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Diploids of the *Valeriana officinalis* group (*Valerianaceae*) in Central Europe, and an attempt to unravel the nomenclatural chaos

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Abstract: Diploid populations of *Valeriana officinalis* L. (*Valerianaceae*) in Central Europe exhibit an extensive variation, with two conspicuous morphotypes. One, corresponding to the lectotype of *V. officinalis*, is larger, with broader, distinctly dentate leaflets, the other is in many respects similar to *V. pratensis* Dierb. and *V. stolonifera* Czern., but is glabrous, with narrow, usually entire leaflets. The two forms also differ in their ecological optimum and in geographical distribution, but are linked with numerous intermediates. Morphometric analysis (PCA) supports the picture outlined above. Nomenclatural analysis shows that the correct name for the taxon with narrow leaflets at the rank of variety is *V. officinalis* var. *tenuifolia* Vahl, with a very old synonym at the rank of subspecies, *V. officinalis* subsp. *tenuifolia* (Vahl) Schübler & Martens. A lectotype and epitype (from a plant with $2n = 14$) are designated for this name. The epithet *tenuifolia* cannot be used for what has usually been called *V. collina* auct., or correctly, *V. stolonifera* subsp. *angustifolia* Soó. Further names were also studied in detail: *V. officinalis* var. *angustifolia* Wahlenb., *V. officinalis* var. *angustifolia* Hayne (for which a lectotype is designated), *V. altissima* Besser and *V. officinalis* var. *altissima* W. D. J. Koch.

Key words: *Valerianaceae*, *Valeriana officinalis*, *Valeriana officinalis* var. *tenuifolia*, taxonomy, nomenclature, Central Europe

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Introduction

The group of taxa around *Valeriana officinalis* L. includes a number of names used without appropriate nomenclatural evaluation, typification and interpretation. Although the group was subject to extensive field research and several taxonomic revisions, taxonomists did not reach any reasonable consensus about the number, circumscription and rank of taxa to be recognized. Objective reasons for this situation should be sought in the rather low level of structural differentiation among taxa, the existence of polyploid series (the most important works on *V. officinalis* polyploidy include Skalińska 1947; Titz 1969; Hidalgo & Vallès 2012; Bressler & al. 2017; and other relevant works cited below) and possible occasional intermediates or hybrids. Many problems, however, stem from uneven geographical exploration of the *V. officinalis* group and from very different methods used to understand the population variability (Walther 1949; Voroshilov 1959; Titz & Titz 1982; Titz 1984; Holub & Kirschner 1997; Buttler & al. 2008).

Taxonomic evaluation of the group of *Valeriana officinalis* therefore remains to be completed using modern methods of genomic analyses and on a geographically representative selection of population samples. The Central

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Table 1. Taxonomic summary of the *Valeriana officinalis* group in Central Europe. Nomenclatural citations are given in Buttler & al. (2008) and in the Euro+Med PlantBase (Kirschner & Raab-Straube 2017+).

Ploidy	Species	Subspecies	Habitat	Comments
2*n* = 14, diploids	*V. officinalis* L.	subsp. *officinalis*	wet meadows	flowering June-August
2*n* = 28, tetraploids	*V. stolonifera* Czern.	subsp. *stolonifera*	steppe, open dry woodland	Ukraine
		subsp. *angustifolia* Soó	dry woodland	usually given under the name *V. collina*
	V. pratensis Dierb.	subsp. *pratensis*	wet meadows	
		subsp. *franconica* Meierott & T. Gregor	mesophilous to wet ecotones (forest margins, ditches etc.)	
2*n* = 56, octoploids	*V. excelsa* Poir.	subsp. *excelsa* (= *V. procurrens* Wallr.)	mountain and/or wet woodland springs	see comment below
		subsp. *sambucifolia* (Pohl) Holub	mountain tall-herb meadows and open mountain woodlands	early flowering (June)
		subsp. *versifolia* (Brügger) Buttler & al.	tall-herb meadows, along streams	Alps, from Tirol to NW Italy and France

Note 1. — With the exception of the autonym, *Valeriana excelsa* Poir. subsp. *excelsa*, the second oldest name for *V. excelsa* at the rank of subspecies is *V. officinalis* subsp. *communis* Schübl. & G. Martens (1834). Following Maillefer (1946) and Buttler & al. (2008), we treat the type of *V. excelsa* as identical with what is called *V. excelsa* subsp. *procurrens* in Holub & Kirschner (1997) and Kirschner (2002). The equation of subsp. *procurrens* and subsp. *excelsa* is in full accordance with the syntype of *V. excelsa* deposited in Firenze (FI 4466 photo!).

Note 2. — The name *Valeriana excelsa* subsp. *transiens* (E. Walther) Holub is excluded from Table 1; it is generally doubtful to accord the rank of subspecies to presumably non-hybrid intermediates, however common.

Note 3. — The differences in the taxonomic treatment of *Valeriana pratensis* Dierb. versus *V. stolonifera* Czern. between Buttler & al. (2008) and the present paper are based on the obviously separate origin of the very local wet meadow species *V. pratensis* and the widespread subxerophilous group of *V. stolonifera.*

European forms of this group have been studied profoundly by several specialists, most importantly by Titz & Titz (1982) and Titz (1984), and nomenclatural aspects have been outlined by Buttler & al. (2008). Results of detailed field observations in Baden-Württemberg were excellently summarized by Sebald (1996). From the above works and our own older research (Holub & Kirschner 1997; Kirschner 2002), we can derive a taxonomic survey of this group in Central Europe (Table 1).

