

Revision of the distribution of the genus *Onosma* (Boraginaceae) in Slovakia

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Abstract: The distribution of the endangered species of Slovak flora from the genus *Onosma*, *O. arenaria*, *O. pseudoarenaria*, *O. visianii* and *O. tornensis*, was revised. The chorological data show that the number of localities of three species decreased in last years, especially that of the species *O. pseudoarenaria*. The exception is *O. tornensis*, the number of localities of which is constant. However, the number of individuals in populations decreased, too. *O. visianii* is still the most frequent species in Slovakia.

Keywords: *Onosma*, Boraginaceae, chorology, Slovakia

Introduction

Onosma L. is a genus with ca. 150 species occurring in dry, cliffy and sunny habitats, and distributed mainly in the Central Asia and the Mediterranean area, having its centre of distribution and maximum concentration of species in Iran (WILLIS 1973). It comprises biennial or perennial, hispid herbs, with flowers in terminal cymes, calyx accrescent, stamens inserted at the middle of the corolla, and generally 4 nutlets, flat at the base. The main taxonomy marker within the genus is sort of indumentum composed of specific trichomes, called stellate setae, but this trait led in the past to several mistakes in taxonomy (BALL 1972). Hence the detailed worldwide and also slovakian nomenclatural and taxonomic

survey has never been given, the taxonomy of the genus *Onosma* is complicated in general as well as within the species occurring in Slovakia.

Four species with different morphological characters and especially with different chromosome numbers can be distinguished in Slovakia: *O. arenaria* WALDST. et KIT. ($2n = 20$), *O. pseudoarenaria* SCHUR ($2n = 26$), *O. visianii* CLEMENTI ($2n = 18$), *O. tornensis* JÁV. ($2n = 14$) (HOLUB & KMEŤOVÁ 1993). This conception of four taxa is used also in the present study. According to JÁVORKA (1906), *O. tornensis* belongs to the section *Asterotricha* BOISS., characterized by several stellate setae on the leaves and stems, *O. visianii* to the section *Haplotricha* BOISS., without stellate setae, and *O. arenaria* and *O. pseudoarenaria* belong to the section *Heterotricha* BOISS., with intermediate traits on the indumentum.

The latter two taxa are also the most often confused not only in the Slovakia but also in Switzerland (VOUILLAMOZ 1999). Extreme forms of variation of these taxa are difficult to distinguish and their certain differentiation within Slovakia is possible only by chromosome counting (MÁRTONFI et al. 2002).

The genus reaches its northern limits of the distribution in the Central Europe approximately at 49° of northern latitude. In this way the localities in southern Slovakia represent the northernmost localities in this region. The limits of the areas are usually represented by places where the occurrence of the species is strongly limited by climatic as well as anthropic factors. This is also the case of the genus *Onosma* in Slovakia, therefore these species are included in List of endangered species in Slovakia (FERÁKOVÁ et al. 2001) and in Red book (HOLUB 1999a, HOLUB 1999b & HOLUB 1999c). All of the taxa of genus *Onosma* occurring in Slovakia are included in the category CR (critically endangered), while *O. tornensis*, stenoendemit of small region near the village of Turňa nad Bodvou (HOLUB 1999c, MEREĎA et al. 2005), is included also in Bern Convention on the Conservation of European Wildlife and Natural Habitats (BERN1) (FERÁKOVÁ et al. 2001).

The history of discovery of the genus *Onosma* in Slovakia

The first datum on the occurrence of the genus *Onosma* in the territory of present Slovakia, from Devínska Kobyla hill and the village of Sv. Jur, is given by ENDLICHER (1830). He gives the occurrence of the species which he called *O. echioides* L. Actually, this is valid name for the taxon, which is distributed in Italy and in the west part of Croatia. Maybe, ENDLICHER used this name in wide sense. He also attaches a short description, which, however, does not allow to determine which taxon is really concerned.

REUSS (1853) in „Května Slovenska“ recorded two species of the genus *Onosma*: *O. echioides* from village of Sv. Jur and Devínska Kobyla hill (probably he took the information from ENDLICHER) and he mentioned the occurrence of the species *O. arenaria* from the banks of the river of Dunaj. He distinguished the species *O. arenaria* from the species *O. echioides* for example by shorter calyx and shorter crooked branches. It indicates, that under the name of *O. echioides* he could understand the taxon *O. visianii*, which have really longer

calyx and longer branches compared with *O. arenaria*. This taxon is relatively frequent in Slovakia. Other relevant information, which can support this hypothesis, is absent.

JÁVORKA (1906) distinguished all four species of the genus *Onosma* known in the Slovakia at the present time in his work about the genus *Onosma* in Hungary (Slovakia was one part of Hungary at that time): *O. visianii*, *O. arenaria*, *O. arenaria* subsp. *pseudoarenaria* (SCHUR) JÁV. (now broadly evaluated as the species *O. pseudoarenaria*) and *O. tornensis*. He mentions *O. visianii* and *O. arenaria* from the locality „Nitrianská župa“ and *O. arenaria* from the surroundings of the town of Bratislava. JÁVORKA does not give any locality of *O. arenaria* subsp. *pseudoarenaria* from Slovakia. However, he gives the occurrence of this taxon near the town of Sátoraljaújhely. This town is situated near the present Slovak-Hungarian border, only few kilometers from locality of the village of Ladmovce, where the occurrence of *O. pseudoarenaria* is known at the present. JÁVORKA also described new species *O. tornensis*, which is known only from the Turniansky hradný vrch hill.

SUZA (1928) recorded *O. visianii*, under the name of *O. tornensis*, in Zádielsky kameň hill for the first time. And classified it as *O. tornensis*. DOSTÁL (1930), however, described differences between the plants in Zádielsky kameň hill and Turniansky hradný vrch hill and clearly defined the two species concerned *O. visianii* and *O. tornensis*. KRAJINA (1936) gave new places of occurrence of *O. tornensis* near the village of Hostovce and in Drienovecká planina plateau which he registered together with BRYM & HADAČ. Six years later, HULJÁK (1942) gives the taxon *O. arenaria* in Slovenský kras karst for the first time.

In the following years new places of occurrence of the genus *Onosma* were gradually, but sporadically discovered in Slovakia. HOLUB (1953 & 1957) brought a survey of the occurrence of *O. visianii* in Slovenský kras karst together with new localities. HENDRYCH (1957) gives the species *Onosma arenaria* subsp. *tuberculata* (KIT.) JÁV. (= *O. pseudoarenaria*) from the surroundings of the town of Jelšava. In the same year BAKSAY (BAKSAY 1957) determined chromosome number of the species *O. tornensis* for the first time, $2n = 14$, on the material from Turňa nad Bodvou. In the work of PTAČOVSKÝ (1959) there is a note about the occurrence of the species *O. visianii* in Devínska Kobyla hill, which he did not succeed to confirm. The record of the occurrence of *O. arenaria* from the surroundings of the town of Fil'akovo was given by HOLUB & MORAVEC (1965). Within broader evaluation of the species *O. pseudoarenaria* RAUSCHERT (1976) supposes that the only subspecies of this species present in the territory of Slovakia is *O. pseudoarenaria* subsp. *tuberculata* (KIT.) RAUSCHERT and he mapped it in several localities from Slovakia. New data about the occurrence of the genus *Onosma* were given by HOLUB (1987) again.

The karyology of Slovak species of the genus *Onosma* was dealt with by BAKSAY (1957), UHRÍKOVÁ & MURÍN in MÁJOVSKÝ et al. (1970), TEPPNER (1971), MURÍN & MÁJOVSKÝ in MÁJOVSKÝ et al. (1978) and TISSOT-DAGUETTE (1979) (Table 1). The survey of the karyological data of slovak material of the genus *Onosma* and material of the genus *Onosma*, which does not come from

Slovakia (some cases at *O. visianii*) was brought by MÁJOVSKÝ et al. (1987). Newer karyological data for the genus *Onosma* in Slovakia were published by UHRÍKOVÁ & KARASOVÁ in LETZ et al. (1999), UHRÍKOVÁ & KARASOVÁ in MÁJOVSKÝ et al. (2000) and MÁRTONFIOVÁ & LEHOČKÁ in MÁRTONFI et al. (2002) (Table 1).

Tab. 1.: Chromosome numbers given for the genus *Onosma* in Slovakia. „*“ – Doubtful datum marked by authors as „polysomaty“. Explanation is given in the text (see the part of *O. tornensis*).

