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Thymus glabrescens subsp. *banaticus* subsp. nov. (Lamiaceae), new overlooked thyme from Banat, Romania

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Čáp J. & Řepka R. 2022: *Thymus glabrescens* subsp. *banaticus* subsp. nov. (Lamiaceae), new overlooked thyme from Banat, Romania. *Acta Musei Moraviae, Scientiae biologicae* **107(1–2):** 21–36. – A new subspecies of thyme, *Thymus glabrescens* subsp. *banaticus*, is described from the territory of Banat in Romania. It differs from other subspecies of *T. glabrescens* and morphologically similar taxa in the region by a set of the following features: allelotrichous hairs on the flowering branches, presence of sterile shoots, heterophyllous foliage, camptodromous venation with strongly prominent veins, upper half of calyx tube with a glabrous upper labium ridge. There is a certain phenological shift in flowering of around one week to ten days earlier. The new taxon has so far been found only in SW Romania, in the Banat region, at about 30 localities. No specimen of this taxon has yet been identified in the studied herbaria. A new combination *Thymus* ×*radoi* nothosubsp. *juranyanus* (Borbás) Čáp et Řepka is published in the article.

Keywords. *Thymus* subsect. *Isolepides*, *T. juranyanus*, Lamiaceae, Romania

Introduction

Thymus L. is one of the most critical genera of the Lamiaceae family, especially in the Submediterranean and Mediterranean flora (Morales 1997, 2002; Federici *et al*. 2013). In the Submediterranean region of southeastern Europe, several dozen species and a great number of infraspecific taxa have been described, but many of them still have an unclear content (Lyka 1925; Ronniger 1924, 1930; Guşuleac 1961; Markova 1989). Recently, 16 species were reported to occur in the territory of Romania (Ciocarlan 2000), but Jalas (1972) gave only nine thyme species and the possible occurrence of two other species – which was a consequence of the required broad species concept in Flora Europaea. In neighbouring Serbia, 30 *Thymus* taxa are distinguished at species level (Diklić 1974). In Romania, the native *Thymus* species belong to two sections (sensu Morales 2002). Section *Hyphodromi* (A. Kerner) Halácsy is represented by one member only, *T. zygioides* Griseb. (subsect. *Serpyllastrum* Villar), all other Romanian species belong to sect. *Serpyllum* (Miller) Bentham (excl. cultivated *T. vulgaris* L. which is a representative of sect. *Thymus*). Taxa of the sect. *Serpyllum* have woody stems or woody stem bases only, herbal stems usually lying and sprouting, with holotrichous or allelotrichous stem hairs, leaves flat and usually ciliate at the base, with distinct lateral veins, inflorescences spike-like or ± capitate (Jalas 1971; Morales 2002). This section is divided into seven subsections, but their recent delimitation does not allow for classification of some species with transient characters into one of them. The Romanian

thymes belong to four subsections: *Serpyllum, Alternantes* Klokov, *Isolepides* (Borbás) Halácsy and *Pseudomarginati* (H. Braun ex Borbás) Jalas (Jalas 1971; Morales 2002).

Thymus glabrescens Willd. (1811: 507; Ronniger 1925: 19) belongs to the section *Serpyllum* (Miller) Bentham subsect. *Isolepides* (Borbás) Halácsy (Jalas 1971, Morales 2002). The diagnostic feature for this section is mainly holotrichous hairness of the flowering branches (with rare exceptions, see Jalas 1971). *Thymus glabrescens* is one of most polymorphic species not only in section *Serpyllum*, but in the genus. The main reason may be a hybridogenous origin of this taxon (Gogina 1974, Jalas 1970, Jalas & Kaleva 1970, Schmidt 1971) whereas it is likely that the species evolution was polytopic with multiple hybridization. The consequence of this phenomenon may also be an aneuploid series of chromosomes of individual populations *T. glabrescens* (2n = 28, 32, 56, 58). Mártonfi & Mártonfiová (1996) found exclusively tetraploid populations (2n = 56) in a Carpathian territory adjacent to the Pannonian. In contrast, Trela-Sawicka (1968) found from 16 samples of *T. glabrescens* populations from southern Poland with 2n = 28 (4 samples), 2n = 32 (2 samples), tetraploids 2n = 56 (8 samples) and also 2n = 58 (2 samples). However, in 9 populations from Slovakia only a single cytotype 2n = 56 was found (Trela-Sawicka 1970).

The great variability of *T. glabrescens* is reflected in the many described infraspecific taxa, especially in the late 19th century (e. g. Wiedermann 1887, Braun in Formánek 1888, Formánek 1887, Braun 1889) and in the first half of the 20th century (Lyka in Jávorka 1925, Ronniger 1930, Pawlowski 1967, Soó 1968, 1970). For example, in the territory of former Czechoslovakia Weber (1958) reported 17 taxa on variety level and one hybrid for *T. glabrescens* or *T. austriacus* Bernh. apud Reichenb. [= *T. glabrescens* Willd. var. *pilosus* (Opiz) Čáp].

On the subspecies level there are several names/taxa of *Thymus glabrescens*: (1) subsp. *decipiens* (H. Braun) Domin [= *T. oenipontanus* H. Braun in Borbás, 2n = 52, 2n = 50, Jalas 1970], (2) subsp. *urumovii* (Velen.) Jalas [= *Thymus roegneri* C. Koch = *T. callieri* Borbás ex Velen., 2n = 56] (Jalas 1971, 1972). (3) subsp. *pilosus* (Opiz) Soó (Ciorcâlan 2000) and (4) subsp. *brachyphyllus* (Opiz) Machule (see Beldie 1979). This broader species concept is not accepted by other authors (Bartolucci 2010, Čáp 2000, Markova 1989). An extensive list of synonyms of *Thymus glabrescens* subsp. *glabrescens* was published by Mártonfi (1997).