The present paper is focused on the taxonomy and nomenclature of diploids of the *Valeriana officinalis* group in Central Europe. We do not include diploid forms occurring in S Europe because there are several diploid entities similar to *V. stolonifera* that remain to be studied and properly understood (Titz & Titz 1982 not only mention the "*illyrica*" diploid form from the Balkans but also a diploid from the Pyrenees; the latter might be close to *V. hispidula* Boiss.). Seemingly, the study of Central European diploids is a relatively simple task because most of the above literature sources recognize only a single diploid taxon there, which is *V. officinalis* L. s.str., its name having recently been typified and interpreted (Kirschner 2007, with the name *V. exaltata* J. C. Mikan ex Pohl as a synonym). However, some comments in the literature indicate that another taxon might be involved in the relatively extensive variation of *V. officinalis* at the diploid level. Titz & Titz (1981) spoke about variants of *V. exaltata* with narrow leaflets in the region of Bodensee: "[shortened] Im Bodenseeraum blüht '*exaltata*' schon im Juni (bis Juli) […]. Dies ist wohl mit ein Grund dafür, daß schmalfiedrige Varianten von '*exaltata*' aus dem Bodenseeraum […] und der Maschwandner Ahmend […] fälschlicherweise für '*V. pratensis*' […] gehalten wurden. Unsere morphologischen und karyologischen Analysen bestätigen die Annahme Sebalds (1977), daß es sich um frühblühende (und stockbildende!) '*exaltata*' handelt."

It was Sebald (1996) who summarized the problem of variation of the diploid *Valeriana officinalis*. Within the diploid *V. officinalis*, he recognized two forms ("*exaltata*" and "*pseudopratensis*"), and their characterization is so useful that we can quote from his identification key to the Baden-Württemberg forms (translated from German, Sebald 1996: 27):

Plants without stolons, often with several stems from one rhizome head, vegetative leaf rosettes directly on rhizome head; stem usually glabrous, usually suffused red, relatively strongly grooved; flowers 3–5 mm long 2

Plants late flowering (usually beginning in July, later than other forms); stem tall; leaflets with distinct and numerous teeth . . . . . subsp. *officinalis*

– Plants earlier flowering (often already at beginning of June); stem shorter; leaflets usually narrower and with less distinct teeth . . . . . subsp. *officinalis* "*pseudopratensis*" form

Table 2. Material used in the morphometric analyses. Preliminary identification based on general habit; samples difficult to assign to either group remain without the preliminary identification. – Abbreviations: O = *Valeriana officinalis* var. *officinalis*; T = *V. officinalis* var. *tenuifolia* (* = isoepitypes of that name); country codes follow ISO 3166-1 alpha-2; herbarium codes follow Thiers (2017+).

Serial numbers	Preliminary identification	Country code	Locality	Latitude, longitude	Herbarium
1–9	O	CZ	Všetaty, railroad	50.2742381°N, 14.5700644°E	PRA
10–13		CZ	Všetaty, margin of nature reserve	50.2770494°N, 14.5720600°E	PRA
14–15	O	CZ	Všetaty, margin of nature reserve	50.2770494°N, 14.5720600°E	PRA
16–17	O	CZ	Všetaty, railroad	50.2742381°N, 14.5700644°E	PRA
18		CZ	Všetaty, railroad	50.2742381°N, 14.5700644°E	PRA
19–24	T	CZ	Všetaty, road ditch	50.2759111°N, 14.5746133°E	PRA
25–26	T	CZ	Všetaty, margin of nature reserve	50.2770494°N, 14.5720600°E	PRA
27–37	T	CZ	Všetaty, road ditch	50.2759111°N, 14.5746133°E	PRA
38–46*	T	CZ	S of Všetaty, at railroad crossing	50.2718244°N, 14.5756864°E	PRA*
47	T	EE	Hiiu County, Männamaa	58.8471406°N, 22.6000136°E	TU
48	T	EE	Tartu	58.374°N, 26.730°E	TU
49	T	EE	Saare County, Püha	58.3133200°N, 22.7301664°E	TU
50	O	EE	Abruka Island	58.1606722°N, 22.5142114°E	TU
51	T	EE	Pärnumaa	58.3864700°N, 24.5087528°E	TU
52	O	CZ	Cheb, Třebeň-Povodí	50.1369958°N, 12.4304514E	herb. Velebil
53	O	RU	Sankt-Peterburg, Dachnoe	59.85°N, 30.25°E	PRA (ex LE)
54		RU	Sankt-Peterburg, Dachnoe	59.85°N, 30.25°E	PRA (ex LE)
55		RU	Sankt-Peterburg, Malaya Istinka	59.6480°N, 33.05638°E	PRA (ex LE)
56	T	RU	Vyborg	60.70°N, 28.75°E	PRA (ex LE)
57	O	CZ	Všetaty, railroad	50.2742381°N, 14.5700644°E	PRA
58		CZ	Všetaty, railroad	50.2742381°N, 14.5700644°E	PRA
59	O	CZ	Všetaty, railroad	50.2742381°N, 14.5700644°E	PRA
60–62	O	CZ	Lysá nad Labem, Hrabanov	50.2198797°N, 14.8393314°E	PRA
63		CZ	Lysá nad Labem, Hrabanov	50.2198797°N, 14.8393314°E	PRA
64		CZ	Kostelec nad Labem	50.2380672°N, 14.5933500°E	PRA
65	T	CZ	Kostelec nad Labem	50.2380672°N, 14.5933500°E	PRA
66–68		CZ	Kostelec nad Labem	50.2380672°N, 14.5933500°E	PRA
69–80		CZ	Újezd u Průhonic	50.02173°N, 14.54478°E	PRA

It should be added that the "*pseudopratensis*" form usually has leaflets entire, very narrow and, as Sebald (1996) correctly says, at the sites where it is in contact with *Valeriana officinalis* s.str., there are numerous intermediates, both morphological and phenological.

In the present paper we therefore aim at the characterization of the above (so-called) "*pseudopratensis*" form, including its general distribution, and we revise the relevant nomenclature, with the emphasis on the correct interpretation of the name *Valeriana officinalis* var. *tenuifolia* Vahl.

