliata and *V. geniculata* are extremely rare ephemerophytes. *V. ciliata* was found in Wrocław by Schalow (1932 – city street) as a new taxon to Silesia, and one year later was confirmed by Meyer (1933 – railway station). Its occurrence in Szczecin (Scheuermann 1956 – railway station, *leg.* G. Wangrin, 1942), was not confirmed by Ćwikliński (1970). On the occurrence of *V. geniculata* only one mention from a single locality in Gubin (1929) was reported by Lademann (1937).

CONCLUSIONS

(1) The greatest concentration of *Vulpia myuros* and *V. bromoides* can be found in the Lower Silesia region (Dolny Śląsk).

(2) Nowadays *Vulpia myuros* is a rare species, although in the first half of 20th century it was recorded in western and south-western Poland in fairly numerous localities. However, the majority of them has not been confirmed during the second half of 20th century.

(3) The occurrence of *Vulpia myuros* has been recently confirmed in 3 localities only, and between 1991 and 2002 it was found in 15 new localities.

(4) Thus the map of its distribution in Poland (Zając and Zając 2001a) was modified by the present authors (Fig. 1).

(5) *Vulpia bromoides* has been recently confirmed only in one locality, and between 1991 and 2002 it was found solely in three new localities. A map of its distribution in Poland is published in the present paper for the first time (Fig. 2).

(6) *Vulpia myuros* and *V. bromoides* are character species of *Filagini-Vulpietum*, a very rare plant community in western Poland (Ziemia Lubuska, Bory Dolnośląskie and Wzgórza Trzebnickie regions). This community has been included in the group of endangered natural communities with unknown dynamic tendencies, and usually with insufficient documentation (Brzeg and Wojterska 1996).

(7) Thus, it seems reasonable to consider both species as stable elements of the Polish flora, though recently they have being decreased in abundance, and for this reason the present authors propose to include them in the "red list" of threatened plants in Poland: *Vulpia myuros* in the EN category, and *V. bromoides* in the CR category (it is worthy of notice, that in the Sudeten Mts *V. myuros* has been included in the EN category, while *V. bromoides* in the VU category – Fabiszewski and Kwiatkowski 2002).

(8) *Vulpia ciliata* and *V. geniculata* are ephemerophytes and their occurrence in Poland has been hitherto noted only incidentally and extremely rarely. The localities of both species have not been confirmed during ca 60 years, therefore are of historical interest only.

LOCALITIES OF *VULPIA MYUROS*

Herbarium materials

AE: **29** – Bolesławiec, 1970, *leg. Wójcikiewicz* (WRSL) 51°16' N/14°35' E; 2002, *leg. P. Kwiatkowski* (private herbarium); **49** – Lwówek Śląski, 1993, *leg. P. Kwiatkowski* (private herbarium) 51°07' N/15°35' E

BD: **62** – Grochowice, 1980, *leg. K. Browicki* (WRSL) 51°47' N/16°0' E

BE: **04** – Podgórze, 1961, *leg. Z. Głowacki* (WRSL) 51°31' N/16°16' E; Toszowice, 1961, *leg. Z. Głowacki*, (WRSL), 1972, *leg. E. Kozioł* (BIL) 51°28' N/16°18'E; **23** – Dobrzejów, 1965, *leg. K. Rostański* (WRSL) 51°15' N/16°11' E; **28** – Oborniki Śląskie, 17.06.1867, *leg. R. Uechtritz* (WRSL); 51°18' N/16°55' E; **32** – Legnica, 1998, *leg. P. Kwiatkowski* (private herbarium) 51°13' N/16°10' E; **41** – Kozia Góra, 375 m a.s.l., 1995, *leg. P. Kwiatkowski* (private herbarium) 51°05' N/15°57' E; **42** – Słup, 2002, *leg. P. Kwiatkowski* (private herbarium) 51°06' N/16°06' E; **49** – Rędzin (Wrocław-Psie Pole), 1881, *leg. Uechtritz* (WRSL) 51°10' N/17°05' E; **52** – Wielisławka 369 m a.s.l. near Świerzawa, 16.06.1894, *leg. Pinkwart* (WRSL), 1993, *leg. P. Kwiatkowski* (private herbarium) 51°01' N/15°54' E; **62** – Wolbromek, 25.06.1874, *leg.?* (WRSL) 50°56' N/16°04' E; **64** – Strzegom, 1973, *leg. E. Kozioł* (KTU) 50°58' N/16°21' E; **65** – Łażany, 1965, *leg. J. Mądalski*, (JM) 50°57' N/16°30' E; **66** – Strzeblów, 1966, *leg. W. Stojanowska*, (WRSL) 50°54' N/16°43' E