Species	Chromosome numbers	Reference	Locality phytogeographical district in brackets
<i>O. arenaria</i>	2n = 20	MÁRTONFI et al. (2002)	Kukudičová skala hill (Slovenský kras)
<i>O. pseudoarenaria</i>	2n = 26	MÁJOVSKÝ et al. (1978)	Burda hills (Burda)
	2n = 26	MÁRTONFI et al. (2002)	village of Ladmovce (Východoslovenská nížina)
<i>O. tornensis</i>	2n = 14	BAKSAY (1957)	village of Turňa nad Bodvou (Slovenský kras)
	2n = 14 & 28*	MÁJOVSKÝ (1970)	village of Turňa nad Bodvou (Slovenský kras)
	2n = 14, n = 7	TEPPNER (1971)	village of Turňa nad Bodvou (Slovenský kras)
	2n = 14	TISSOT-DAGUETTE (1979)	„Czechia“ [Czechoslovakia]
	2n = 14, n = 7	TISSOT-DAGUETTE (1979)	Slovakia
	2n = 14	TISSOT-DAGUETTE (1979)	village of Turňa nad Bodvou (Slovenský kras)
<i>O. visianii</i>	2n = 18	LETZ et al. (1999)	village of Turňa nad Bodvou (Slovenský kras)
	2n = 18	LETZ et al. (1999)	village of Drienovec (Slovenský kras)
	2n = 18	MÁJOVSKÝ et al. (2000)	village of Turňa nad Bodvou (Slovenský kras)
	2n = 18	MÁJOVSKÝ et al. (2000)	village of Domicia (Slovenský kras)

The first comprehensive survey of distribution and taxonomy of genus *Onosma* in Slovakia was given in Flóra Slovenska V/1 (HOLUB & KMEŤOVÁ 1993) and partial data was also given in Red book of endangered species of plants and animals in SR and ČR (HOLUB 1999a, 1999b, 1999c). The data on occurrence in these works issue above all from morphological characters. The revision of some plants on the basis of chromosome numbers showed (MÁRTONFI et al. 2002) that the situation is still not clear enough. Repeated evaluation of state of conservation of *O. tornensis* populations is carried by MEREĎA et al. (2005) and interesting hypothesis of origin of this species was given by MRÁZ (2004). New literature data about occurrence of *O. visianii* in Plešivecká planina plateau was brought in recent time by ŠUVADA (2006).

Materials and methods

The material from the following herbaria, abbreviations are according to HOLMGREN et al. (1990), was used to study morphological characters and distribution of the species of the genus *Onosma*: BP, BRA, BRNM, BRNU, KO,

PR, PRC, SAV, SLO. The research was also based on the study of literature data. Much information was provided to us by colleagues from various workplaces of State Nature Reserve of Slovakia. Most but not all of the localities known at the present time were verified by field investigation. The collection of the plants, deposited in herbarium of PAVOL MÁRTONFI (abbreviation herb. PM in the text), was carried on the basis of exception from nature conservation of Ministry of Environment of the Slovak Republic no. 1210/481/05-5.1. Precise GPS co-ordinates are not given in the text, for the safe of nature conservation. They are available in the authors' institution upon request. The marks „○“ (the occurrence known in the past and not confirmed at present time) and „●“ (present occurrence), given in the text before the name of each locality, indicate the state of the occurrence of the species in the locality at the present time. Phytogeographical division of Slovakia follows FURÁK (1984). The name of the locality is followed by corresponding number of squares of Central European mapping unit.

Results and discussion

Onosma arenaria

At the present time *O. arenaria* occurs only in four localities in Slovakia. Many localities known in the past, were not confirmed for some decades (Fig. 1). The populations in extant localities are not numerous and require strict protection. The questionable recent occurrence of the species *Onosma arenaria* in Kukudičova skala hill in Slovenský kras karst was confirmed by MÁRTONFI et al. (2002) by the determination of chromosome number, $2n = 20$. At the same time it is the only datum on chromosome number of the species *O. arenaria* in Slovakia.

Phytogeographical district nr. 1: Burda

○ **Village of Kamenica nad Hronom – Kováčovské kopce hills (8178c, d)**

The first record from this locality is voucher specimen from 1929 collected by unknown collector. However, it was documented in the years 1935 and 1936 for the last time. KOLARČIK was unsuccessful when checking this locality in 2005.

Voucher specimens: s. coll. 1929 PRC, NÁBĚLEK 1935 BRA, KRIST 1936 BRA, VALENTA 1936 BRA; **literature data:** HOLUB (1999A)

○ **Village of Salka – slopes above the village from direction of village of Kamenica (8178b,c)**

Only two vouchers collected by MÁJOVSKÝ are known from this locality. According to SZABÓOVÁ from the Office of the Dunajské luhy Protected Landscape Area (2005, pers. comm.), the species is probably extinct from this locality. However, nobody has checked this locality at the present time.

Voucher specimens: MÁJOVSKÝ 1958 SLO, MÁJOVSKÝ s. dat. SLO; **literature data:** HOLUB & KMEŤOVÁ (1993), HOLUB (1999a).

Phytogeographical district nr. 2: Ipeľsko-rimavská brázda

○ **Village of Plášťovce – Konerád hill (7879d)**

Two records only, about 50 years ago, the locality has not been confirmed since then. BENEDIKT were not successful, when checked locality (2007, pers. comm.).

Voucher specimens: SKRIVÁNEK 1953 BRNM, ČERNOCH 1958 BRNM; **literature data:** HOLUB & KMEŤOVÁ (1993, sub nom. *O. pseudoarenaria* subsp. *tuberculata*), (HOLUB 1999b, sub nom. *O. pseudoarenaria* subsp. *tuberculata*).

○ **Village of Plášťovce – direction to the village of Rykynčice (7879b)**

Only two vouchers exist from this locality, both from 1955 collected by MÁJOVSKÝ. More than 50 years the occurrence was not confirmed. Actually nobody has checked this locality.

Voucher specimens: MÁJOVSKÝ 1955 SLO; **literature data:** HOLUB & KMEŤOVÁ (1993, sub nom. *O. pseudoarenaria* subsp. *tuberculata*), HOLUB (1999b, sub nom. *O. pseudoarenaria* subsp. *tuberculata*).

○ **Town of Fil'akovo – Šarkan hill (7785a)**

The only one note from this locality is the literature datum given by HOLUB & MORAVEC (1965). There is no other datum of the species from this locality, which probably doesn't exist at the present time. However, actually nobody checked this locality.

Literature data: HOLUB & MORAVEC (1965), HOLUB & KMEŤOVÁ (1993), HOLUB (1999a).

Phytogeographical district nr. 3: Slovenský kras

● **Village of Jablonov nad Turňou – Kukudičová skala hill (7390c)**

The first known record from this locality is the literature datum given by HULJÁK (1942), the locality was confirmed four times later on. In this locality also the species *O. visianii* occurs. The plants belonging to the species *O. arenaria* were often evaluated also as *O. pseudoarenaria* (HOLUB & KMEŤOVÁ 1993, HOLUB 1999). MÁRTONFIOVÁ & LEHOCKÁ in MÁRTONFI et al. (2002), giving the chromosome number $2n = 20$ for the plants from this locality, unequivocally classified the plants as the species *O. arenaria*. KOLARČIK & KARASOVÁ confirmed the occurrence of *O. arenaria* in this locality in 2005 – ca. 50 mainly fertile individuals.

Voucher specimens: FUTÁK 1949 SLO, KARASOVÁ 1991 SLO, KOLARČIK & KARASOVÁ 2005 herb. PM; **literature data:** HULJÁK (1942), HOLUB & KMEŤOVÁ (1993, sub nom. *O. pseudoarenaria* subsp. *tuberculata*), HOLUB (1999b, sub nom. *O. pseudoarenaria* subsp. *tuberculata*), MÁRTONFIOVÁ & LEHOCKÁ in MÁRTONFI et al. (2002).

Phytogeographical district nr. 5: Devínska Kobyla

○ **Town of Bratislava – Devínska Kobyla hill (7867b)**

The first historical datum about the occurrence of the genus *Onosma* from this locality was given by ENDLICHER (1830) as *O. echioides*, as well as by REUSS (1853). The description of REUSS indicates that these data are probably related to the species *O. visianii*. No later data about occurrence of *O. echioides* exist. These indicia give to suspect that name of *O. echioides* was used in wide sense in the past. In our case, also for the taxon *O. visianii* (presented by HOLUB &

KMEŤOVÁ 1993). It is also possible, that ENDLICHER could use the name of *O. echioides* for the taxon *O. arenaria* or *O. pseudoarenaria*. These three taxa (*O. visianii*, *O. arenaria* & *O. pseudoarenaria*) were known from this locality from later time. However, the clear data evidenced hypothesis given here doesn't exist. So the opinion presented by HOLUB & KMEŤOVÁ (1993) could not be followed. The first herbarium specimen of *O. arenaria* from this locality was collected by WIESBAUER in 1879. The locality was confirmed by two another collectors and the voucher specimen from 1911 collected by MERGL is the last known one. It is a mixed specimen, there are two plants, each of them belongs to another species (*O. arenaria* and *O. pseudoarenaria*). The locality probably ceased to exist in the 20th century. FERÁKOVÁ et al. (1997) did not record this species in the Devínska Kobyla hill any more. However, since that time, nobody has checked this locality.

Voucher specimens: WIESBAUER 1879 PR, ESCHFAELLER 1880 PR, LAUBNER 1910 BRA, MERGL 1911 SAV; **literature data:** ?ENDLICHER (1830, sub nom. *O. echioides*), ?REUSS (1853, sub nom. *O. echioides*), JÁVORKA (1906), HOLUB & KMEŤOVÁ (1993, sub nom. *O. pseudoarenaria* subsp. *tuberculata* & *O. visianii*), FERÁKOVÁ et al. (1997), HOLUB (1999b, sub nom. *O. pseudoarenaria* subsp. *tuberculata*).