Concise illustrations of *T. glabrescens* are published by Jávorka & Csapody (1975: fig. 2972), Pawlowski (1967: 183) and Ciorcâlan (2000); less successful can be found here: Dostál (1989), Štěpánek & Tomšovic (2000) and Markova (1989). An accurate description of *T. glabrescens* is provided by Weber (1958), Pawlowski (1967) and Markova (1989), map of distribution area of *T. glabrescens* (incl. *T. austriacus*) was created by Pawlowski (1967: 24 and 26).

In the years 2009–2016 during a floristic survey conducted around the Czech villages in Banat, Romania (from the village of Coronini to the town of Orşova) we found six *Thymus* taxa [*Thymus glabrescens* var. *glabrescens* (incl. f. *nyaradyanus* Lyka), *T. glabrescens* var. *pilosus* (Opiz) Čáp, *T. bulgaricus* (Domin et Podp.) Ronniger, *T. cherlerioides* Vis., *T. pulegioides* subsp. *montanus* (Bentham) Ronniger and *T.* ×*porcii*

Borbás], and an unknown taxon from sect. *Serpyllum*, at first identified as *T.* ×*radoi* Borbás, but after a comparative study distinguished as a new subspecies.

Material and Methods

The study is based on a morphological study of herbarium specimens in selected institutional herbaria (BP, BRNM, BRNU, CL, PR, PRC, W) and own specimens collected in Banat (see Appendix 1), living material in the field, and all the literature data concerning the thymes of the Central and SE Europe (Borbás 1890; Lyka 1925; Ronniger 1924, 1930; Guşuleac 1961; Markova 1989; Mártonfi & Mártonfiová 1996). Taxa delimitation at species and subspecies level follows Jalas (1972) or Morales (2002).

Genome size was measured in samples from three populations (Sfânta Elena, 1.3 km SW of the church in the village; Sfânta Elena, 1 km NR of the village; Ljubcova, 4 km NNE of the village) using a Partec CyFlow SL flow cytometer (Partec GmbH, Münster, Germany); the results were compared with the standards and recalculated to the same standards published by Šmarda *et al.* (2019).

Results

Thymus glabrescens subsp. *banaticus* Čáp et Řepka, subsp. nov.

Type locality. "Flora banatica: Romania, louka před skalními srázy k Dunaji, 1,3 km JJZ od kostela v obci" [Flora of Romania: SW part of Banat, the village of Sfânta Elena, dry meadow on the way to a rocky lookout over the Danube, 1.3 km SW of the church in the village], 44°39′57.780″N, 21°42′27.864″E, 385 m a. s. l., 10 June 2016, leg. & det. J. Čáp (holotype: BRNM-806150; see Fig. 1; isotype BRNU 681262). Other material studied is listed in Appendix 1.

Description. Sympodial stem branching. Stems short or long procumbent, sometimes underground, from which individual or bundles of flowering branches and infrequent, obliquely ascending sterile shoots develop. Flowering branches (7–)12–35(–44) cm high, and (0.4–)0.5–0.9(–1.1) mm in diameter, straight or shortly ascending, rarely simply branched under the inflorescence. Stem hairs allelotrichous, stem sides equally wide or wider on two opposite sides, alternating per internode. Wider stem sides slightly convex to flat, narrow sides slightly concave. Two stem sides glabrous or with sporadic small retrorse hairs, the other two with long and short hairs, not densely arranged on the stem edges. Hairs on branches under the inflorescence long or short; the longer ones patent, often half bent, sometimes curled, up to 1.0 mm long, shorter hairs retrorse but not fully adpressed. Hairs on basal branches only short and retrorse. Flowering branches under inflorescence with two to three pairs of leaves of the same size and shape, sessile, widest in the middle, narrow to broad elliptic; lower leaves smaller, obovate, with elongated petiole. On some branches, obovate leaves are already found under the inflorescence and the foliage is more heterophyllous. Zone of small, thickened leaves at the base of flowering branches missing. Leaf shape very variable (elliptic–ovate–oblanceolate). Leaves (7–)10–18(–20) × (2–)2.5–5.5(–8.6) mm, margins slightly revolute. Leaves with

long thin hairs at the base; leaf blades glabrous. Leaf venation camptodromous, distinctive, especially central vein, lateral veins diminishing and disappearing towards the edge of the leaf. Tiny sessile etheric glands sparse, dark or pale brown-red. Leaf surface with small conical papillae.

Bracts similar in shape to the leaves but smaller, sessile, with pronounced venation. Brackets present, tiny, usually 0.2–0.8 mm long. Inflorescence interrupted, upper verticillastrum headed, lower ones separated. Calyx at flowering time (3.0–)3.5–3.8(–4) mm long, after flowering (3.5–)3.8–4.5(–6.5) mm long, tube as long as or longer than upper lip. Middle tooth of upper calyx lip (0.6–)0.7–1.2(–1.5) mm long, at basis (0.4–)0.6–0.8(–1.1) mm wide, length/width ratio 1.33–2.0(–2.5). Calyx regularly hirsute on the entire abaxial side, in the basal part and usually up to the middle of the calyx tube with multicellular hairs (often also unicellular bristles), these hairs missing over the middle of the calyx length (on the upper lip), on the veins sparse hairs or bristles; the entire upper calyx lip glabrous. Upper calyx teeth with multicellular hairs on the edge, sparse or absent under the top teeth.

Pedunculate glands missing. Flower peduncle 2–5(–6) mm, without pedunculate glands but with almost retrorse hairs. Crowns of hermaphroditic flowers up to 6 mm long, pale lilac-violet. *Thymus* sect. *Serpyllum* subsect. *Isolepides*.