CD: **50** – Lipówka, 1995, *leg. A. Czarna* (POZ) 51°58' N/17°09' E

CE: **30** – Borowa, 1963, *leg. Z. Głowacki* (WRSL) 51°11' N/17°17' E; **40** – Szczodre, 1859, *leg. Uechtritz* (WRSL) 51°12' N/17°11' E; **44** – Kowalowice, 1887, *leg.*?, (WRSL) 51°08' N/17°46' E; between Namysłów and Byczyna, 1888, *leg.*?, (WRSL) 51°06' N/17°58' E; **58** – Pawłowice Gorzowskie,?, *leg. H. Zuschke* (WRSL) 51°01' N/18°24' E; **69** – Biskupice?, *leg. H. Zuschke* (WRSL) 50°57' N/18°29' E, Skrońsko, *leg. H. Zuschke* (WRSL) 50°59' N/18°27' E

CF: **69** – Boguszowice, 1959, *leg. J. Janota* (LOD) 50°02' N/18°34' E; Niedobczyce, 1959, *leg. J. Janota* (LOD) 50°03' N/18°28' E

DA: **80** – Gdańsk-Westerplatte, 1843, *leg. Klinsmann* (TRN) 54°25' N/18°40' E

DD: **75** – Łódź-Rokicie, 1965, *leg. R. Sowa* (LOD) 51°44' N/19°26' E; **82** – Szadek, 1967, *leg. R. Sowa* (LOD) 51°42' N/18°59' E

DE: **92** – Herby Nowe, 1978, *leg. K. Ptak* (KTU) 50°40' N/18°53' E

DF: **69** – Kraków-Zakrzówek, 2001, *leg. J. Guzik* (KRAM) 50°01' N/19°54' E; **86** – Gorzeń Dolny, 1992, *leg. E. Markiewicz* (KTU) 49°52' N/19°30' E; **97** – Skawce, 1999, *leg. W. Bartoszek* (private herbarium) 49°48' N/19°35' E; Dąbrówka, 1997, *leg. W. Bartoszek* (private herbarium) 49°48' N/19°37' E

DG: **02** – Brenna, 1935, *leg. J. Gałuszka*; 1974, *leg. K. Rostański* (KTU) 49°43' N/18°54' E; **14** – Wieprz, 1987, *leg. M. Skolarz* (KTU) 49°38' N/19°10' E

FE: **84** – Zaklików, 1970, *leg. D. Fijałkowski*, (LBL) 50°45' N/22°06' E

Literature

AB: **83** – Szczecin (Scheuermann 1956) 53°26' N/14°34' E

AC: **96** – Sulęcin (Ćwikliński 1995) 52°26' N/15°07' E

AD: **17** – Toporów (Decker) 52°16' N/15°16' E; **18** – Mostki (Decker (1911) 52°16' N/15°24' E; Ołobok (Decker 1911) 52°13' N/15°26' E; **23** – Rąpice (Ćwikliński 1995) 52°06' N/14°44' E; **27** – Zawisze (Decker 1911) 52°09' N/15°19'E; **73** – Brożek (Decker 1911) 51°43' N/14°41' E; **98** – Pruszków (Schube 1903) 51°32' N/15°25' E, Małomice (Schube 1903) 51°33' N/15°27' E

AE: **18** – Kliczków (Schube 1903) 51°20' N/15°26' E; Osiecznica (Schube 1903) 51°20' N/15°25' E; **29** – Bolesławiec (Schube 1914) 51°16' N/15°34' E; Godnów (Schube 1903) 51°16' N/15°38' E; **49** – Lwówek Śląski (Schube 1903) 51°07' N/15°35' E; **58** – Popielówek (Schube 1903) 50°59' N/15°31' E; **78** – Cieplice Śląskie-Zdrój (Schube 1903) 50°52' N/15°35' E

BD: **06** – Poznań-Górczyn, (Żukowski 1960) 52°22' N/16°53'E; **09** – Poznań-Franowo, (Żukowski 1960) 52°22' N/17°01' E; **52** – between Krępina and Lubiatów (Schube 1903) 51°56' N/15°58' E; Święte (Schube 1903) 51°55' N/15°57' E; **61** – Borowiec (Schube 1903) 51°48' N/15°53' E, Lipiny (Gruhl 1929) 51°52' N/15°49' E; **70** – between Drwalowice and Lasocin (Schube 1903) 51°43' N/15°41' E; **75** – Laskowa (Schube 1903) 51°46' N/16°31' E, Radosław-Strupina (Schube 1903) 51°45' N/16°26' E; **81** – Mieszków (Schube 1903) 51°38' N/15°52' E