Phytogeographical district nr. 6: Podunajská nížina

• Village of Modrany – Suchý vrch hill (8176c)

The first record is represented by four voucher specimens from 1970 collected by CHRTEK, KRÍSA & SLAVÍKOVÁ, the locality is considered recent due to collection of BARINA (National History Museum, Budapest) from 2004.

Voucher specimens: CHRTEK, KRÍSA & SLAVÍKOVÁ 1970 PRC, BARINA 2004 BP

○ Village of Čenkov – Čenkovský les forest (8277a)

The locality is known because of the occurrence of *O. pseudoarenaria*, several specimens from this locality deposited in BRA & SLO are however morphologically close rather to the species *O. arenaria*. Such plants, however, have not been documented since 1948 any more. KOLARČIK, MAJESKÝ & SZABÓOVÁ did not confirm the occurrence of *O. arenaria* in this locality at the present time.

Voucher specimens: cf. *O. arenaria*: VALENTA 1938 BRA, FUTÁK 1948 SLO; **literature data:** HOLUB & KMEŤOVÁ (1993, sub nom. *O. pseudoarenaria* subsp. *tuberculata*), HOLUB (1999b, sub nom. *O. pseudoarenaria* subsp. *tuberculata*).

• Belianské kopce hills – Vršok hill (8177d)

The occurrence of *O. arenaria* is documented by herbarium specimens collected in this locality since 1918 to 1978. According to the information of the Office of the Dunajské luhy Protected Landscape Area, only four individuals are known in this locality at the present time (SZABÓOVÁ 2005, pers. comm.). KOLARČIK & MAJESKÝ confirmed this datum in 2005 – four fertile individuals.

Voucher specimens: unread. coll. 1918 PRC, KLÁŠTERSKÝ 1933 PR, KRIST 1935 BRNU, DOMIN & JIRÁSEK 1936 PRC, KLIKA 1937 PR, JIRÁSEK 1947 PRC, JEDLIČKA 1950 BRNU, SMEJKAL 1950 BRNU, KNEBLOVÁ 1951 PR, ŽERTOVÁ 1958 PR, VICHÉREK 1972 BRNU, DVOŘÁK 1978 BRNU, KOLARČIK & MAJESKÝ 2005 herb. PM (small branch with flowers); **literature data:** HOLUB & KMEŤOVÁ (1993), HOLUB (1999a).

Phytogeographical district nr. 12: Trábeč

• **Town of Nitra – National Nature Reserve Lupka (7674c)**

The locality is well known both in the past and in the present (ŘEHOŘEK 2005, pers. comm.), and confirmed by KOLARČIK, MAJESKÝ & ROSINOVÁ (2005) – ca. 15 individuals, 10 were sterile yearling individuals in state of ground rosette.

Voucher specimens: VLACH 1932 PRC, s. coll. 1933 PRC, PULCHART & SOUČEK 1933 PRC, VLACH 1935 BRNM, POSPÍŠIL 1950 BRNM, ŠOUREK 1950 PR, POSPÍŠIL 1952 BRNM, KOLARČIK, MAJESKÝ & ROSINOVÁ 2005 herb. PM; **literature data:** HOLUB & KMEŤOVÁ (1993), HOLUB (1999a).

Onosma pseudoarenaria subsp. tuberculata

According to RAUSCHERT (1976), as well as HOLUB & KMEŤOVÁ (1993) and HOLUB (1999b) only the subspecies *O. pseudoarenaria* subsp. *tuberculata* occurs in Slovakia. At the present time *O. pseudoarenaria* occurs in six localities in Slovakia, in two of them it is confirmed also karyologically (MURÍN & MÁJOVSKÝ in MÁJOVSKÝ et al. 1978, MÁRTONFI et al. 2002). Many others localities are not confirmed (Fig. 2). The extant populations are, similarly to populations of *O. arenaria*, very poor and require consistent protection. The confirmation of the species occurrence in the hills near the village of Jelšava by BENEDIKT in 2001 and 2006, represents a very interesting finding. The species was considered extinct in this locality for more than thirty years (MÁRTONFI et al. 2002).

Phytogeographical district nr. 1: Burda

• **Village of Kamenica nad Hronom – Kováčovské kopce hills (8178c, d)**

This locality is recorded by SUZA in 1920 for the first time and the locality was confirmed several times later on. The last known voucher specimen before the confirmation by KOLARČIK in 2005 (ca. 10 individuals dispersally distributed, half of them were sterile yearling plants in state of ground rosette) is from 1985 collected by ČÁP. The first karyology datum for *O. pseudoarenaria* from Slovakia ($2n = 26$) was also given from this locality (MURÍN & MÁJOVSKÝ in MÁJOVSKÝ et al. 1978).

Voucher specimens: SUZA 1920 BRNU, NOVÁK 1922 PRC, DOMIN 1929 PRC, DOMIN 1930 PRC & BP, DOMIN & SILLINGER 1930 PRC, SKŘIVÁNEK 1931 BRNM, KLÁŠTERSKÝ & DEYL 1933 PR, KRIST 1933 BRNU, SKŘIVÁNEK 1933 BRNM, VLACH 1933 PRC, WEBER 1933 PR, KLIKA 1935 PR, WEBER 1935 PR & SLO, KRIST 1936 BRA, KRIST & VALENTA 1936 BRA, WEBER 1936 BRA, KLIKA 1937 PR, NÁBĚLEK 1937 SAV, OPLUŠTILOVÁ 1946 SLO, FUTÁK 1947 SLO, FUTÁK 1948 SLO, FUTÁK 1949 SLO & SAV, ČERNOCH 1950 BRNM, HRABĚTOVÁ 1950 BRNU, KAVKA 1950 BRA, SKŘIVÁNEK 1950 BRNM, DOČOLOMANSKÝ 1951 BRA, SKŘIVÁNEK 1951 BRNM, ŠMARDA 1951 BRNM, ŠOUREK 1951 PR, DEYL 1952 PR, HOLUBIČKOVÁ & ONDRÁKOVÁ 1952 PR, ČERNOCH 1953 BRNM, FUTÁK 1953 SAV, GREBENŠČIKOV 1955 SAV, unread. coll. 1956 SAV, FUTÁK 1956 SAV, MICHALCO 1956 SAV, HLAVÁČEK 1957 SAV, unread. coll. 1958 SLO, FUTÁK & HLAVÁČEK 1958 SAV, MICHALCO 1958 SLO, FUTÁK 1959 SAV, ČERNOCH 1961 BRNM, DOMIN 1964 PR, MÁJOVSKÝ 1967 SLO, SMEJKAL 1967 BRNU, SMEJKAL 1968 BRNU, FUTÁK 1972 SAV, BERTOVÁ 1973 SAV, ČVANČARA 1973 BRNM, ONDRÁŠEK 1983 BRA, ČÁP 1985 BRNM, KOLARČIK 2005 herb. PM, MAGDALENOVÁ unread. dat. BRA; **literature data:** MURÍN & MÁJOVSKÝ in MÁJOVSKÝ et al. (1978), HOLUB & KMEŤOVÁ (1993), HOLUB (1999b).

Phytogeographical district nr. 2: Ipeľsko-rimavská brázda

○ **Village of Malá nad Hronom – village of Kamenín (8177b)**

Only two voucher specimens are known from this locality. The first of them, which looks like intermediate type between *O. arenaria* and *O. pseudoarenaria*, was collected by DEYL in 1938 and placed in PR herbarium. The second voucher specimen (FUTÁK 1948) is *O. pseudoarenaria*. There is no further information, the locality probably ceased to exist. However, actually nobody has checked this locality.

Voucher specimens: cf. *O. pseudoarenaria*: DEYL 1938 PR; *O. pseudoarenaria*: FUTÁK 1948 SLO; **literature data:** HOLUB & KMEŤOVÁ (1993, sub nom. *O. arenaria*), HOLUB (1999a, sub nom. *O. arenaria*).

○ **Town of Šahy – Turovec hill (Regisko hill) (7879d, 7979b)**

The specimen known from this locality is morphologically intermediate type to the species *O. pseudoarenaria*. Other specimens known from not so far Konerád hill and village of Plášťovce belong to *O. arenaria* (see the part of *O. arenaria*). This locality was checked by BENEDIKT but he did not confirm occurrence of *Onosma* species (BENEDIKT 2007, pers. comm.).

Voucher specimens: cf. *O. pseudoarenaria*: DOMIN & SILLINGER 1932 PRC; **literature data:** HOLUB & KMEŤOVÁ (1993), HOLUB (1999).

Phytogeographical district nr. 3: Slovenský kras

Town of Jelšava and its surroundings

○ **Stráň hill (7387d)**

The first historical datum about the occurrence of this taxon in the locality was given by HENDRYCH (1957), confirmed once again by MÁJOVSKÝ in 1967. *O. pseudoarenaria* is not confirmed in this locality at the present time (BENEDIKT 2007, pers. comm.).