Material and methods

Nomenclatural analysis was performed in strict accordance with the latest version of the *International Code of Nomenclature for algae, fungi, and plants* (hereafter "*Code*"; McNeill & al. 2012). Voucher specimens for chromosome counts and other material are deposited at PRA. A number of relevant herbarium collections were consulted in the course of the present study: BM, BRNM, BRNU, C, K, LI, OL, PR, PRC, W and WU. Herbarium codes are according to Thiers (2017+).

Chromosome numbers were determined in roots of mature cultivated plants, according to the techniques described in Štěpánek & al. (2011). The inevitable prerequisite for any study of the group of *Valeriana officinalis* was the typification and interpretation of this Linnaean name, which was done by Kirschner (2007; see also Kirschner & al. 2007).

Morphometric analyses were done on a selection of our population samples and additional herbarium specimens (LE, PRA, TU). The characters recorded were: (1) plant height at full flowering; (2) leaflet width (middle leaflet of middle cauline leaf); (3) leaflet length; (4) proportion of leaflets with teeth on both margins; (5) number of teeth (middle leaflet of middle cauline leaf); (6) number of leaflets (middle cauline leaf); and (7) proportion of leaflets with teeth (middle cauline leaf). The material measured is given in Table 2; altogether 80 specimens were measured. The material was selected to make it possible to evaluate the large-scale variation (Central Europe versus Estonia and NW Russia) and the variation within a series of large populations in C Bohemia.

The morphometric data were visualized using PCA in R 3.3.2 (R Core Team 2016), from package ade4 (Dray & Dufour 2007), the resulting graphics having been adjusted in CorelDraw 16. The variables for PCA were scaled and centred. The samples were labelled according to preliminary visual taxonomic assessment of herbarium material as a synthetic recognition of *Valeriana officinalis* var. *tenuifolia*-like plants, *V. officinalis* var. *officinalis*-like specimens and unclear cases. The hierarchical clustering (UPGMA, not displayed) was carried out in NTSYSpc 2.2, Exeter Software.

Results

Morphometric analysis of the *Valeriana officinalis* diploids

The material used for the morphometrics consists of a representative sample of a large metapopulation in the W part of the Elbe basin, C Bohemia (between Všetaty and Kostelec nad Labem), and a sample from another two C Bohemian populations (Hrabanov, Újezd u Průhonic); in all these subsamples, both forms are represented, although not at the same habitats. These samples were supplemented with herbarium specimens from the NE part of the distribution range of the form with narrow leaflets (Estonia and Saint Petersburg, Russia), and additional samples of (presumed) *Valeriana officinalis* var. *officinalis* s.str.

The PCA (Fig. 1) ordination shows a clear variation trend but with no really distinct entities, which corresponds to the hypothesis of two morphological units connected with a range of intermediates. The presumed identity of samples (if we disregard the intermediates) was obtained by means of a preliminary general habit assessment, and the two groups coincide with the main trend displayed in Fig. 1. Two major groups are also recognized by the hierarchical cluster analysis (UPGMA, not shown), with about 10 % of samples wrongly assigned in the preliminary assessment. The intermediates are almost evenly divided between the two major groups.

Brief characterization of the "*pseudopratensis*" form of Sebald

The morphometry-based subdivision of the diploids within *Valeriana officinalis* subsp. *officinalis* is in good agreement with the observations of Titz & Titz (1981) and Sebald (1996). If we summarize the data, the following short description of the "*pseudopratensis*" form can be compiled from the above sources and from our measurements: Diploids ($2n = 14$); early flowering (June; in the Scandinavian populations, peak flowering is in July); plants usually 50–120 cm tall, without stolons; stem ± glabrous, with very short, thick hairs at or near nodes on ridges, usually suffused red in lower part (often not so in N part of range of this form); lower and middle leaves long petiolate, petiole usually villous in proximal part; leaflet pairs numerous, usually 6–9 in middle leaves; leaflets narrow, usually 2–6 mm wide, entire or rarely with a few teeth, ± glabrous, often with relatively sparse, very short and thick, almost subconic hairs on margins and some veins beneath (binocular lens needed).

Concerning distribution, the form is known to occur in Central Europe, from Switzerland, Austria, Slovakia and Hungary in the south, through Germany and Czech Republic to Denmark and S Sweden and along the S Baltic shore (Baltic states and the Saint Petersburg region). It is to be expected in Poland and Finland (specimens of promising appearance but with unknown chromosome number were seen).