Differencial diagnosis. *Haec subspecies similis* T. glabrescens *sensu stricto, sed ab ramificatio sympodialis, caulis procumbens, ramos floriferos et steriles gerens. In rami floriferi indumento allelotricho, aequilaterali vel cum duobus oppositis lateribus latioribus, in internodiis alternantibus. Latera latiora leviter convexa usque ad plana, latera angustiora interdum leviter concava. Duo latera glabra vel pilis parvis, sporadicis, retrorsis obsita, duo cetera latera pilis longis et brevibus, in angulis non densioribus instructa. Folia ramorum floriferorum valde heterophylli foliis usque ad basim inflorescentiae obovatis instructi adsunt. Nervatura foliorum camptodroma, distincta. Calyces florum hermaphrodicorum (3.0–)3.5–4.5(–6.5) mm longi, tubo labiis plus minusque aequilongo, dentes superiores in calyces florum 0.6–0.8 mm longi; glandulis stipitatis absentibus. Bracteae forma foliis similes sed minores, sessiles, cum nervatura eminente. Bracteolae praesentes, perparvae.*

Variability. *Thymus glabrescens* subsp. *banaticus* is a highly polymorphic taxon; this refers to the size of the plants (dwarf plants of poor habitats as well as large plants of nutrients rich meadows were collected), the dimensions of the leaf blades, the length of the hairs on the flowering branches (plants with hairs longer than the diameter of the branches were collected) and with a short calyx tube in proportion to the length of the calyx upper lip. The plants resemble more robust habitus than of *T. glabrescens* s. str., with sympodial stem branching (however, in *T. glabrescens* s. str. it may also be monopodial). In taller vegetation or in the shade, the ascending stems can reach a height of up to 48 cm. When the stems are covered with soil, they grow partially underground, i.e. the nodes root only if they are overlaid by soil. The formation of sterile shoots is a constant feature of this species. These shoots are 1/3 to 2/3 of the length of the flowering branches and the leaves they bear are usually longer than the ones on flowering branches. In the leaf axils, especially in the upper part of the flowering branches, shortened side

branches with small leaf bundles are often present. It can prolong an internodium and form side branches with smaller leaves and sometimes with smaller spherical side inflorescences. In case the growing tip is damaged (by trampling, grazing, mowing, frost etc.) the stems either end there, or entire stems tend to be strongly reduced or die off, and the flowering branches grow almost from the root; these plants take the appearance of compact tufts. On the shallow limestone soils above the village of Coronini, subsp. *banaticus* forms distinct minor morphotypes, lower plants with stiffer and more crowded smaller leaves, with the transient type of foliage (homophyllous–heterophyllous), more compact inflorescences and occasionally a very small calyx (2.5–3.0 mm long) with sparser hairs. In the pastures, due to repeated grazing of animals, stem branching is different, up to monopodial, in mown meadows the branching is normal (Fig. 2A–D).

A typical feature of the subspecies is the alternation of two different opposite stem sides from internodium to internodium: two opposite sides narrower, slightly convex or straight and the other two sides broader, sometimes slightly concave; there is also an alternation in degree of hairiness of the opposite stem sides: two sides are glabrous or exceptionally with sparse small retrorse hairs (more often in plants growing in the shade) and two sides with long and short hairs. The hairiness of the sides is regular, exceptionally the hairs are denser on the edges. The hairs are shorter or equal to the diameter of the branch, in some populations (in robust plants or more often in the populations near the village of Ravensca) individual hairs are exceptionally slightly longer than the diameter of the branches. The shorter hairs on the branches are retrorse, but not quite adpressed. Flowering branches are light brown, brown-green, light brown-violet to dark violet-brown.

The edges of the leaves and the leaf blades lack long hairs; leaf venation is less pronounced in some populations (e.g. in the vicinity of the villages of Sfânta Elena and Ravensca, in shaded plants). Punctate ethereal glands are, except for the colour in the description, rarely yellowish or dark brown. The calyx tube changes its length and ratio to the upper lip during flowering, but the upper lip does not change or modify its length.

The calyx hairiness with simple multicellular regular hairs. Multicellular hairs are missing over the middle of the calyx length (on the upper lip), on the veins sparse hairs or bristles are found; the entire upper calyx lip surface is glabrous or rarely covered by hairs, sometimes with unicellular papillae. In some populations, the hairiness is noticeably bristle-like (similarly to some forms of *T. pannonicus*). The ethereal glands on the calyx surface are sessile, sparse or scattered, often shiny (rarely matt), usually light orange to orange, rarely yellowish.

Ploidy level. The samples from three measured populations of the new taxon (see Material and Methods) showed an average value of genome size 2.03 pg, which, when converted to the standards used in the article by Šmarda *et al.* (2019), i.e. *Bellis perennis,* corresponds well to the authors' published genome sizes in both tetraploid species (*T. praecox* and *T. pulcherrimus* subsp. *sudeticus*, 2.16 and 2.20 pg, respectively). Therefore, we can conclude that this new taxon is tetraploid (2n = 4× = 56).

Ecology. The habitats in which subsp. *banaticus* has so far been found are sheep pastures (predominantly with various communities of the *Festucion valesiacae* alliance affected

by humans) on shallow, rocky soils on limestone (rendzina). It often forms there different morphotypes – see above. However, the predominant habitats are situated on deeper clay soils (loess), on subxerophilous subcontinental meadow-steppes mown once annually, verges along ravine roads and other disturbed communities of the *Festuco-Brometea* class.

Distribution. Based on the localities of subsp. *banaticus* known to date, the distribution area lies in Banat, Romania on the hills north of the Danube valley and its lateral valleys; namely between the village of Coronini in the west and the surroundings of the town of Orşova in the east. The sites are located at altitudes from 70 to 625 m, but most often they are in the range of 400–500 m above sea level (Fig. 3). The subspecies *banaticus* is a local taxon growing on the SW edge of the distribution area of the *T. glabrescens* s. str. It is necessary to continue studying the occurrence of subsp. *banaticus*, since its distribution area may be much wider, including Transylvania, the southern part of the Carpathians (Serbia) and the northern part of Bulgaria.

Etymology. The name was chosen after the area in which the authors first found this subspecies.

Remarks. The hairiness and diameter of the flowering branches, as well as leaf shape and size were evaluated on the second stem internodium under the inflorescence; the size of the calyx and the length of the flowering stems were measured on the second verticillastrum of the inflorescence, unless otherwise indicated.