Voucher specimens: MÁJOVSKÝ 1967 SLO; **literature data:** HENDRYCH (1957), HOLUB & KMEŤOVÁ (1993).

● **Tri peniažky hill (7387c)**

The only record from this locality is voucher specimen collected by GALLO in 1970. At the present time, new important record was given by BENEDIKT (2007, pers. comm.) – couple of plants in different phase of ontogeny.

Voucher specimens: GALLO 1970 BRA; **literature data:** HOLUB & KMEŤOVÁ (1993).

● **Slovenská skala hill (7387d)**

The only record from this locality is voucher specimen collected by SLABÝ in 1966. Likewise in previous case, *O. pseudoarenaria* was confirmed from this locality by BENEDIKT (2007, pers. comm.), too – couple of plants in different phase of ontogeny.

Voucher specimens: SLABÝ 1966 PRC; **literature data:** HOLUB & KMEŤOVÁ (1993).

Phytogeographical district nr. 5: Devínska Kobyla

○ **Town of Bratislava – Devínska Kobyla hill (7867b)**

The voucher specimen from 1857 collected by HOLUBY (SLO) is the first record from this locality. Only two another voucher specimens are known from this locality. One of them is mixed voucher (*O. arenaria* + *O. pseudoarenaria*) from 1911 collected by MERGL (see comments to this locality in the part devoted

to *O. arenaria*). FERÁKOVÁ et al. (1997) did not record this species in the Devínska Kobyla hill and therefore the locality is considered extinct. However, since that time, nobody has checked this locality.

Voucher specimens: HOLUBY 1857 SLO, MERGL 1911 SAV, ESCHFAELLER unread. dat. BRNU; **literature data:** HOLUB & KMEŤOVÁ (1993), FERÁKOVÁ et al. (1997), HOLUB (1999b).

Phytogeographical district nr. 6: Podunajská nížina

● **Village of Čenkov – Čenkovský les wood (8277a)**

The locality is fairly well-known and documented from the years 1935-1972. According to the Office of Dunajské luhy Protected Landscape Areas, *O. pseudoarenaria* grows in two places in Čenkovský les wood and the number of individuals (mainly fertile) is about fifteen (SZABÓOVÁ 2005, pers. comm.). KOLARČIK, MAJESKÝ & SZABÓOVÁ confirmed this locality in 2005.

Voucher specimens: WEBER 1935 PR, KRIST 1937 BRNU, KRIST & VALENTA 1937 BRA, KRIST 1938 BRNU, JIRÁSEK 1947 PRC, JEDLIČKA 1950 BRNU, POSPÍŠIL 1950 BRNM, ŠOUREK 1950 PR, KRIPPEL 1952 SLO, „excursion“ 1954 SLO, „excursion“ MÁJOVSKÝ 1955 SLO, VACEK 1958 BRNM, MÁJOVSKÝ 1959 SLO, MÁJOVSKÝ 1963 SLO, BUTOVÁ 1968 BRA, KMEŤOVÁ 1969 SAV, FLAŠÍKOVÁ & ZAHRADNÍKOVÁ 1971 SAV, VICHEREK 1972 BRNU, KOLARČIK, MAJESKÝ & SZABÓOVÁ 2005 herb. PM; **literature data:** HOLUB & KMEŤOVÁ (1993), HOLUB (1999b).

○ **Belianske kopce hills – Vršok hill (8177d)**

The locality is documented from the years 1934-1938, but not confirmed since then. Actually, only four plants of *O. arenaria* are known from this locality (see the part of *O. arenaria*).

Voucher specimens: *O. pseudoarenaria*: WEBER 1934 PR, WEBER 1935 PR, WEBER 1936 PR; cf. *O. pseudoarenaria*: DEYL 1938 PR; **literature data:** HOLUB & KMEŤOVÁ (1993), HOLUB (1999b).

Phytogeographical district nr. 8: Východoslovenská nížina

● **Village of Malý Kamenec – Tarbucka hill (7696b)**

The first record from this locality is from 1931 (MARGITTAI PRC). Only few other records exist from this locality, but it was confirmed recently by HODÁLOVÁ & PERNÝ in 2005 (HODÁLOVÁ 2005, pers. comm.) and by KOLARČIK & ŠUVADA in 2006 (two fertile individuals).

Voucher specimens: MARGITTAI 1931 PRC, MARGITTAI 1933 PRC, DOSTÁL 1952 PRC, FUTÁK 1956 SAV, FUTÁK 1958 SAV; **literature data:** HOLUB & KMEŤOVÁ (1993), HOLUB (1999b).

○ **Village of Viničky – Borsuk hill (Borszhegy) (7596c, d)**

HOLUB & KMEŤOVÁ (1993) mentioned voucher specimen of MARGITTAI 1931 SLO as the only record from this locality in their survey. The specimen has not been found in the herbarium SLO at the present time (we have checked all specimens of the genus *Onosma* found in SLO), the duplicate can be probably found in BP. The occurrence of any species from genus *Onosma* is not confirmed in this locality at the present time (BOGOLY 2005, pers. comm.).

Voucher specimens: MARGITTAI 1931 BP; **literature data:** HOLUB & KMEŤOVÁ (1993).

● **Village of Ladmovce – Dlhá Hora hill (7596d)**

Voucher specimens from this locality were collected by MÁRTONFI & BOGOLY in 2001 for the first time. The locality was known by BOGOLY (2001, pers. comm.). several years before the first collection. Karyological datum ($2n = 26$) was also given from this locality (MÁRTONFIOVÁ & LEHOCKÁ in MÁRTONFI et al. 2002). The

locality was confirmed in 2005 by KOLARČIK & BOGOLY and in 2006 by KOLARČIK, ŠUVADA & MAJESKÝ – ca. 40 individuals (half of them were only sterile yearling plants in state of ground rosette) in the area of 20 x 60m.

Voucher specimens: MÁRTONFI & BOGOLY 2001 BRA & KO, KOLARČIK & BOGOLY 2005 herb. PM; **literature data:** MÁRTONFIOVÁ & LEHOČKÁ in MÁRTONFI et al. (2002).

○ **Town of Kráľovský Chlmec – Veľký kopec hill (7597d)**

Only two identical voucher specimens placed in PRC are known from this locality. The plants are intermediate between *O. arenaria* and *O. pseudoarenaria*, we endorse an opinion that they represent marginal type of *O. pseudoarenaria*. This locality was checked by BOGOLY and it is not confirmed at the present time (BOGOLY 2005, pers. comm.).

Voucher specimens: cf. *O. pseudoarenaria*: DOMIN & SILLINGER 1932 PRC; **literature data:** HOLUB & KMEŤOVÁ (1993), HOLUB (1999b).

○ **Village of Vinné – Senderov hill (7197d)**

The first record from the locality is represented by the collections of HAZSLINSKY with missing year of collection. The last collection was done by MICHALCO in 1959. The occurrence of *O. pseudoarenaria* is not known at the present time (BENEDIKT 2006, pers. comm. and BOGOLY 2005, pers. comm.).

Voucher specimens: HAZSLINSKY s. dat. BRA & PR, MICHALCO 1954 SAV, ČERNOCH 1957 BRNM, ŠOUREK 1957 PR, MICHALCO 1959 SAV; **literature data:** HOLUB & KMEŤOVÁ (1993), HOLUB (1999b).

Onosma visianii

At the present *O. visianii* is the most frequent species of the genus *Onosma* in Slovakia. It occurs scattered in Tematínske kopce hills and in Slovenský kras karst. Other occurrence, which was known in the past, was not confirmed for a long time (Fig. 3). The plants from three localities in Slovenský kras karst were confirmed also by chromosome number ($2n = 18$) (UHRÍKOVÁ & KARASOVÁ in LETZ et al. 1999, UHRÍKOVÁ & KARASOVÁ in MÁJOVSKÝ et al. 2000).

Phytogeographical district nr. 3: Slovenský kras

● **Village of Plešivec – Plešivecká planina plateau (7488a, b)**

This is a well-known and well documented locality. According to the workers of the Office of Slovenský kras National Park (KARASOVÁ 2005, pers. comm. and ŠUVADA 2006, pers. comm.) scattered abundant occurrence of the *O. visianii* is known in the southern slopes of the plateau at the present time – ca. 500 individuals together in different state of ontogenesis.

Voucher specimens: DOMIN 1921 PRC, TRAPL 1922 PRC, TRAPL 1923 PRC, DOSTÁL 1930 PRC, DOSTÁL 1932 PRC, KLIKA 1932 PR, HEJNÝ 1936 PRC, FUTÁK 1946 SLO, KLÁŠTERSKÝ 1946 PR, ŠMARDÁ 1947 BRNM, POPOVIČ & ŠČEPKO 1955 SAV, PECIAR 1956 SLO, SOJÁK 1958 PR, POKLUDA 1960 BRNM, SMEJKAL 1966 BRNU, NÁBĚLEK s. dat. SAV; **literature data:** HOLUB (1953), HOLUB (1957); ŠUVADA (2006).