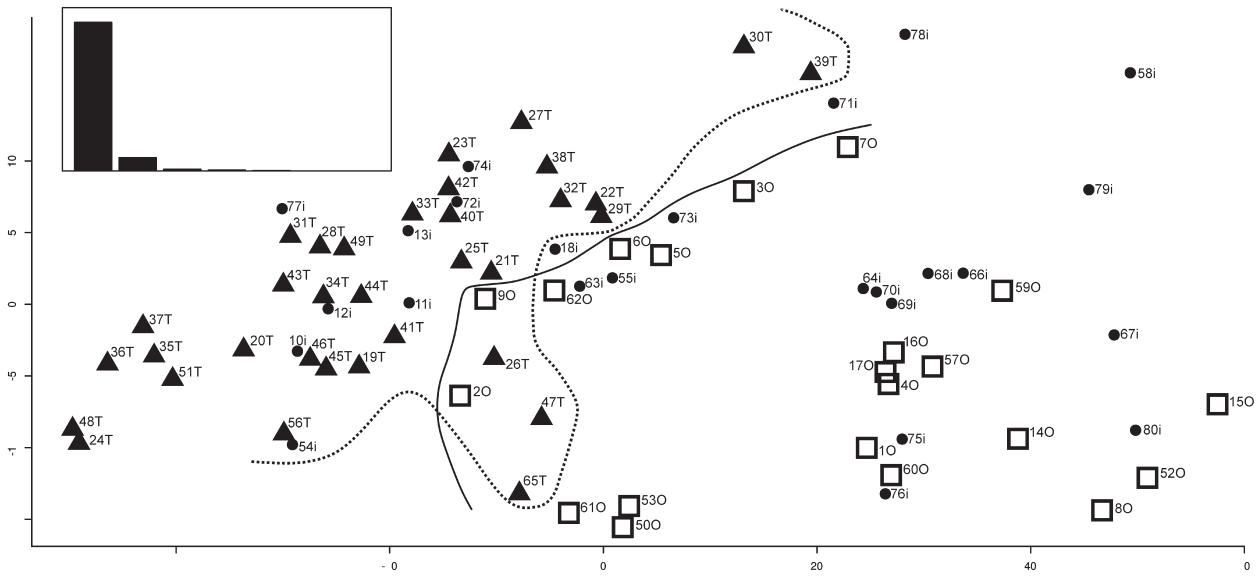

Fig. 1. PCA of morphometric data of *Valeriana officinalis* s.lat. shows a morphological continuum along abscissa with two recognizable morphotypes. Numbers beside symbols correspond to the serial numbers in Table 2. A preliminary visual taxonomic assessment of herbarium material yielded a synthetic recognition of the "*pseudopratensis*" form (▲, above dotted line), which is equated with var. *tenuifolia*-like plants (T after number), and var. *officinalis*-like plants (□, below solid line, O after number); unclear cases (•) may represent intermediates (i after number). The histogram shows proportions of summative variance accounted for by individual principal components.

Nomenclatural analysis

We have concluded that the diploid *Valeriana officinalis* consists of two population entities linked by intermediates; the rank of variety seems to be appropriate for this type of differentiation. As regards the tall, late flowering form with large, conspicuously dentate leaflets, it corresponds to the type of the name *V. officinalis* (Kirschner 2007; Kirschner & al. 2007; see also Fig. 2). It remains, then, to find the correct name for the form with narrow, entire leaflets, the "*pseudopratensis*" form of Sebald (1996). The first infraspecific names to be considered were published by Wibel (1799: 87). From the vicinity of Wertheim, Baden-Württemberg, Germany, Wibel published *V. officinalis* with two varieties (explicitly assigned to this rank): the first one, var. *montana* Wibel, characterized by narrower leaflets and the habitat confined to "montosis, saxosis et nemorosis", which makes it possible to equate this name with *V. stolonifera* subsp. *angustifolia* Soó. We have to refrain from the typification of var. *montana* because the original material was not traced in the herbarium collections known to preserve Wibel's specimens (GOET, JE). The second variety, var. *palustris* Wibel, is characterized by larger, more conspicuously dentate leaflets, and may belong to *V. excelsa* Poir. or to *V. officinalis* var. *officinalis*.

Valeriana officinalis var. *tenuifolia*

We will concentrate on one of the earliest varietal names published within *Valeriana officinalis*, the name *V. officinalis* var. *tenuifolia* Vahl (1805). It was Holub (1983) who listed a number of early subspecies names published by Schübler & Martens (1834), and the names *V. officinalis* subsp. *tenuifolia* (Vahl) Schübl. & G. Martens and *V. officinalis* subsp. *latifolia* (Vahl) Schübl. & G. Martens turned out to be the earliest names at subspecific rank in the genus [disregarding early *Valeriana* subspecies names in Ehrhart (1783) – see Chater & Brummitt (1966) – because they belong to *Valerianella*]. In this way, the overlooked, almost forgotten name of var. *tenuifolia* became important for the nomenclature of the whole group.

The epithet *tenuifolia* (Vahl 1805) was mentioned at various ranks under *Valeriana officinalis* (form, variety, subspecies) in the floristic and taxonomic literature (Rouy 1903; Pleijel 1925; Wisskirchen & Haeupler 1998; Sebald 1996; Fischer & al. 2008; Tison & Foucault 2014; Vásquez Pardo & al. 2007) and with doubtful or probably erroneous taxonomic meaning (usually with the names *V. collina* auct. or *V. wallrothii* Kreyer in synonymy). In what follows, the name *V. officinalis* var. *tenuifolia* is typified and interpreted taxonomically. Other relevant names then are briefly discussed.

The protologue of *Valeriana officinalis* var. *tenuifolia*

Enumeratio plantarum, vol. 2 (Vahl 1805) was published posthumously, under the editorship of N. Tönder, J. W. Horneman and P. Thonning. We compared the published protologue (Fig. 3) with Vahl's original manuscript (deposited at Copenhagen, C) and found the two sources identical. Vahl (1805: 6) characterized *Valeriana officinalis* using his own phrase name (in principle, a Linnaean phrase name with an addition: "pinnis lanceolatis serratis"). Then