The hairiness of flowering branches is an important feature in the *Serpyllum* section, considering that different groups of thyme have different stem cross-sectional anatomy (e.g. Pawlowski 1966, Schmidt 1968, Šustar 1968, Berciu & Toma 2008). Most taxa with goniotrichous and allelotrichous hairiness are classified in the subsection *Alternantes* or *Pseudomarginati*. Only if we add *T. oenipontanus* as a subspecies to *T. glabrescens* (*T. glabrescens* subsp. *decipiens*) does this subspecies have flowering branches with irregular hairiness: on two opposite surfaces the branches have regular pubescence, on two surfaces these may be sparse to almost absent (mixotrichous), but not completely allelotrichous. *Thymus oenipontanus* is endemic to the southern and western Alps (Machule 1957, Schmidt 1973) – it is a plant of higher altitudes, therefore the areas of both species do not meet; from *T. glabrescens* s. str. differs mainly in homophyllous foliage, leaves with veins more pronounced, usually whitish (except in shady forms), the calyx on the dorsal side not glabrous under the upper teeth, the lower teeth being yellowish and prickly. Plants of subsp. *banaticus*, as the only intraspecific taxon of *T. glabrescens* display allelotrichous or predominantly allelotrichous hairiness of flowering branches. The anatomy on the cross-section of the flowering branches is also different, with its reinforced strands of the sclerenchyma, which however are not as pronounced as in *T. pulegioides*.

Key to determination of *Thymus* subsection *Isolepides* from south-eastern Europe

[Hairiness of flowering branches was evaluated on second internodium under the inflorescence.]

1a Flowering branches of stem with four edges or seemingly with four edges, with allelotrichous (to mixotrichous) hairiness, e.g. two opposite sides narrower, convex, with long or short hairs retrorse or down bent and the other two sides broader, slightly concave, glabrous (exceptionally with sparse small retrorse hairs), this hairiness type alternating from internodium to internodium. ..... ***T. glabrescens* subsp. *banaticus* Čáp et Řepka**

1b Flowering branches of stem rounded, rarely faintly 4-edges, with ± holotrichous hairiness, (e.g. hairs around the stem). **2**

2a Calyx upper side semiglabrous to glabrous (especially below the upper teeth), plants with sterile shoots, foliage heterophyllous. ..... ***T. glabrescens* Willd. subsp. *glabrescens***

2b Whole calyx with regular hairiness, plants with or without sterile shoots, foliage usually homophyllous. **3**

3a Flowering branches 4–10(–13) cm high, veins on the back side of the leaves of flowering branches whitish, calyx 5–6 mm long, calyx upper teeth spiny. ..... ***T. longedentatus* (Degen et Urum.) Ronniger**

3b Flowering branches higher, (8–)10–30(–40) cm high, veins on the back side of the leaves of flowering branches not whitish, calyx up to 5 mm long, calyx upper teeth without aspen, herbaceous. **4**

4a Leaves stiff, leathery, with prominent veins, calyx small, 2.5–3.5(–4) mm long, calyx lower teeth yellowish. **5**

4b Leaves thin, soft, herbaceous, veins excellent or weak, calyx 2.5–5.5 mm long, calyx lower teeth not yellowish. **6**

5a Leaves with dense punctate glands, 10–17 × 2–6 mm. ..... ***T. sibthorpii* Bentham**

5b Leaves with sparse, often dotted glands not pronounced, 9–15 × 2–3 mm. ..... ***T. tosevii* Velen.**

6a Sterile shoots present, partly erect, partly decumbent, middle vein of leaves of flowering branches excellent, calyx in flower 3.5–5 mm long, in fruit 4–5.5 mm long, calyx upper teeth 1.2–1.5 mm long. ..... ***T. bulgaricus* (Domin et Podp.) Ronniger**

6b Sterile shoots are missing or only sporadic and small, the middle vein of the leaves of flowering branches not excellent, calyx in flower 2.5–3.5 mm long, in fruit 4(–4.5) mm long, calyx upper teeth 0.7–1.0(–1.1) mm long. ..... ***T. pannonicus* All.**