● **Village of Gemerská Hôrka – Hôrka hill (7488c)**

In this locality, expected occurrence was confirmed by ELIÁŠ jun. & SÁDOVSKÝ (one yearling plant in state of ground rosette!) within the excursion in 2006 (one of the excursions organized within Floristic course in the town of Tornaľa in 2006

by Slovak Botanical Society and Czech Botanical Society) (ELIÁŠ jun. 2006, pers. comm.). No other record exists.

○ **Village of Štítňik – Village of Honce; between these two villages (7388a)**

The only known record from this locality is voucher specimen collected by DOSTÁL in 1947 (PRC). According to the Office of Slovenský kras National Park, the occurrence of *O. visianii* in this locality is not confirmed at the present time (ŠUVADA 2006, pers. comm.). However, actually nobody has checked this locality.

Voucher specimens: DOSTÁL 1947 PRC.

● **Village of Domica – National Nature Reserve Domické škrapy (7588b)**

FUTÁK's voucher specimen from 1947 placed in SLO is the only herbarium material known from this locality. Other record was given by UHRÍKOVÁ & KARASOVÁ in MÁJOVSKÝ et al. (2000) – the chromosome number from this locality ($2n = 18$). According to the staff of the Office of Slovenský kras National Park, the occurrence of *O. visianii* in this locality is still known at the present time – ca. 100 mainly fertile individuals (ŠUVADA 2006, pers. comm.).

Voucher specimens: FUTÁK 1947 SLO; **literature data:** UHRÍKOVÁ & KARASOVÁ in MÁJOVSKÝ et al. (2000).

● **Village of Hrhov – plateau above the village (7390c, d)**

The first record from this locality is voucher specimen collected by HABROVCOVÁ in 1935 and placed in BRNU. Two FUTÁK's voucher specimens from 1949 and some literature data are the next but the last data confirming the occurrence of *O. visianii* in this locality. According to the Office of Slovenský kras National Park, *O. visianii* still dispersaly occurs in few places of southern slopes of the plateau above the road between the villages of Hrhov and Jablonov nad Turňou (KARASOVÁ 2005, pers. comm. and ŠUVADA 2006, pers. comm.) – ca. 50 plants together mainly in state of ground rosette.

Voucher specimens: HABROVCOVÁ 1935 BRNU, FUTÁK 1949 SLO; **literature data:** HOLUB (1953), HOLUB (1957).

● **Soroška hill – village of Jablonov nad Turňou – Kukudičová skala hill (7390c)**

Poorly documented locality, KOLARČIK confirmed the occurrence of *O. visianii* there in 2005 – few plants, ca. 10, all in state of ground rosette.

Voucher specimens: KLIKA 1937 PR, DEYL 1938 PR, KOLARČIK & KARASOVÁ 2005 herb. PM.

● **Village of Turňa nad Bodvou – Hradisko hill (Nagy Várad) (7390d)**

The voucher specimen collected by BRYM in 1928 is the first known record from this locality. Only few another voucher specimens are known. *O. visianii* still occurs in this locality – ca. 50 fertile individuals and ca. 50 sterile individuals (ŠUVADA 2006, pers. comm.).

Voucher specimens: BRYM 1928 PRC, DOMIN & KRAJINA 1937 PRC, FUTÁK 1948 SLO, FUTÁK 1950 SLO; **literature data:** HOLUB (1953).

● **Village of Turňa nad Bodvou – Turniansky hradný vrch hill, slope to the Zádielsky kameň hill and Zádielsky kameň hill (7391c)**

It is a well-known locality, the first record is represented by voucher specimen collected by THAISZ in 1908 placed in BRA, later the locality was confirmed many times. Ca. 50 individuals (half of them were only sterile yearling ground rosette)

were found at the last confirmation (KOLARČIK in 2006). Chromosome numbers were also given from this locality in UHRÍKOVÁ & KARASOVÁ in LETZ et al. (1999) and UHRÍKOVÁ & KARASOVÁ in MÁJOVSKÝ et al. (2000).

Voucher specimens: THAISZ 1908 BRA, HULJÁK 1916 BP, DOMIN 1919 PRC, NOVÁK 1922 PRC, BRYM 1924 PRC, BRYM 1927 BRNU, DOSTÁL 1927 PRC, KRIST 1927 BRNU, SUZA 1927 BRNM, BRNU, PR, PRC & SLO, ŠVESTKA 1933 BRNM, KRIST 1935 BRNM, HORÁK 1936 SLO, KARAN 1937 BRA, KAVKA 1937 BRA & PRC, KLIKA 1938 PR, FUTÁK 1943 SLO, FUTÁK 1946 SLO, HLAVÁČEK 1947 SAV, FUTÁK 1947 SLO, MÁJOVSKÝ & MICHALCO 1950 SLO, SOUČKOVÁ 1950 BRNM, ČERNOCH 1951 BRNM, LICHERDOVÁ & KRIPPEL 1951 SLO, SKŘIVÁNEK 1951 BRA & BRNM, DVOŘÁK 1952 BRNM, FUTÁK 1956 SAV, HRABĚTOVÁ 1958 BRNU, SOJÁK 1958 PR, KMEŤOVÁ & HUBOVÁ 1968 SAV, HODOVAL 1972 BRA, SUTORÝ 1978 BRNM, KOLARČIK & KARASOVÁ 2005 herb. PM; **literature data:** SUZA (1928), DOSTÁL (1930), HULJÁK (1942), HOLUB (1953), HOLUB (1957), UHRÍKOVÁ & KARASOVÁ in LETZ et al. (1999), UHRÍKOVÁ & KARASOVÁ in MÁJOVSKÝ et al. (2000).

• **Villages of Háj and Drienovec – Jasovská planina plateau (Drienovecká planina plateau, Šomodská planina plateau) (7391d)**

The first datum from this locality is voucher specimen collected by ŠVESTKA in 1933 placed in BRNM. Chromosome number of *O. visianii* was given also from this locality (UHRÍKOVÁ & KARASOVÁ in LETZ et al. 1999). The locality was confirmed many times and is known at the present time, too – ca. 500 individuals in different state of ontogenesis (ŠUVADA 2006, pers. comm.).

Voucher specimens: ŠVESTKA 1933 BRNM, DOSTÁL 1934 PRC, KRIST 1935 BRNU, KLIKA 1937 PR, FUTÁK 1948 SLO, ČERNOCH 1952 BRNM, ČERNOCH 1958 BRNM, SKŘIVÁNEK 1958 BRNM; **literature data:** HOLUB (1953), UHRÍKOVÁ & KARASOVÁ in LETZ et al. (1999).

○ **Village of Host'ovce – Dolný vrch hill (Alsó hegy) (7491a)**

Two DOSTÁL's voucher specimens from 1935 could be considered the first record from this locality. Another one record was collected by DOČOLOMANSKÝ in 1957. With regards to the character of locality, which is situated in Slovenský kras National Park, the occurrence of the species in the locality is much probable at the present time, however, it has not been confirmed (ŠUVADA, 2006 pers. comm.).

Voucher specimens: DOSTÁL 1936 PRC, DOČOLOMANSKÝ 1957 BRA.

Phytogeographical district nr. 5: Devínska Kobyla

○ **Town of Bratislava – Devínska Kobyla hill (7867b)**

The voucher specimen from 1929 collected by PTAČOVSKÝ placed in SAV is the first known unambiguously determined material from this locality. In the work from 1959 he only states that he did not succeed to find *O. visianii* in the locality. However, voucher specimen from 1961 collected by KALETA confirmed the locality once again. However, it is the last record because the occurrence of *O. visianii* has not been confirmed at the present time and probably *O. visianii* is extinct there (FERÁKOVÁ et al. 1997). In spite of existing some indicia, data of occurrence of *O. echioides* in Slovakia brought by ENDLICHER (1830) and REUSS (1953), assigned by HOLUB & KMEŤOVÁ (1993) to *O. visianii*, could not be taken as datum confirmed occurrence of *O. visianii* in Devínska Kobyla hill due to unclear evidences (see the part of *O. arenaria*).

Voucher specimens: PTAČOVSKÝ 1929 SAV, KALETA 1961 BRA; **literature data:** ?ENDLICHER (1830, sub nom. *O. echioides*), ?REUSS (1853, sub nom. *O. echioides*), PTAČOVSKÝ (1959), HOLUB & KMEŤOVÁ (1993), FERÁKOVÁ et al. (1997), HOLUB (1999b).

Phytogeographical district nr. 6: Podunajská nížina

○ **Village of Trenčianské Bohuslavice – Turecký vrch hill (7273a)**

The only voucher specimen collected by FUTÁK placed in SLO is connected with this locality. KOLARČIK checked this locality in 2005 and did not succeed to confirm the occurrence. Probably *O. visianii* doesn't occur there at the present time.

Voucher specimens: FUTÁK 1931 SLO; **literature data:** HOLUB & KMEŤOVÁ (1993), HOLUB (1999b).