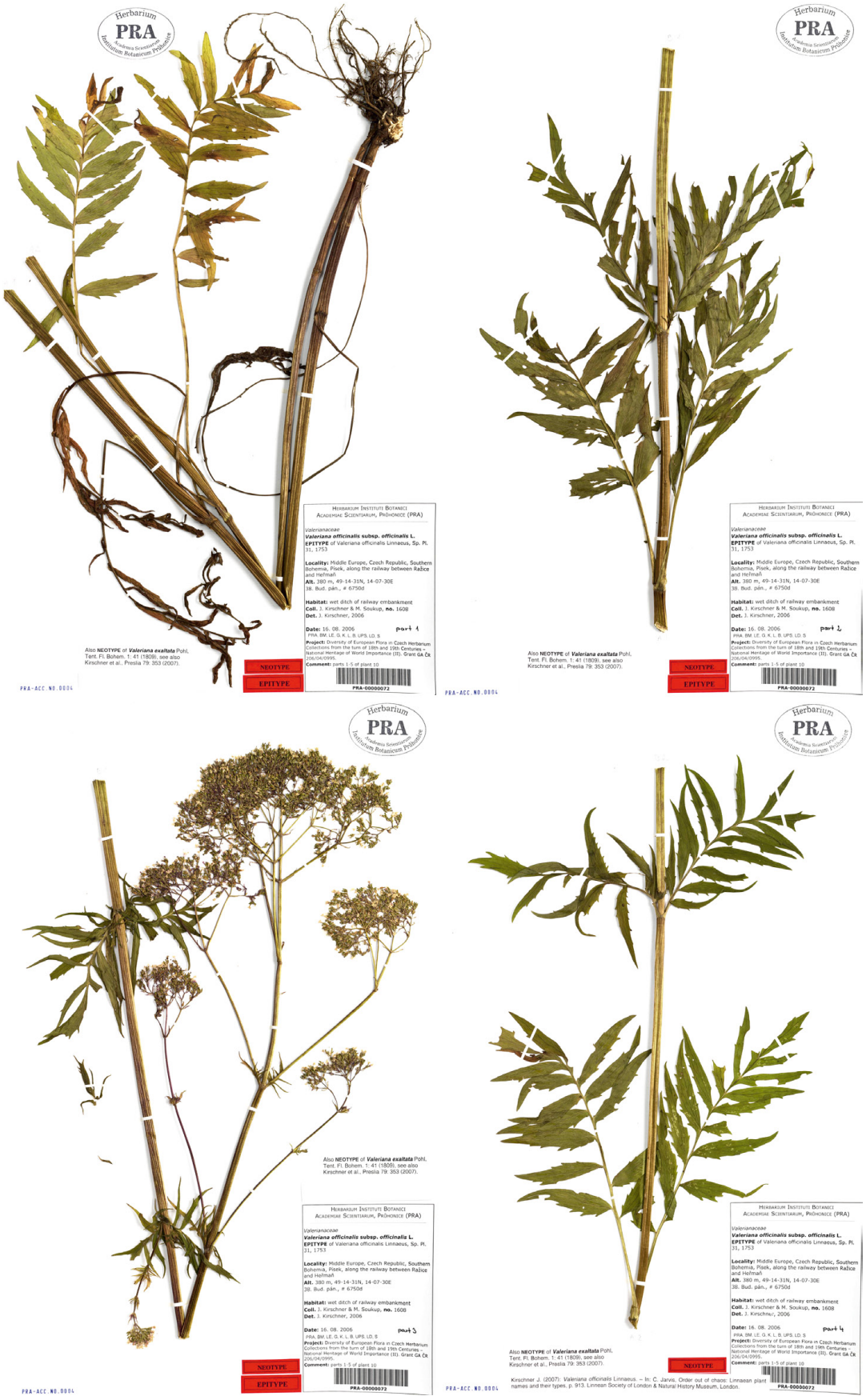

Fig. 2. Epitype of *Valeriana officinalis* and neotype of *V. exaltata* (PRA-00000072). The specimen consists of six parts, of which four are shown here.

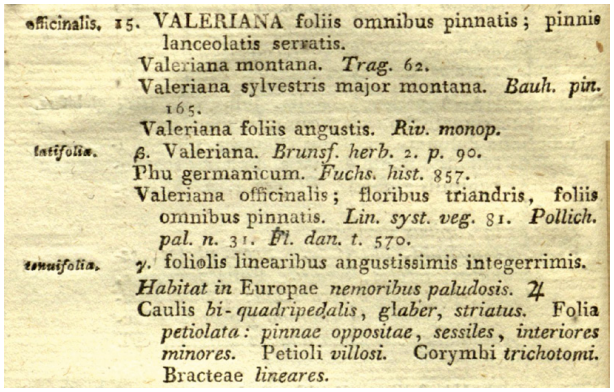
officinalis. 15. VALERIANA foliis omnibus pinnatis; pinnis lanceolatis serratis.
Valeriana montana. *Trag.* 62.
Valeriana sylvestris major montana. *Bauh. pin.* 165.
Valeriana foliis angustis. *Riv. monop.*
latifolia. β. Valeriana. *Brunsf. herb.* 2. *p.* 90.
Phu germanicum. *Fuchs. hist.* 857.
Valeriana officinalis; floribus triandris, foliis omnibus pinnatis. *Lin. syst. veg.* 81. *Pollich. pal. n.* 31. *Fl. dan. t.* 570.
tenuifolia. γ. foliolis linearibus angustissimis integerrimis.
Habitat in Europae *nemoribus paludosis.* 4
Caulis *bi-quadripedalis*, *glaber*, *striatus*. Folia *petiolata*: *pinnae oppositae*, *sessiles*, *interiores minores*. Petioli *villosi*. Corymbi *trichotomi*. Bracteae *lineares*.

Fig. 3. Protologue of *Valeriana officinalis* var. *tenuifolia* (Vahl 1805: 6).

he recognized two subordinate names within the species (β and γ); according to the *Code* (McNeill & al. 2012: Art. 37.4) they are varieties. The first is var. [β] *latifolia*, without a new phrase name, quoting, together with several pre-Linnaean sources, the Linnaean phrase name from *Species plantarum* to the 13th edition of *Systema vegetabilium*, and adding a reference to Oeder (1771: t. 570). Because of the inclusion of the phrase name used by Linnaeus in numerous works including *Species plantarum* (see Richter 1840), it is reasonable to equate var. *latifolia* Vahl with the typical variety of *V. officinalis* (Kirschner 2007), as a taxonomic synonym. It is also supported by the fact that plate 570 from *Flora danica* (Oeder 1771) was seen by Linnaeus and included in *V. officinalis* in his later works. The plate depicts a plant very similar to the epitype of *V. officinalis* (Kirschner 2007; Fig. 2). The second variety is *V. officinalis* var. [γ] *tenuifolia*, published without any reference to other sources, solely on the basis of material seen by Vahl. The complete diagnosis of var. *tenuifolia* is quite concise. The entry in Vahl (1805) (Fig. 3) is closed by general remarks pertaining to the whole species and is therefore also applicable to var. *tenuifolia*. The following protologue characters are relevant from the point of view of the modern understanding of the variation within the *V. officinalis* group: plants 2–4 feet tall; stem glabrous; stem leaves distinctly petiolate; petiole hairy (villous); leaflets linear, very narrow; leaflet margin entire; habitat: marshy groves ("in […] nemoribus paludosis").