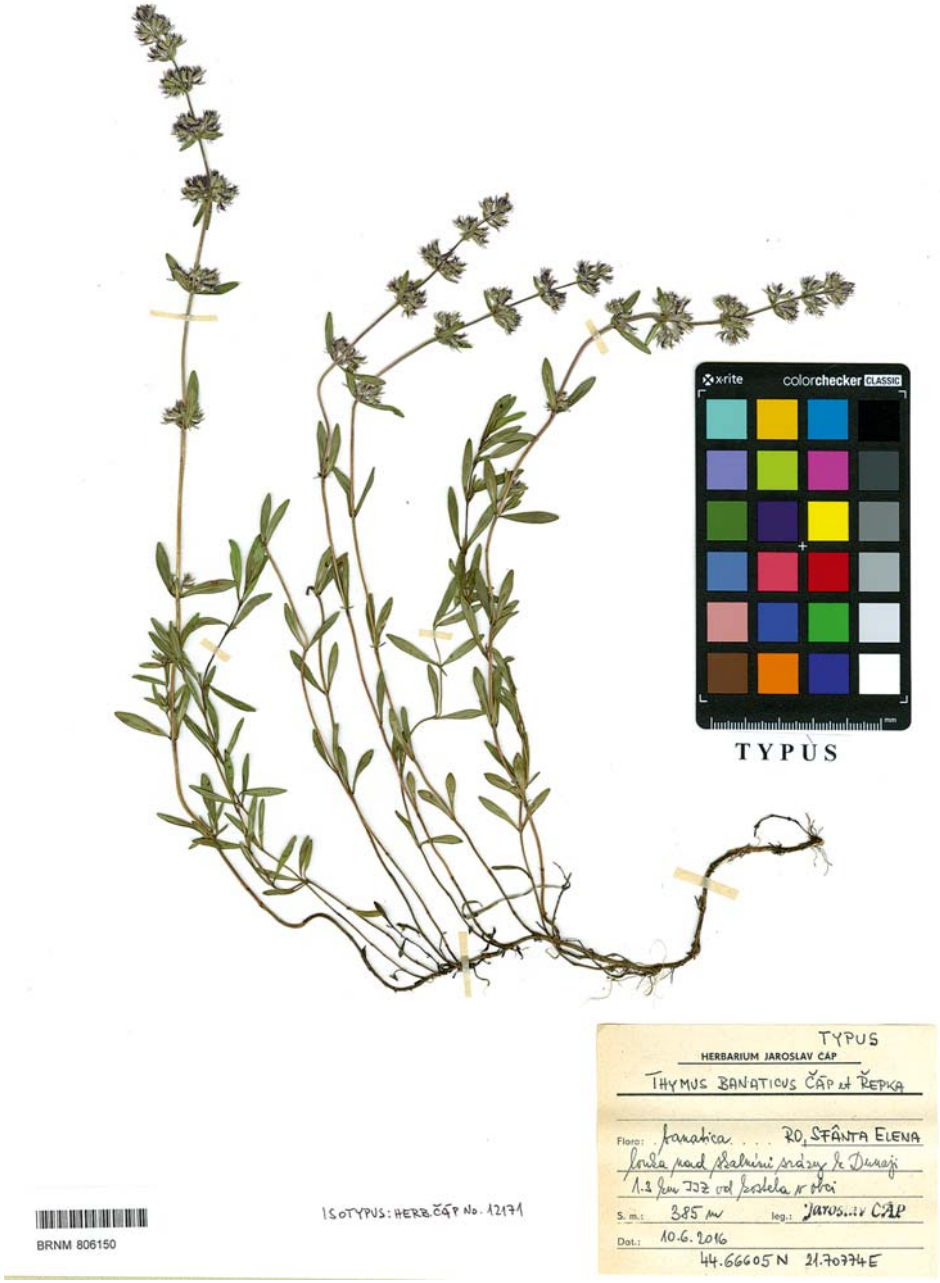

Fig. 1. *Thymus glabrescens* subsp. *banaticus* Čáp et Řepka: holotype (BRNM-806150).

Fig. 2. A – The slender form of subsp. *banaticus* from suxerophilous meadow-steppe vegetation, probably the most common morphological form (herb. specimen J. Čáp 12187). **B** – More compact form of subsp. *banaticus* from loose, low steppe vegetation with rigid, wider leaves and shorter internodes (herb. specimen J. Čáp 12188). **C** – The form of subsp. *banaticus* forming dense tufts, growing o n ravine slopes on deeper soil (herb. specimen J. Čáp 12185). **D** – The minor compact form of subsp. *banaticus* from scrap limestone and pastures (influence of shallow soils and repeated grazing and trampling) (herb. specimen J. Čáp 12196).

Discussion

In the *Serpyllum* section, which includes Central European thyme, a considerable degree of hybridization has been demonstrated, where there are almost no genetic barriers to cross (e.g. Pawlowski 1966, Morales 2002, Nachychko & Sosnowsky 2021: 119). The combination of morphological features of the new taxon may originate in hybridization. The hybridogenous origin of subsp. *banaticus* could indicate that in the area of its distribution both *T. glabrescens* and *T. pulegioides* (in subsp. *chamaedrys* and subsp. *montanus*) grow. However, nowhere at the occurrence sites of the hybrid *T. glabrescens* × *T. pulegioides* (central, western part of eastern and northern part of southeastern Europe) specimens of this hybrid were not common, rather rare or completely missing, let alone forming autonomous large populations, as we observed in subsp. *banaticus* in the SW part of the Romanian Banat. In addition, the habitats of both species are not isolated in Banat, making hybrid swarms possible.

For the first time, we found subsp. *banaticus* on a study trip to Banat, Romania in 2011, but identified it as *T.* ×*radoi* Borbás [*T. glabrescens* × *T. pulegioides* subsp. *chamaedrys* (Fries) Litard]. Phenologically, these two parent species can virtually be excluded, and therefore hybrids found in Central Europe or the northern part of the Balkan Peninsula are extremely rare and have low vitality. *Thymus* ×*radoi* Borbás (*T. glabrescens* × *T. pulegioides*) has a later flowering period, closer to *T. pulegioides*. In nature there are no long-living populations of *T.* ×*radoi*, the same applying to "*T.* ×*juranyanus* Borbás" [*T. glabrescens* × *T. pulegioides* subsp. *montanus* (Bent.) Ronniger]. At the time of full flowering of *T. glabrescens* s. str. (e.g. between May 20 and June 20), *T. pulegioides* subsp. *montanus* does not even have flower buds attached; it first flowers at the beginning of July. At the time of *T. pulegioides* subsp. *montanus* flowering, *T. glabrescens* s. str. is already faded, although individual flowers may appear for the second time at the end of summer. Subsp. *banaticus* is phenologically identical to *T. glabrescens* s. str., its flowers and inflorescences are fully developed in late June and only a small proportion of aborted pollen has been detected (the result of a superficial study of pollen grains under a binocular microscope). In some *Thymus* hybrids aborted pollen was detected (e.g. *T. praecox* × *T. pulegioides* 57.7%), while parental species have just a small portion of aborted pollen: *T. praecox* 9.8% and *T. pulegioides* 15.4% (see Pawłowski 1966).

Hybrids *Thymus glabrescens* × *T. pulegioides* occur much more rarely than hybrids *T. pannonicus* × *T. pulegioides*. Hybrids *T. glabrescens* with two subspecies of *T. pulegioides* were recognized and described:

Thymus ×*radoi* Borbás in Geogr. Enum. Pl. Comit. Castriferrei (1887) 215 (orig. *T. collinus* × *T. subcitratus*) = *T. glabrescens* subsp. *glabrescens* × *T. pulegioides* subsp. *chamaedrys* (Fries) Litard.