BE: **04** – Chełmek Wołowski (Głowacki 1962) 51°27' N/16°21' E; **07** – Białawy Małe (Schube 1903) 51°29' N/16°42' E; **09** – „Stawy Milickie" near Ruda Sułowska (Anioł-Kwiatkowska et al. 1995) 51°32' N/17°06' E; **11** – Rokitki (Schube 1903) 51°21' N/15°54' E, Duninów (Schube 1903) 51°24' N/15°57' E; **12** – Trzebnice (Schube 1907) 51°23' N/16°01' E; **13** – Lubin (Schube 1903) 51°24' N/16°12' E; **21** – Chojnów (Schube 1903) 51°17' N/15°56' E; Czernikowice (Schube 1903) 51°18' N/15°54' E; Jaroszówka (Lubin) (Schalow 1932) 51°19' N/15°59' E; **22** – Niedźwiedzice (Schube 1903) 51°17' N/16°02' E; Raszówka (Schube 1903) 51°19' N/16°07' E; Grzymalin, (Anioł and Pender 1971) 51°17' N/16°06' E; **23** – Bieniowice (Schube 1903) 51°16' N/16°11' E; Rzeszotary (Schube 1903) 51°16' N/ 16°09' E; Dobrzejów (Schube 1903) 51°15' N/16°11' E; **24** – Szczytniki (Schube 1903) 51°17' N/16°17' E; Lisowice (Schube 1903) 52°17' N/16°22' E; **25** – Lubiąż (Schube 1903) 51°16' N/16°28' E; **27** – Rościsławice (Schube 1903) 51°18' N/16°50' E; **31** – Podolany (Schube 1903) 51°11' N/15°58' E; **32** – Wilczyce (Schube 1903) 51°10' N/16°04' E; **33** – Kunice (Schube 1903) 51°14' N/16°15' E; Pątnów Legnicki (Schube 1903) 51°14' N/16°13' E; **35** – Prawików (Schube 1903) 51°15' N/16°30' E; **36** – between Brodno and Szczepanów (Schube 1915) 51°12' N/16°36' E; **38** – Wrocław-Świniary (Schube 1903) 51°12' N/16°58' E; **41** – Wilków (Schube 1905) 51°06' N/15°56' E; **42** – Krotoszyce (Schube 1903) 51°09' N/16°03' E; Górzec 445 m a.s.l. near Jawor (Schube 1903) 51°04' N/16°02' E; **43** – Nowa Wieś Legnicka (Schube 1903) 51°09' N/16°11' E; **48** – Wrocław-Leśnica (Schube 1915) 51°09' N/16°53' E; **49** – Wrocław-Popowice (Schube 1903) 51°08' N/17°00' E; Wrocław (Meyer 1932, 1936) 51°07' N/17°02' E; **54** – Targoszyn (Schube 1903) 51°01' N/16°18' E; **57** – Nowa Wieś Kącka (Schalow 1932) 51°01' N/16°44' E; Krobielowice (Schube 1903) 51°00' N/16°48' E; **64** – Strzegom (Stojanowska 1973) 50°58' N/16°21' E; **65** – Pyszczyn (Schube 1903) 50°59' N/16°32' E; **75** – Kraszowice (Schube 1903, 1929) 50°59' N/16°29' E; **76** – Strzeblów (Schube 1903) 50°54' N/16°43' E; **85** – Krzyżowa (Schube 1903) 50°48' N/16°32' E; **87** – Gola Dzierżoniowska (Schube 1903) 50°44' N/16°47' E; **89** – Strzelin (Stojanowska 1973) 50°47' N/17°04' E; **96** – between Nowa Wieś Niemczańska and Piława Górna (Schube 1925) 50°41' N/16°44' E; **97** – Piekiełko near Niemcza (Schalow 1931) 50°43' N/16°50' E, Niemcza-Jasin (Schalow 1931) 50°43' N/16°50' E

BF: **14** – Radków (Schube 1903) 50°30' N/16°24' E

CC: **82** – Imiołki (Balcerkiewicz et al. 1997) 52°33' N/17°23' E

CD: 58 – Pawłowice Gorzowskie (Schube 1903) 51°01' N/18°24' E;