Original material and typification of *Valeriana officinalis* var. *tenuifolia*

As stated above, in the protologue of this name, there is no reference to older sources nor any specimen or locality citation. The major part of the herbarium collection of M. Vahl is deposited in Copenhagen (C); the other herbarium with numerous specimens coming from the Vahl herbarium is G, but no relevant specimen was traced there. The keepers of the herbarium C searched the collection for Vahl's material of *Valeriana officinalis* s.lat. and found a single specimen that was studied and annotated by Vahl (Fig. 4). The specimen does not bear any text other than "*Valeriana officinalis* L. S. N. [= Linnaeus, *Systema naturae*] 44.5" on the reverse side of the sheet. However, the plant on the sheet matches the protologue characters of var. *tenuifolia* (see the list above) in every detail; in all likelihood the plant represents the original material for the name, which was also noted by I. Hiitonen on a separate label in 1966. As regards the absence of the epithet *tenuifolia* on the specimen, it should be taken into consideration that Vahl's work was published posthumously. The above specimen is therefore selected as the lectotype of the name. Because of the utmost importance of the ploidy level in the *V. officinalis* group, and in order to avoid future misinterpretations of the name, we also select an epitype with determined chromosome number (diploid); see also the taxonomic discussion below.

Valeriana officinalis var. *tenuifolia* Vahl, Enum. Pl. 2: 6. 1805 ≡ *Valeriana officinalis* subsp. *tenuifolia* (Vahl) Schübl. & G. Martens, Fl. Würtemberg: 25. 1834 ≡ *Valeriana officinalis* f. *tenuifolia* (Vahl) Neuman, Sver. Fl.: 101. 1901 ≡ *Valeriana officinalis* var. *angustifolia* Wahlenb., Fl. Suec. 1: 19. 1824, nom. illeg. (Art. 52.1 and 53.1), see comment below. – **Lectotype (designated here):** "*Valeriana officinalis* L. S. N. 44.5, Hb. Vahlii", without locality, date or collector (C [Fig. 4]). – **Epitype (designated here):** Bohemia centr., distr. Mělník, distr. phytogeogr. 11a. Všetatské Polabí, pagus Všetaty, in fossa ad viam publicam ad compitum viae et ferroviae, c. 1.5 km merid. a pago [50.2657°N, 14.5879°E], 16 Jun 1986, *J. Kirschner K-28 & J. Hašková* (PRA-00011994 [Fig. 5]; isoepitypes: B, BM, PRA-00011995, PRA-00011996, W, WU); chromosome number: 2*n* = 14, det. by J. Kirschner as K-28 in 1987; also from the same population as K-31.

Taxonomic interpretation of the name *Valeriana officinalis* var. *tenuifolia*

The lectotype and epitype (and numerous isoepitypes) belong to our "*pseudopratensis*" form characterized above. We therefore conclude that the correct name for the early flowering meadow diploid with narrow, entire leaflets within *Valeriana officinalis* is var. *tenuifolia* at the rank of variety and *V. officinalis* subsp. *tenuifolia* (Vahl) Schübl. & Mart. at the rank of subspecies. It is a mistake to use the latter name for the tetraploids of drier habitats, correctly to be called *V. stolonifera* subsp. *angustifolia* Soó at the rank of subspecies.

Notes on the epithet *"angustifolia"* in the *Valeriana officinalis* group

It was shown by Holub & Kirschner (1997) and Buttler & al. (2008) that the epithet "*angustifolia*" belongs to the earliest name at the rank of subspecies for what was commonly called *Valeriana collina*, but (due to the dou-

Fig. 4. Lectotype of *Valeriana officinalis* var. *tenuifolia* (C).

Fig. 5. Epitype of *Valeriana officinalis* var. *tenuifolia* (PRA-00011994).

ble threat of homonymy) only outside *V. officinalis* (the basionym, *V. angustifolia* Tausch ex Host 1827, is a later homonym of *V. angustifolia* Mill. 1768, which applies to a taxon of *Centranthus* DC.). Within *V. officinalis*, the epithet cannot be used at the rank of subspecies because of the existence of two earlier, seemingly heterotypic names, usually referred to as *V. officinalis* var. *angustifolia* Hayne (1813) and *V. officinalis* var. *angustifolia* Wahlenb. The latter name was published (Wahlenberg 1824: 19) with a short diagnosis ("β. *angustifolia*, pinnis subintegerrimis"), with a direct reference to variety "γ" in Roemer & Schultes (1817: 351). On the page referred to, we find a variety "γ", but with the epithet *tenuifolia* and a reference to Vahl (1805) and another reference to Dufresne (1811, where var. *tenuifolia* was accepted without any reference). Thus, the name *V. officinalis* var. *angustifolia* Wahlenb., renaming the existing, legitimate *V. officinalis* var. *tenuifolia*, was nomenclaturally superfluous when published and thereby illegitimate (McNeill & al. 2012: Art. 52.1), is homotypic with var. *tenuifolia* (Art. 7.5) and at the same time is illegitimate as a later homonym (Art. 53.1) of *V. officinalis* var. *angustifolia* Hayne. The name published by Hayne (1813: t. 32 and text without pagination) refers to Schrader (1806: 85), where two varieties were recognized but their names were not in a form that could be validly published ("β. foliis angustioribus"). Hayne gave a number of references to various sources, including images, but there is a nice plate of var. *angustifolia* accompanying the description, with all the relevant details and characters, and that is suitable for the role of the lectotype (see below), when no herbarium specimens are extant. As regards the taxonomic interpretation of this name, the lectotype plate leaves no doubt that Hayne's var. *angustifolia* is to be equated with *V. officinalis* s.str.