Phytogeographical district nr. 8: Východoslovenská nížina

○ **Town of Kráľovský Chlmec – Veľký kopec hill (7597d)**

Only three voucher specimens from 1950 collected by FUTÁK placed in SAV are known from this locality. Occurrence of *O. visianii* was checked and it is not confirmed there at the present time (BOGOLY 2005, pers. comm.).

Voucher specimens: FUTÁK 1950 SAV.

Phytogeographical district nr. 10: Malé Karpaty

○ **Village of Svätý Jur (7769a)**

Only two old literature data recording the occurrence of the genus *Onosma* from the surroundings of this village are known. The first is the datum of ENDLICHER from 1830, where the genus *Onosma* was recorded in Slovakia for the first time (as *O. echioides*). Description by REUSS from 1853 indicates that probably the record represents *O. visianii*. HOLUB & KMEŤOVÁ (1993) think so. However, no clear evidences exist. (see the part of *O. arenaria* – locality of Devínska Kobyla hill). For more than 150 years the locality has not been confirmed. However, actually nobody has checked this locality.

Literature data: ?ENDLICHER (1830, sub nom. *O. echioides*), ?REUSS (1853, sub. nom. *O. echioides*), HOLUB & KMEŤOVÁ (1993).

Phytogeographical district nr. 11: Považský Inovec

● **Village of Lúka nad Váhom – Lučanská dolina valley – Tematínske kopce hills (7373a, b)**

It is a well-known locality since 1899 (HOLUBY, BRA) up to date. KOLARČIK found in the few places ca. 10 mainly fertile plants. However, BENEDIKT confirmed this locality, too. He noticed: *O. visianii* is common in Tematínske kopce hill.

Voucher specimens: HOLUBY 1899 BRA, HOLUBY 1901 BRA, HOLUBY 1902 BRA & PRC, NOVÁK 1902 PRC, SILLINGER 1920 PRC, WEBER 1924 BRA, SKŘIVÁNEK 1925 BRNM, SUZA 1926 BRNU, SILLINGER 1928 PRC, VLACH 1930 PRC, SUZA 1933 PRC, s. coll. 1934 PR, KRÍSTEK 1937 PRC, NÁBĚLEK 1937 SAV, FUTÁK 1943 SLO, HLAVÁČEK 1956 SAV, MICHÁLKO 1956 SAV, PAVELKOVÁ & MORAVČÍKOVÁ 1956 SLO, POKLUDA 1959 BRNM, ČERNOCH 1961 BRNM, MÁJOVSKÝ 1964 SLO, MAGLOCKÝ 1965 SAV, SCHWARZOVÁ 1966 SLO, MAGLOCKÝ 1967 SAV, KMEŤOVÁ & GAJOVSKÝ 1968 SAV, MAGLOCKÝ 1969 SAV, DVOŘÁK 1975 BRA, MURÍN 1986 SLO, SUTORÝ 1986 BRNU, KOLARČIK 2005 herb. PM; **literature data:** DOSTÁL (1930).

○ **Villages of Modrovka and Modrová – Kamienka hill (7373c)**

This locality is poorly documented. KOLARČIK & MAJESKÝ checked this locality in 2005. *O. visianii* does not occur there at the present time.

Voucher specimens: SILLINGER 1929 PR & PRC, MÁJOVSKÝ 1966 SLO.

Phytogeographical district nr. 12: Trábeč

○ **Town of Nitra – National Nature Reserve Lupka (7674c)**

Only four voucher specimens are known from this locality. Three of them are from 1932 collected by VLACH (PRC) and one voucher is from 1937 collected by NÁBĚLEK (BRA). According to the information of the staff of the Office of the Ponitrie Protected Landscape Area, *O. visianii* doesn't occur in this locality at the present time (ROSINOVÁ 2006, pers. comm.). KOLARČIK, MAJESKÝ & ROSINOVÁ found only *O. arenaria* in this locality in 2005 (see the part of *O. arenaria*).

Voucher specimens: VLACH 1932 PRC, NÁBĚLEK 1937 BRA; **literature data:** HOLUB & KMEŤOVÁ (1993), HOLUB (1999b).

Onosma tornensis

This species occurs in four localities in the surroundings of village of Turňa nad Bodvou (Fig. 4). The last survey was given by MEREĎA et al. (2005). The number of populations is constant for a long time, but the numbers of individuals for particular populations decreased in the last years. Chromosome number of *O. tornensis* ($2n = 14$) was given for the first time by BAKSAY (1957), later it was confirmed by UHRÍKOVÁ & MURÍN in MÁJOVSKÝ et al. (1970), TEPPNER (1971) and TISSOT-DAGUETTE (1979). UHRÍKOVÁ & MURÍN in MÁJOVSKÝ et al. (1970) also recorded chromosome number $2n = 28$ – polysomaty – this term means that authors counted both chromosome numbers ($2n = 14$ & 18) in the same slide. Higher chromosome number recorded in particular cell could be the consequence of an effect of mitotic poison used in the slide preparation. This higher chromosome number was not included by MÁJOVSKÝ in karyological survey (MÁJOVSKÝ et al. 1987), because he obviously considered this datum as a doubtful one already at that time. This polyploid count was not recorded in any other case.

Phytogeographical district nr. 3: Slovenský kras

● **Village of Turňa nad Bodvou – Turniansky hradný vrch hill and slope to the Zádielsky kameň hill (7391c)**

Locus classicus for the species. Probably the first voucher specimen comes from 1880 collected by ŽIVOTSKÝ (BRNU, sub *O. echioides*). This locality is well-known, it was confirmed for many times. Number of individuals in different state of ontogenesis is ca. 900 (MEREĎA et al. 2005).

Voucher specimens: HAZSLINSZKY s. dat. BP, ŽIVOTSKÝ 1880 BRNU, MÁGÓCSY 1898 BP, HULJÁK 1907 PRC, THAISZ 1908 BRA, „unread. coll.“ 1908 BRA, HULJÁK 1911 PRC, NYÁRÁDY 1911 BRNU, unread. coll. 1911 BRNU, DOMIN 1919 PRC, BRYM 1927 BRNU & PRC, BUČEK 1930 BRNM, MARGITTAI 1931 BRNM & PRC, DOSTÁL 1932 PRC, MARGITTAI 1932 BRA, HULJÁK 1933 BP, KLÁŠTERSKÝ & DEYL 1933 PR, ŠVESTKA 1933 BRNM, WEBER 1933 BRNM, DEYL 1934 PR, WEBER

1934 BRA, HROBAŘ 1934 BRNM, BRYM 1935 PRC, KRIST 1935 BRNM & BRNU, NABĚLEK 1935 SAV, SUZA 1935 BRNU & PRC, WEBER 1935 BRNM, WEBEROVÁ & WEBER 1935 BRNM, WEBER 1935 SLO & PRC, HEJNÝ 1936 PRC, HORÁK 1936 SLO, WEBER 1936 BRNM, WEBEROVÁ 1936 BRNM, KAVKA 1937 BRA & PRC, FUTÁK 1946 SLO, HLAVÁČEK 1947 SAV, HLAVÁČEK 1949 SLO, SOUČKOVÁ 1950 BRNM, ČERNOCH 1951 BRNM, LICHERDOVÁ & KRIPPEL 1951 SAV & SLO, SKŘIVÁNEK 1951 BRA & BRNM, ČERNOCH 1952 BRNM, DVOŘÁK 1952 BRNM, FUTÁK 1954 SAV & SLO, CHRTEK & ŽERTOVÁ 1956 PRC, FUTÁK 1956 SLO, MÁJOVSKÝ 1956 SLO, PECIAR 1956 SLO, ŠMARD 1958 BRNM, HAJDÚK 1960 BRA, DOČOLOMANSKÝ 1962 BRA, UJČÍK 1962 BRNU & PRC, ŠOURKOVÁ & DUHOVÁ 1965 PRC, MÁJOVSKÝ 1966 SLO, POSPÍŠIL 1966 BRNM, HAJDÚK 1971 BRA, HODOVAL 1972 BRA, HUBOVÁ 1975 SAV, DVOŘÁK 1977 BRA, unread. coll. 1977 BRA, SUTORÝ 1978 BRNM, VAŠÁK 1978 BRA, MÁRTONFI 1988 KO, KOLARČIK & KARASOVÁ 2005 herb. PM; **literature data:** JÁVORKA (1906), SUZA (1928); DOSTÁL (1930), KRAJINA (1936), BAKSAY (1957), MÁJOVSKÝ et al. (1970), TEPPNER (1971), TISSOT-DAGUETTE (1979), HOLUB (1987), HOLUB & KMEŤOVÁ (1993), HOLUB 1999c, MRÁZ 2004, MEREĎA et al. 2005.

● **Village of Host'ovce – Dolný vrch hill (Alsó hegy) (7491a)**

It is also well-known locality of the species. Number of individuals in different state of ontogenesis is ca. 2000 (MEREĎA et al. 2005).

Voucher specimens: BRYM 1935 PRC, DOSTÁL 1935 PRC, DOSTÁL 1936 PRC, DOMIN & KRAJINA 1937 PRC, DOČOLOMANSKÝ 1956 BRA, PECIAR 1956 SLO, DOČOLOMANSKÝ 1957 BRA; **literature data:** KRAJINA (1936), HOLUB & KMEŤOVÁ (1993), HOLUB (1999c), MRÁZ (2004), MEREĎA et al. (2005).