Thymus ×*radoi* Borbás nothosubsp. *juranyanus* (Borbás) Čáp et Řepka comb. et stat. nov.

Basionym: *Thymus juranyanus* Borbás in Symb. Thym. Eur. Med. (1890) 96 (orig. *T. collinus* × *T. supermontanus*) = *T. glabrescens* subsp. *glabrescens* × *T. pulegioides* subsp. *montanus* (Bentham) Ronniger.

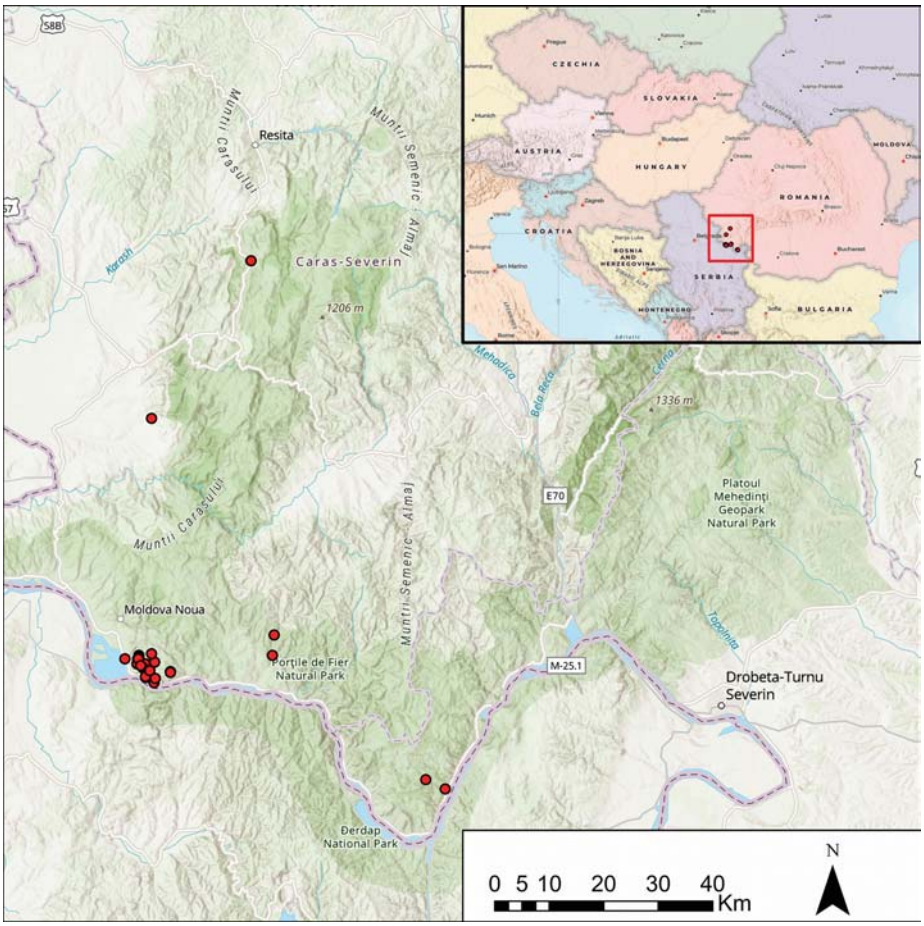

Fig. 3. Distribution of *Thymus glabrescens* subsp. *banaticus* Čáp et Řepka in Romania (Banat) based on revised herbarium specimens (some nearby localities were merged).

Results of the selected herbaria study

In selected herbaria (see chapter Material and Methods) specimens of the following taxa were studied: *Thymus* "*dacicus*", *T.* ×*porcii, T.* ×*radoi* and *T. oenipontanus* were compared with herbarium specimens of the new taxon. Nevertheless, *T. dacicus* f. *coronensis* Lyka was described from the territory of Banat, but no specimen for this name was found in herbaria. According to the protologue, plants collected on the slopes near the village of Coronini could be compared to the new taxon. However, f. *coronensis* differs in leaves that are broadest in the upper 1/3, calyx tube hairy (in the new taxon it is hairy at the top) and Lyka does not report the presence of sterile decumbent shoots,

which the new taxon has. It is most likely that much of the material will be stored in Ronniger's herbarium in Vienna (W), but it is currently inaccessible. Specimens from other collectors (Borbás, Nyárády, Richter, etc.) can also be expected in Ronniger's material, which could also belong to a new taxon and clarify taxonomical content of the name *T. dacicus*.

It is also likely that the botanists collecting thymi in Banat tried to place *T. glabrescens* subsp. *banaticus* in available keys, and since they were not specialists in this genus, they tried to give the plants an already published name. We assume that during further study of the herbarium collections, these documents can be found and revised.

Comparison with related taxa

When identifying plants now considered to be subsp. *banaticus* according to commonly used keys (Jávorka 1925; Gusuleac 1961; Beldie 1979; Ciocârlan 2000) we will arrive at the species *T. dacicus* Borbás. However, this species is ambiguously interpreted by many authors, and at present it is not possible to objectively establish what plants the name *T. dacicus* applies to.

Thymus dacicus is not conspecific with the newly described taxon for the following reasons:

(1) In the protologue of the name *Thymus dacicus*, a hybrid combination of *T. montanus* × *T. pinifolius* (according to Borbás), *T. pinifolius* is a narrow-leaved form of *T. effusus*, which he contradicts by adding *T. dalmaticus* as a synonym and emphasizing the two-row hairiness of flowering branches of *T. dacicus* (see Borbás 1890: 78–79).

(2) the protologue of *T. dacicus* states the hairiness of flowering branches: at the bottom, four-rowed ciliate, at the top, two-rowed (under the inflorescence around the stem), white-woolly, which contradicts the classification into sect. *Goniotrichi*.