A note on the name *Valeriana altissima*

Although the *Code* (McNeill & al. 2012) reckons with mistakes in newly published names (e.g. in Art. 41), there are mistakes in names that have nomenclatural consequences. One such mistake is the name *Valeriana altissima* Besser [recognized as a mistake by Koch (1840)]. Pohl (1809) published *V. exaltata* "Mikan jun.", a name introduced but not published by Mikan, and later treated and typified by Kirschner & al. (2007, equated with *V. officinalis* s.str.). Roemer & Schultes (1817: 351) published a note under *V. officinalis*: "α pro specie habetur, (*V. altissima* Mikan vide Pohl tent. fl. boëm. p. 41. […])" meaning that variety "α" (i.e. var. *excelsa* (Poir.) Roem. & Schult.) is treated as a separate species, *V. altissima*, by other authors. They therefore did not validly publish the name *V. altissima* because they did not accept it in their treatment (Art. 36.1(a)).

It was Besser (1821), in his enumeration of plants of Volyn, who validly published the name *Valeriana altissima* "Mikan". The ascribed authorship is here understood as an indirect reference, via "*V. altissima*" in Roemer & Schultes (1817), to *V. exaltata* J. C. Mikan ex Pohl (1809), who in fact published *V. exaltata* and *V. sambucifolia*, not *V. altissima*. Because of the indirect form of the references to both Roemer & Schultes (1817) and Pohl (1809), *V. altissima* Besser can only doubtfully be considered as a superfluous, illegitimate substitution of *V. exaltata*. Moreover, there is a *V. altissima* Hornem. (Hornemann 1815), a name published on the basis of plants cultivated in the Copenhagen Royal Gardens, with a diagnosis different from (though similar to) those of *V. altissima* Besser and *V. exaltata*, i.e. a name with independent typification. The name *V. altissima* was later used at the rank of variety, as *V. officinalis* var. *altissima* ("Mikan") W. D. J. Koch, synonymous but doubtfully homotypic with the earlier *V. officinalis* var. *exaltata* (J. C. Mikan ex Pohl) Kostel. The nomenclature of *V. exaltata* and *V. altissima* is summarized below.

Note. — There is a presumably authentic specimen of *Valeriana exaltata* (BM 1134437) sent by J. C. Mikan to J. J. Roemer and acquired by R. J. Shuttleworth. The transcribed label repeats the diagnosis from Pohl (1809), and it is difficult to decide if Mikan collected and sent the material in the period between 1804 (when the name was first introduced) and 1809, or between 1809 and 1819 (when Roemer died), which is more probable.

Selected synonyms of *Valeriana officinalis* var. *officinalis*

As a summary, we list the main synonyms of *Valeriana officinalis* var. *officinalis*. It should be noted that only the epitype of *V. officinalis* is identical with the neotype of *V. exaltata*, so that the two names are not homotypic (Kirschner & al. 2007).

Valeriana officinalis L., Sp. Pl. 1: 31. 1753 var. *officinalis*. – Lectotype (designated by Kirschner 2007): Herb. Burser VIII: 100 (UPS). – Epitype (designated by Kirschner 2007): Czech Republic, S Bohemia, Písek, along railway between Ražice and Heřmaň, 49°14'31"N, 14°07'30"E, 380 m, 16 Aug 2006, *J. Kirschner & M. Soukup 1608* (PRA-00000072 [Fig. 2]; isoepitype: BM); see also Kirschner & al. (2007: 352).

= *Valeriana officinalis* var. *latifolia* Vahl, Enum. Pl. 2: 6. 1805. – Original material: Oeder, Fl. Dan. 4(10): t. 570. 1771.

= *Valeriana exaltata* J. C. Mikan ex Pohl, Tent. Fl. Bohem. 1: 41. 1809 ≡ *Valeriana officinalis* var. *exaltata* (J. C. Mikan ex Pohl) Kostel., Clav. Anal. Fl. Bohem.: 9. 1824 ≡ *Valeriana palustris* Kreyer in Bot. Mater. Gerb. Glavn. Bot. Sada R.S.F.S.R. 5: 192. 1924, nom. illeg. (Art. 52.1, *V. exaltata* included). – Neotype (designated by Kirschner & al. 2007: 353, q.v.): Czech Republic, S Bohemia, Písek, along railway between Ražice and Heřmaň, 49°14'31"N, 14°07'30"E, 380 m, 16 Aug 2006, *J. Kirschner & M. Soukup 1608* (PRA-00000072 [Fig. 2]; isoneotype: BM).

= *Valeriana officinalis* var. *angustifolia* Hayne, Getreue Darstell. Gew. 3: t. 32. 1813. – **Lectotype (designated here):** [icon] "*Valeriana officinalis*" in Hayne, Getreue Darstell. Gew. 3: t. 32. 1813.

= *Valeriana altissima* Besser, Enum. Pl.: 4. 1821, nom. illeg. (Art. 53.1) [non Hornem., Hort. Bot. Hafn. 2: 950. 1815] ≡ *Valeriana officinalis* var. *altissima* W. D. J. Koch, Syn. Fl. Germ. Helv. 1: 337. 1836. – Original material: in protologue "Ad Hypanim in sylvis", no material was traced at KW and the only reference is that to Mikan.