CE: **01** – Duchowo (Schube 1916) 51°31' N/17°19' E, Milicz-Kobiałka (Schube 1916) 51°32' N/17°17' E, Krośnice (Schube 1929) 51°28' N/17°22' E; **02** – Sławoszowice (Schube 1915) 51°32' N/17°18' E; **52** – Kolonia Miłocice (Schube 1914) 51°12' N/17°38' E; **66** – Markotów Mały (Sendek 1966) 50°59' N/18°06' E; **69** – Biskupice (Schube 1903) 50°57' N/18°29' E, Skrońsko (Schube 1903) 50°59' N/18°27' E; **70** – Niemil (Schube 1903) 50°52' N/17°16' E; **75** – Murów (Michalak 1965) 50°51' N/17°56' E; **76** – Bukowo (Sendek 1966, 1970) 50°54' N/18°06' E; **80** – Krajno (Schalow 1935) 50°44' N/17°14' E; **93** – Prądy (Schube 1903) 50°39' N/17°43' E; **95** – Osowiec Śląski (Schube 1903) 50°44' N/17°59' E

CF: **05** – Szczepanowice (Schube 1903) 50°39' N/17°54' E; **10** – between Goświnowice and Głębinów (Schube 1903) 50°28' N/17°16' E; **31** – Głuchołazy (Schube 1903) 50°19' N/17°23' E; Jarnołtówek (Szotkowski 1971) 50°17' N/17°25' E; Biała Głuchołaska (Krawiecowa et al. 1963, after Schube 1902) 50°18' N/17°22' E; **33** – Prudnik (Schalow 1933) 50°19' N/17°36' E; **37** – Kędzierzyn (Schalow 1931) 50°21' N/18°12' E; **55** – Raków Głubczycki (Schube 1903) 50°07' N/18°01' E; **56** – Dobrosławice (Schube 1903) 50°12' N/18°02' E; Maciowakrze (Schube 1903) 50°11' N/18°02' E; **67** – Racibórz (Schube 1929) 50°05' N/18°14' E

DA: **80** – Gdańsk (Abromeit et al. 1940) 54°22' N/18°36' E

DD: **75** – Łódź–Rokicie (Sowa 1968, 1969, 1974) 51°44' N/19°26' E

DF: **44** – near Dąbrowa (Berdau 1859) 50°13' N/19°13' E; **69** – Kraków-Łobzów (Kornaś et al. 1959) 50°04' N/19°54' E; **81** – Ochaby (Zając 1989) 49°51' N/18°46' E; **84** – Kobiernice Górne (Kotońska 1991) 49°51' N/19°13' E; **97** – Skawce (Mizianty et al. 1981) 49°48' N/19°35' E

DG: **01** – Ustroń (Schube 1903) 49°43' N/18°49' E; **02** – Brenna-Leśnica (Celiński et al. 1976) 49°41' N/18°54' E; Brenna GRN (Celiński et al. 1976) 49°43' N/18°58' E

Unpublished

AD: **02** – Świecko, E. Ćwikliński, 1988, 52°18' N/14°35' E; **79** – Sokołów, E. Kuźniewski, unpbl. 1966 – ATPOL 51°44' N/15°39' E

AE: **28** – Bolesławice, K. Pender, 2002 – personal communication 51°17' N/15°33' E

BD: **08** – Poznań, B. Jackowiak, 1986 – ATPOL 52˚24' N/ 16˚55' E

BE: **65/75** – Wiśniowa, K. Pender, 2000 – personal communication 50˚53' N/16˚29' E

CB: **35** – Przytarnia, I. Kosiński, 1988 – ATPOL 53˚56' N/ 17˚52' E

CE: **05** – Antonin, J. Borysiak et al., 1993 – ATPOL 51˚31' N/17˚52' E; **35** – Feliksów, A. Wawrzyniak, 1979 – ATPOL 51˚12' N/17˚57' E; 3**6** – Laski, A. Wawrzyniak, 1979 – ATPOL 51˚12' N/18˚02' E

DF: **79** – Libertów 260, D. Tumidajowicz, 1965 – ATPOL 49˚58' N/19˚53' E

DG: 14 – Grojec Mt. near Żywiec, K. Nowak, 1997 – personal communication 49˚38' N/19˚10' E