(3) In the protologue it is stated that *T. dacicus* is particularly close to *T. montanus* and *T. effusus* (both names are synonyms of *T. pulegioides*), with more wavy calyx; Borbás also states a relationship to *T. pulchellus* C.A.Meyer from the Caucasus.

(4) Borbás (1890) in the list of taxa placed *T. dacicus* as a subordinate taxon of *T. ovatus* to the same level as *T. chamaedrys* or *T. subcitratus* (all are synonyms of *T. pulegioides*); in the same work Borbás (1890: 50) included *T. dacicus* in group "d2" to "Bb *Camptodromi*, I. A. *Goniotrichi*". Borbás's explanation suggests that it is a goniotrichous species, perhaps with hybridogenous origin.

(5) Taxonomic content of the name *T. dacicus* is not understood uniformly by more than one author. This is probably also a consequence of the author's own concept: according to Borbás's plants marked as *T. dacicus* (herbarium

Table 1. Comparison of *Thymus glabrescens* subsp. *banaticus* with similar allelotrichous thymi (hybrids from *T. glabrescens-pannonicus* agg.). →

Character / taxon	*T. glabrescens banaticus*	*T. ×porcii*	*T. ×radoi*	*T. ×juranyianus*
Synonymy		(= *T. pannonicus* × *T. pulegioides*; incl. *T. ×erioclados* Borbás, *T. dacicus* Borbás, *T. ×pilisiensis* Borbás)	(= *T. glabrescens* × *T. pulegioides* subsp. *chamaedrys*)	(= *T. glabrescens* × *T. pulegioides* subsp. *montanus*)
Similarity to widely distributed taxa	*T. glabrescens*	*T. pannonicus* less to *T. glabrescens*	*T. pulegioides*	*T. pulegioides* subsp. *montanus*
Sterile overground or creeping underground stolons	present, long	missing	missing or reduced (rare)	missing or reduced (very rare)
Foliage type	heterophyllous	homophyllous	heterophyllous or homophyllous	heterophyllous or homophyllous
Leaf venation	distinctive (especially middle veins)	weak	weak	weak or stronger
Width of leaf (2nd node below inflorescence)	broadest above middle and upper 1/3 part	broadest in middle and lower part	broadest in middle and lower part	broadest in middle
Flowering branches and their hairiness	all sides equally wide, more often two surfaces from internodium to internodium alternately wider/narrower, slightly convex or flat, and two surfaces narrower and glabrous (rarely with individual short hairs); two other surfaces with long and short hairs, the hairiness regular, shorter hair on branches retrorse, but not quite appressed	edges of branches distinct or weak (according to morphological similarity to one or other parent, but two sides are not significantly concave), the hairs on edges are thicker and longer; hairiness short, bent or standing	two sides densely hairy, remaining ones glabrous with sparse (to missing) hairs; hairiness mixotrichous, usually with lines of thickerand longer hairs on edges	two sides with shorter hairs (regularly hairy), two opposite ones mostly glabrous; hairiness usually mixotrichous, with lines of thicker hairs on all edges
Calyx characters	calyx 3.5–4.5 mm long, calyx base densely hirsute, from half the teeth hairs rare or missing; upper teeth with multicellular hairs; pedunculate glands missing	calyx 3–5 mm long, all over hairy, upper teeth with multicellular hairs; pedunculate glands missing or present	calyx 4–4.5 mm long, all over hairy or under upper teeth glabrous, upper teeth with multicellular hairs; pedunculate glands missing or present	calyx 2–3 mm long, ridge under upper teeth glabrous upper teeth only sparse ciliate; pedunculate glands missing or present
Time of flowering	end of May to June	half of May to September	half of June to September	July to August
Distribution	SW Romania, hill country belt	relatively common in central and SE Europe, lowland to mountain belt	very rare in central and SE Europe, lowland to hill country belt	rarely in SE Europe, hill country belt

specimens in W and BRNM) are not taxonomically identical plants; however, they all have a common feature: imperfectly goniotrichous, mixotrichous or allelotrichous hairiness of flowering branches. Guşuleac (1961) presents *T. dacicus* as a member of hybrid series between *T. marschallianus* and *T. pulegioides* (in accordance with Borbás) and this concept is also accepted by Jalas (1972). Under the name *T. dacicus* Diklić & Vasić (2000) probably also see a completely different taxon widespread in the Carpathian mountains and in the Danube lowlands, as shown in the published distribution map; such a altitudinal gradient would only be possible for *T. pulegioides*.

(6) *Thymus dacicus* has homophyllous foliage, leaves are widest in the lower 1/3; *T. glabrescens* with heterophyllous foliage has leaves which are widest above half or at the upper third (see Fig. 2980 in Jávorka & Czapody 1975: 439).

Table 1 shows a morphological comparison of the taxa with allelotrichous hairs (hybrids from *T. glabrescens-pannonicus* agg.), which are morphologically closest to subsp. *banaticus*. As comparison, similar species with holotrichous hairs within subsect. *Isolepides* are presented in the above key.