● **Village of Drienovec (7391d)**

O. tornensis was collected in this locality by DOSTÁL in 1935 (PRC) for the first time. MEREĎA et al. (2005) have confirmed two microlocalities in surroundings of village of Drienovec with 10 + 10 individuals.

Voucher specimens: DOSTÁL 1935 PRC; **literature data:** KRAJINA (1936), HOLUB & KMEŤOVÁ (1993), HOLUB (1999c), MRÁZ (2004), MEREĎA et al. (2005).

Doubtful data (not mapped)

O. arenaria

Phytogeographical district nr. 11: Považský Inovec

Village of Modrová – near the town of Nové Mesto nad Váhom

Only the voucher specimen from 1957 collected by MICHALKO placed in SAV is known from this locality. KOLARČIK and MAJESKÝ checked this slopes above the village towards Kamienka hill in 2005 without finding any *Onosma* plants. In Považský Inovec hills only *O. visianii* is known. We consider the voucher specimen of MICHALKO a mistake caused probably by wrong manipulation with the specimens.

Voucher specimens: MICHALKO 1957 SAV.

O. pseudoarenaria subsp. tuberculata

Phytogeographical district nr. 2: Ipeľsko-rimavská brázda

Village of Plášťovce – Konerád hill

HOLUB & KMEŤOVÁ (1993) report voucher specimen collected by SKŘIVÁNEK in 1938 (BRNM). We did not succeed to find this specimen in BRNM. However,

in BRNM voucher specimen of SKŘIVÁNEK from 1953, collected in this locality are present. We evaluate them as *O. arenaria*, similarly to all other collections of various collectors from this locality (see the part of *O. arenaria*). Therefore the datum on the occurrence of *O. pseudoarenaria* (HOLUB & KMEŤOVÁ 1993) is considered a mistake.

Onosma visianii

Phytogeographical district nr. 8: Východoslovenská nížina

Zemplín

According to the authors, the datum is probably related to the whole region Zemplín in eastern Slovakia (there is also a village of Zemplín in eastern Slovakia). In this case, the occurrence of *O. visianii* was known in the locality near the town of Kráľovský Chlmec (see the part of *O. visianii*).

Voucher specimens: HAZSLINSKY s. dat. SAV.

O. tornensis

Phytogeographical district nr. 23: Tatry

Vysoké Tatry mountains – Mačie diery

The record from this locality is an obvious nonsense. The only one datum is voucher specimen collected by HUBOVÁ & FLAŠÍKOVÁ in 1971 placed in SAV. Probably, this mistake is due to wrong assignment of herbarium label to plants of *O. tornensis*.

Voucher specimens: HUBOVÁ & FLAŠÍKOVÁ 1971 SAV.

Datum assigned generally to the genus Onosma.

Phytogeographical district nr. 13: Strážovské a Súľovské vrchy

Strážovské vrchy hills – village of Valaská Belá

JANIŠOVÁ et al. (2004) wrongly brought the information about the occurrence of the genus *Onosma* in the locality village of Valaská Belá – Prielom Nitrice Canyon. The revision of the voucher specimen from 2002 placed in the herbarium of authors showed, that the plant material does not belong to any species of the genus *Onosma*.

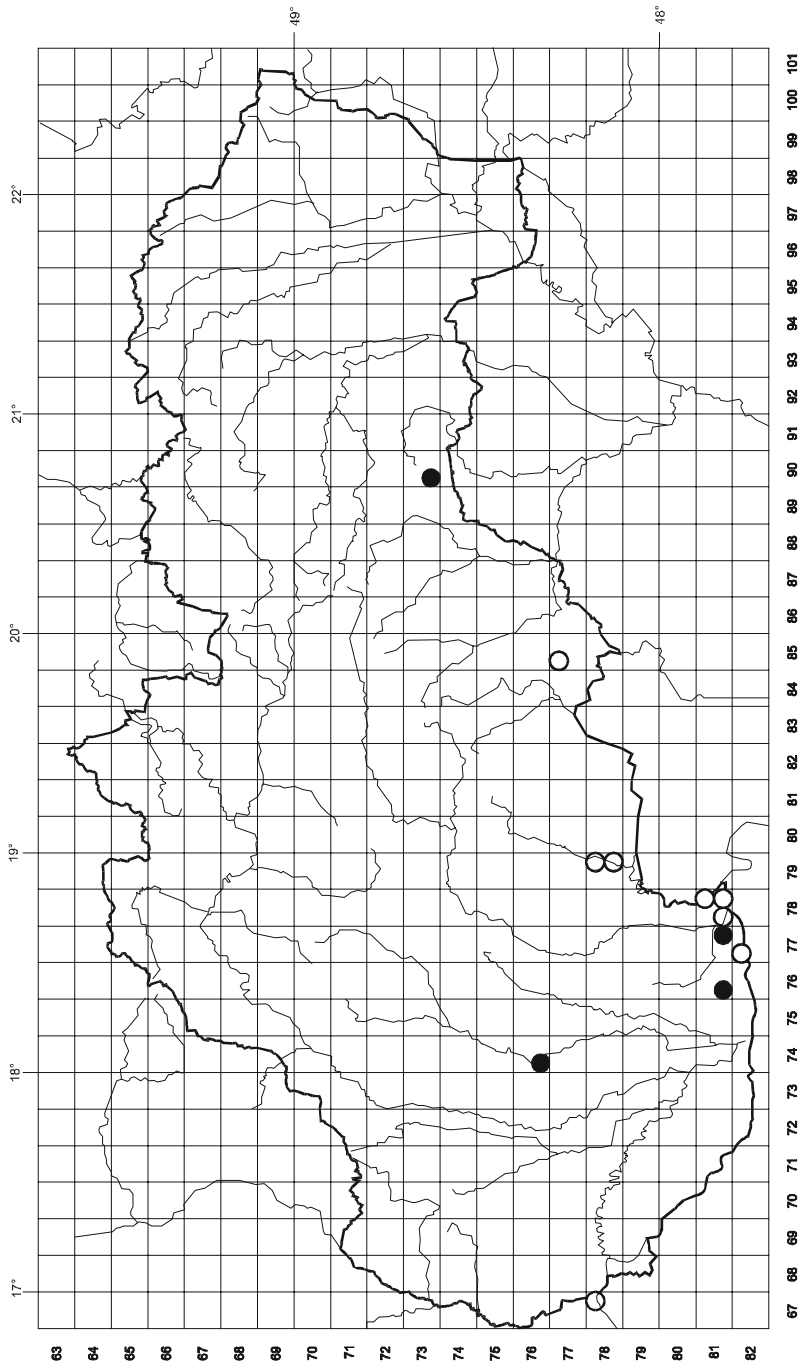


Fig. 1. Distribution of *Onosma arenaria* in Slovakia („○“ - the occurrence known in the past and not confirmed at present time; „●“ - present occurrence).