EF: **70** – Pawlikowice, D. Tumidajowicz, 1965 – ATPOL 49˚57' N/20˚04' E, Podlesie, D. Tumidajowicz, 1965 – ATPOL 49˚57' N/19˚58' E

LOCALITIES OF *VULPIA BROMOIDES*

Herbarium materials

BE: 41 – Wilcza Góra 378 m a.s.l. near Złotoryja, 1991, *leg. P. Kwiatkowski* (private herbarium) 51˚06' N/17˚55' E

CF: **36** – Większyce, 1965, *leg. T. Bereta* (KRAM) 50˚20' N/18˚06' E

DD: **76** – Łódź–Rokicie, 1965, *leg. R. Sowa* (LOD) 51˚44' N/19˚26'E,

DE: **51** – Bobrowniki, Pajęczno, 1967, *leg. R. Sowa* (LOD) 51˚05' N/18˚44' E; **52** – Raciszyn, 1967, *leg. R. Sowa* (LOD) 51˚06' N/18˚52' E

Literature

AD: 99 – Dziećmiarowice (Schube 1917) 51˚33' N/ 15˚35' E

AE: **17** – Parowa (Schube 1903) 51˚22' N/15˚17' E; **18** – Krępnica (Schube 1903) 51˚20' N/15˚29' E; **29** – Bolesławiec (Schube 1906) 51˚16' N/15˚34' E, Godnów (Schube 1903) 51˚16' N/15˚34' E; **35** – Zgorzelec (Schube 1903) 51˚09' N/15˚01' E; **38** – Kraszowice (Schube 1903) 51˚13' N/ 15˚31' E; **47** – Niwnice (Schube 1903) 51˚08' N/15˚23' E; **48** – Gradówek (Schube 1903) 51˚07' N/15˚29' E

BD: **15** – Lisowice (Schube 1903) 52˚17' N/16˚22' E; **50** – Pyrnik (Schube 1903) 51˚56' N/15˚46' E

BE: **27** – Brzeg Dolny (Głowacki 1973, 1975) 51˚16' N/ 16˚43' E; **28** – Oborniki Śląskie (Schube 1903) 51˚18' N/ 16˚55' E; **34** – Goślinów (Schube 1903), Jaśkowice (Schube 1903) 51˚13' N/16˚18' E; **41** – Sępów (Schube 1903) 51˚06' N/ 15˚53' E, Wilcza Góra 378 m a.s.l. near Złotoryja (Schube 1903) 51˚06' N/17˚55' E; **42** – Kopista (Widoma), 264 m a.s.l. near Jawor (Kwiatkowski 2000) 51˚05' N/ 16˚06' E; **43** – Nowa Wieś Legnicka (Schube 1903) 51˚09' N/ 16˚11' E; **48** – Wrocław (Schube 1903, Meyer 1936) 51˚07' N/17˚02' E; **52** – Winna Góra (Winnica), 275 m a.s.l. near Piotrowice (Kwiatkowski 2001) 51˚04' N/ 16˚07' E; **60** – Wzgórze Kościuszki, 412 m a.s.l. near Jelenia Góra 50˚54' N/15˚44' E (Schube 1903); **75** – Pszenno (Schube 1925) 50˚51' N/16˚32' E, Marcinowice (Schube 1926) 50˚53' N/16˚35' E; **85** – Lubachów (Schube 1909) 50˚46' N/16˚26' E; **89** – Strzelin (Stojanowska 1973) 50˚47' N/17˚04' E

CB: **71** – Myśligoszcz (Abromeit et al. 1940) 53˚35' N/ 17˚19' E

CE: **30** – Szczodre (Schube 1903) 51˚12' N/17˚11' E; **51** – Kopalina (Schube 1912) 51˚02' N/17˚25' E; **91** – Wilczyce (Schalow 1932) 50˚50' N/16˚59' E; **95** – Opole (Schube 1928; Michalak 1970) 50˚40' N/17˚56' E

CF: **10** – Głębinów (Schube 1903) 50˚28' N/17˚16' E; **15** – Dąbrówka (Schube 1903) 50˚32' N/17˚55' E

DB: **52** – Kwidzyn (Abromeit et al. 1940) 53˚44' N/ 18˚56' E

DD: **82** – Szadek (Sowa 1969) 51˚4' N/18˚58' E

Unpublished data

DA: **82** – Mikoszewo, H. Skowron, 1977 – ATPOL 54˚20' N/18˚57' E

FD: **00** – Kąty–Flakowizna, Z. Głowacki, 1978 – ATPOL 52˚21' N/21˚36' E

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