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APPENDIX

Other material studied

Thymus glabrescens subsp. *banaticus* Čáp et Řepka

Paratypes. ROMANIA, Banat, distr. Caraş-Severin (from west to east): Coronini, limestone gravel field, on slope of Danube valley 1.6 km NW of the village church, 44°41′20.112″N, 21°41′43.188″E, 390 m a.s.l., 11 June 2016, Čáp *12196* (herb. J. Čáp); Coronini, limestone grassland and stony slope by playground 1.2 km NNW of the village church, 90 m a.s.l., 11 June 2016, Čáp *12162*, *12163* and *12175* (herb. J. Čáp); Coronini, limestone rocks and verges along road 1.9 km NE of the village church, 44°41′29.940″N, 21°41′51.036″E, 430 m, 11 June 2016, Čáp *12177* (herb. J. Čáp); Coronini, limestone gravel along road 1.75 km NE of the village church, 44°41′24.648″N, 21°41′47.544″E, 420 m a.s.l., 11 June 2016, Čáp *12178* (herb. J. Čáp); Coronini, grassy and rocky limestone hill 1.2 km NNW of the village church, 44°41′20.148″N, 21°40′25.644″E, 90 m a.s.l., 11 June 2016, Čáp *12161* (herb. J. Čáp); Coronini, slopes of Danube River valley with short dry pasture on limestone, 1.3 km NW of the village church, 44°41′10.464″N, 21°41′38.076″E, 340 m a.s.l., 11 June 2016, Čáp *12194* (herb. J. Čáp); Sfânta Elena, by road to wind power plant on ridge above the Danube River 2.0 km SSE of the village church, 44°39′36.108″N, 21°43′18.732″E, 340 m a.s.l., 11 June 2016, Čáp *12187–12189* (herb. J. Čáp); Sfânta Elena, verge of road to wind power plants, 2.8 km E–ESE of the village church, 44°40′23.376″N, 21°44′52.872″E, 425 m a.s.l., 11 June 2016, Čáp *12190* (herb. J. Čáp); Sfânta Elena, verge in forest near road to Coronini, 1 km WNW of the village church, 44°40′50.592″N, 21°41′59.496″E, 270 m a.s.l., 11 June 2016, Čáp *12193* (herb. J. Čáp); Sfânta Elena, limestone gravel verge of road in forest, 2 km E of the village church, 44°40′38.172″N, 21°42′13.644″E, 420 m a.s.l., 11 June 2016, Čáp *12192* (herb. J. Čáp); Sfânta Elena, verge of road to wind power plants 2.9 km E-ESE of the village church, 44°40′19.380″N, 21°44′55.680″E, 420 m a.s.l., 11 June 2016, Čáp *12191* (herb. J. Čáp); Sfânta Elena, field margin 1 km NE of the village, 380 m a.s.l., 28 June 2011, R. Řepka *10835* (herb. J. Čáp); Sfânta Elena, by road to wind power plant above the Danube River 1.8 km SSE of the village church, 44°39′43.632″N, 21°43′15.060″E, 360 m a.s.l., 11 June 2016, Čáp *12199* (herb. J. Čáp); Sfânta Elena, northern margin of the village, at start of red-marked hiking trail, 44°40′55.920″N, 21°42′27.720″E, 350 m a.s.l., 10 June 2016, Čáp *12184* (herb. J. Čáp); Sfânta Elena, verge of road near northern margin of the village, 760 m NNW of the village church, 44°40′58.224″N, 21°42′22.860″E, 355 m a.s.l., 10 June 2016, Čáp *12185* (herb. J. Čáp); Sfânta Elena, „Vranovec" crossroads at the Kulhavá skála Rock, 2.1 km N–NNE of the village church, 44°58′8.400″N, 21°43′3.144″E, 450 m a.s.l., 10 June 2016, Čáp *12166* & *12186* (herb. J. Čáp) (form with narrow leaves); Sfânta Elena, sloping steppe grassland (*Festucion valesiacae*), 930 m S–SSW of the village church, 44°40′9.264″N, 21°42′31.680″E, 310 m a.s.l., 10 June 2016, Čáp *12168* (herb. J. Čáp); Sfânta Elena, sloping steppe grassland (*Festucion valesiacae*), 770 m S–SSW of the village church, 44°40′13.800″N, 21°42′33.480″E, 330 m a.s.l., 10 June 2016, Čáp *12167* (herb. J. Čáp); Sfânta Elena, sloping steppic grassland (*Bromion*) 1.3 km SSW of the village church, 44°39′58.572″N, 21°42′27.972″E, 380 m a.s.l., 10 June 2016, Čáp *12169* &*12170* (herb. J. Čáp); Sfânta Elena, gorge surrounding the cemetery at SE margin of the village, 330 m a.s.l., 10 June 2016, Čáp *12173* (herb. J. Čáp); Sfânta Elena, meadow near the viewpoint above the Danube River, 1.6 km JJV of the village church, 310 m a.s.l., 10 June 2016, Čáp *12172* (herb. J. Čáp); Sfânta Elena, sunny verge of road at SE margin of the village, 300 m a.s.l., 10 June 2016, Čáp *12174* (herb. J. Čáp); Caraşova, verge of road to village of Anina 5.6 km SSE of the village museum, 45°9′12.060″N, 21°52′52.680″E, 580 m a.s.l., 12 June 2016, Čáp *12197* (herb. J. Čáp); Ljubcova, Pîrîu Oreviţa valley, by road to Ravensca, 4 km NNE of the village church, 44°41′33.432″N, 21°54′59.904″E, 130 m a.s.l., 11 June 2016, Čáp *12160* (herb. J. Čáp); Ravensca, sandy meadow in stream valley on path from Liborajdea to Ravensca 6 km S of the village, 44°43′0.960″N, 21°55′10.080″E, 154 m a.s.l., 7 June 2013, R. Řepka *11704*, *11705, 12194* (herb. J. Čáp); Ravensca, verge of road in Pîrîu Oreviţa valley between the villages of Ljubcova and Ravensca, 6.3 km S of the village centre 44°43′1.128″N, 21°55′11.568″E, 180 m a.s.l., 11 June 2016, Čáp *12181–12183* (herb. J. Čáp) (form with densely hairy calyx); Ravensca, sandy-stony slope in Pîrîu Oreviţa valley between the villages of Ljubcova and Ravensca, 6.35 km S of the village centre, 44°43′0.192″N, 21°55′7.464″E, 180 m a.s.l., 11 June 2016, Čáp *12159* (herb. J. Čáp); Eibenthal, fringe of pine forest, 3.4 km ESE of the village church, 44°32′6.972″N, 22°12′4.428″E, 250 m a.s.l., 10 June 2016, Čáp *12165* (herb. J. Čáp); Eibenthal, verge along road, 760 m E–ENE of the village church, 44°32′45.672″N, 22°10′10.776″E, 445 m a.s.l., 10 June 2016, Čáp *12164* (herb. J. Čáp).