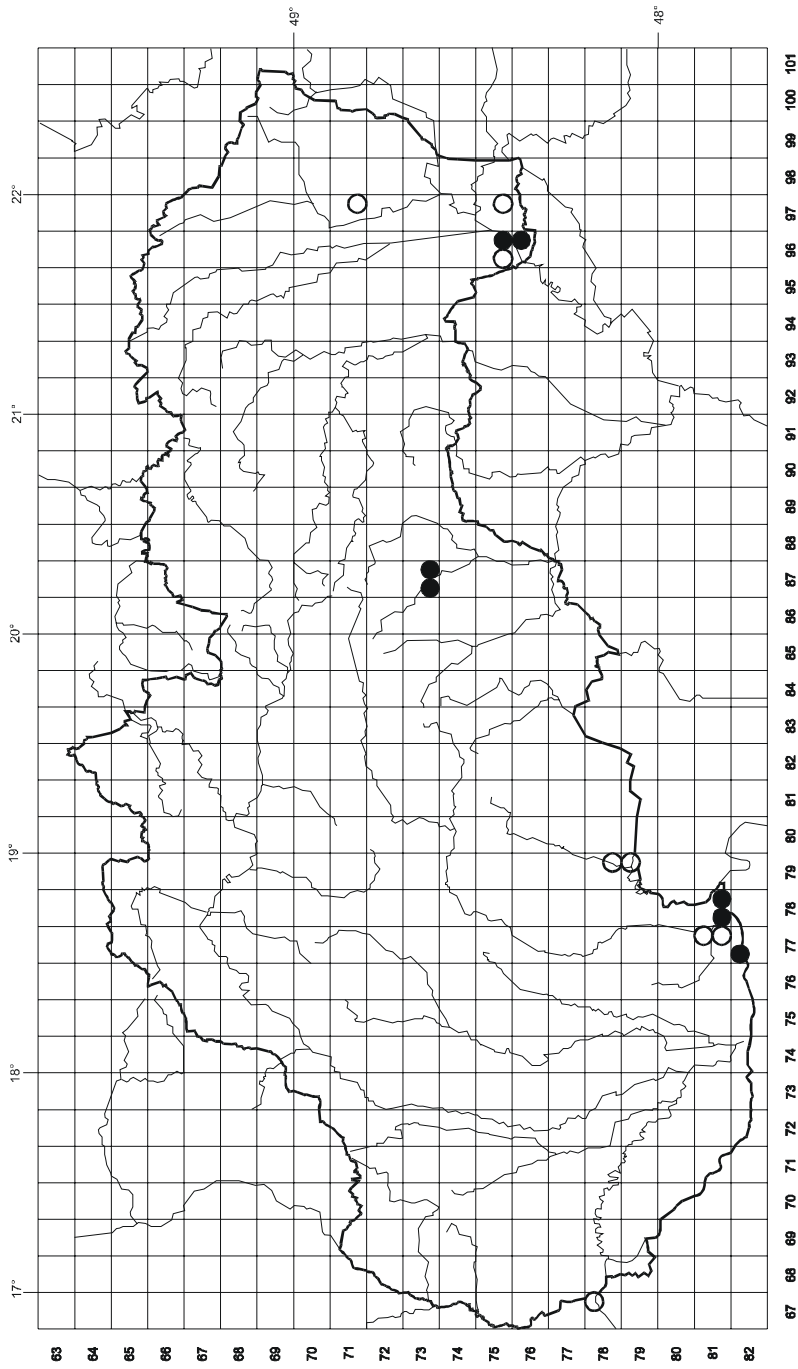


Fig. 2. Distribution of *Onosma pseudoarenaria* subsp. *tuberculata* in Slovakia („○“ - the occurrence known in the past and not confirmed at present time; „●“ - present occurrence).

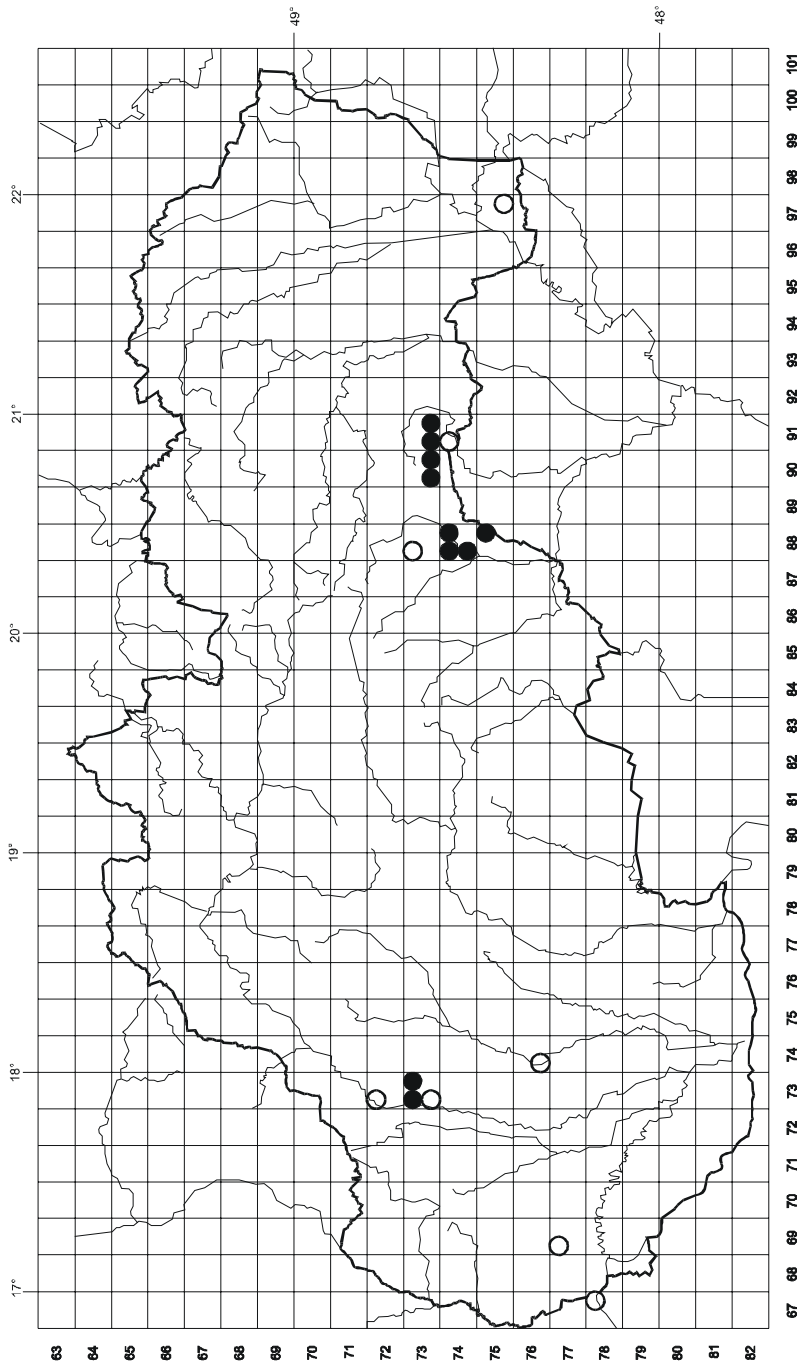


Fig. 3. Distribution of *Onosma visianii* in Slovakia (○ - the occurrence known in the past and not confirmed at present time; ● - present occurrence).

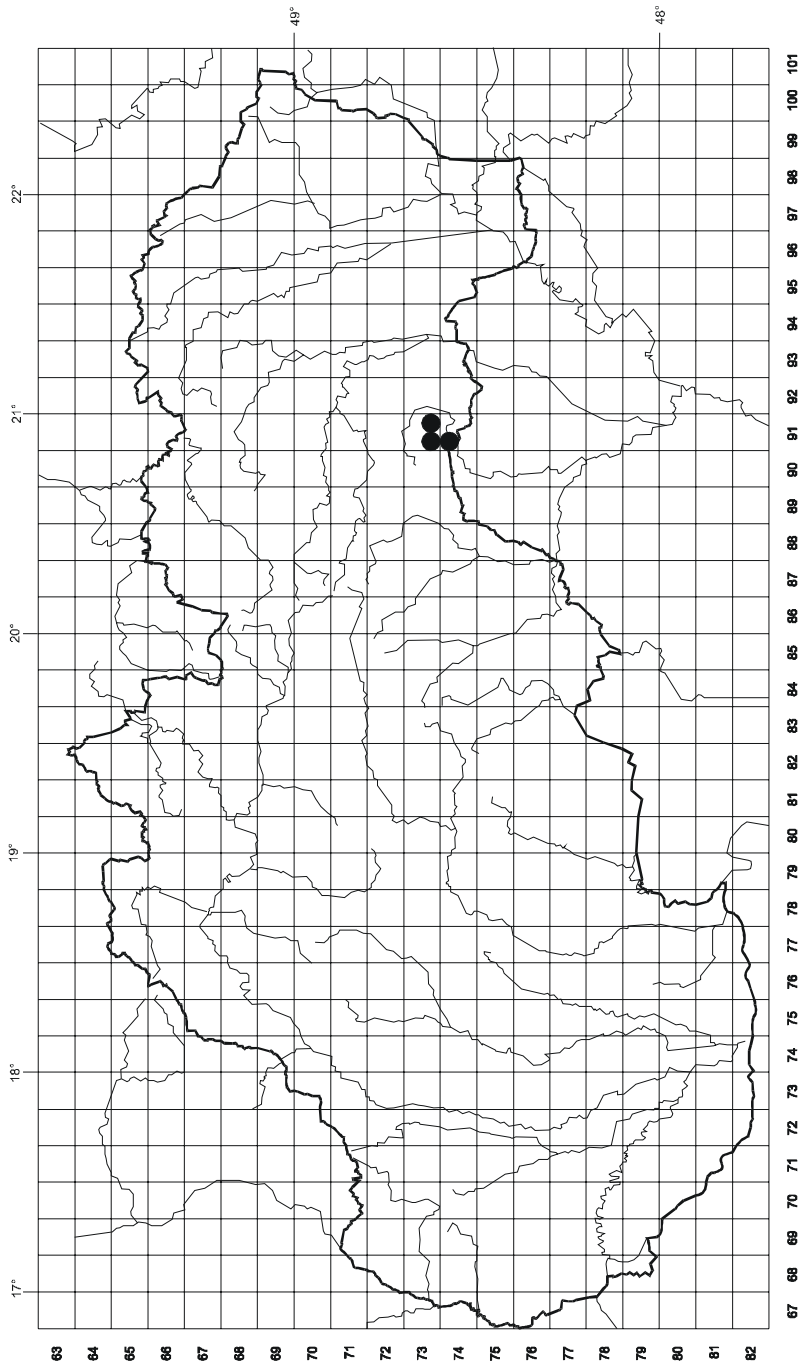


Fig. 4. Distribution of *Onosma tornensis* in Slovakia („o“ - the occurrence known in the past and not confirmed at present time; „•“ - present occurrence).

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