= *Valeriana multiceps* Wallr. in Linnaea 14: 539. 1840. – Lectotype (designated by Skočdopolová & Chrtek 2008: 35): "*Valeriana multiceps* m., var. *dentata*", Kohnstein [a hill NW of Nordhausen], Aug., [*Wallroth*] (PR 10121).

Representative herbarium specimens studied

Specimens listed in Table 2 are not included.
Austria: Moosbrunn [Niederösterreich, Wien-Umgebung, Wien, 48.0156461°N, 16.4732775°E], s.d., *Heimerl*, Flora Exsiccata Austro-Hungarica 3444, as *Valeriana officinalis* (PRC, W, WU). — Czech Republic: Bohemia: [Mělník] Čečelické černavy [Čečelice fens, 50.2944406°N, 14.6083361°E], 1939, *Jirásek* (PRC); Ovčáry [50.2463442°N, 14.6164056°E], 1939, *Dostál & Jirásek* (PRC); [Nymburk] Kostomlaty [Kostomlaty nad Labem, 50.1820461°N, 14.9533139E], 1947, *Kaufmann* (PRC); Velenka [50.1515325°N, 14.9037897°E], 1904, *Domin* (PRC); [Mladá Boleslav] Pěčice, bažantnice [pheasantry, 50.3521872°N, 15.0157375°E], 1911, *Wilhelm* (PRC); Pardubice, stráň u Opočínku, lužní les [alluvial woodland, 50.0398358°N, 15.6452306°E], 220 m, 2000, *Šotolová* (OL). — Czech Republic: Moravia: [Moravský Beroun] Bärn, Wiesen bei Andersdorf [Ondřejov, 49.9112594°N, 17.2878853°E], Jun 1933, *Otruba* (PRC); Olomouc, rašelinné louky u Hlušovic [Hlušovice, fen meadows, 49.6341636°N, 17.2732853°E], 1943, *Otruba* (OLM, PRC); Olšiny u Černovíra [49.6207767°N, 17.2708611°E], 1933, *Otruba* (PRC); Olomouc, Černovírský les, rašelinné louky [49.6207767°N, 17.2708611°E], 1962, *Hlůza* (OLM); [Olomouc, Řepčín] Řepčínská louka [49.6120061°N, 17.2350867°E], 1956, *Šula* (OLM); [Olomouc] Slavonín – Kyselov [49.5663431°N, 17.2319222°E], 1904, *Čoka* (BRNU); [Prostějov] Bedihošť [49.4458075°N, 17.1707444°E], 1886, *Spitzner* (BRNU); [Prostějov, Vrbátky] Wrbatek [49.5074025°N, 17.2088753°E], 1905, 1907, *Laus* (BRNM); Kojetín, 2 km SE [49.3460894°N, 17.3288558°E], 1973, *Deyl* (OLM); Kojetín, násep trati na Přerov [railroad towards Přerov, 49.3496681°N, 17.3202728°E], 200 m, 1983, *Trávníček* (OL); [Brno-Černovice] Rajský les u Černovic [Černovický les Nature Reserve, 49.1655156°N, 16.6443897°E], 1914, *Bílý* (BRNM); [Moravský Písek] prope Písek [48.9875011°N, 17.3485861°E], 1942, *Podpěra* (BRNU); [Velká nad Veličkou] Weliká [48.8944339°N, 17.5156683°E], 1914, *Béňa* (BRNU); [Hodonín] Milotice [48.9613442°N, 17.1471483°E], 1921, *Picbauer* (BRNU); [Mikulov, Nové Mlýny] Neumühl an der Thaya [48.8552333°N, 16.7264097°E], 1897, *Schierl* (BRNM); Břeclav – Lednice [48.7807036°N, 16.8429247°E], 161 m, 1983, *Hermann* (BRNU); [Velké Bílovice] Podivín: Hradištěk prope Bilovice [48.8464653°N, 16.8990581°E], 1921, *Podpěra* (BRNU); [Břeclav] Břeclava, prope Kostice [48.7428033°N, 16.9861944°E], s.d., *Podpěra* (BRNU). — Estonia: Pölva, Kanepi, Pühajöe, 1961, *Pihlapuu* (TU309436, TU309481); [Tartu] Ulila [58.3632403°N, 26.4355406°E], 1963, *Pullisaar* (TU). — Sweden: Sm. [Småland], Oskarshamn, 24 Jul 1908, *Köhler* (W); ibid., 14 Jul 1914 (PRC).

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References

Besser W. S. J. G. 1821: Enumeratio plantarum per Volhyniam et Podoliam hucusque observatarum. – Wilna: J. Zawadski.

Bressler S., Klatte-Asselmeyer V., Fischer A., Paule J. & Dobeš C. 2017: Variation in genome size in the *Valeriana officinalis* complex resulting from multiple chromosomal evolutionary processes. – Preslia **89:** 41–61.

Buttler K. P., Hand R. & Kirschner J. 2008: 7. *Valeriana-officinalis*-Gruppe. – In: Beiträge zur Fortschreibung der Florenliste Deutschlands (*Pteridophyta, Spermatophyta*) – Zweite Folge. – Kochia **3:** 82–86.

Chater A. O. & Brummitt R. K. 1966: Subspecies in the works of Friedrich Ehrhart. – Taxon **15:** 95–106.

Dray S. & Dufour A. 2007: The ade4 package: implementing the duality diagram for ecologists. – J. Stat. Softw. **22:** 1–20.

Dufresne P. 1811: Histoire naturelle et médicinale de la famille des *Valerianées* […]. – Montpellier: Jean Martel.

Ehrhart F. 1783: Fortsetzung des Versuches eines Verzeichnisses der um Hannover wild wachsenden Pflanzen. – Hannover. Mag. **20:** [columns] 361–364.

Fischer M. A., Oswald K. & Adler W. 2008: Exkursionsflora für Österreich, Liechtenstein und Südtirol. Ed. 3. – Linz: Land Oberösterreich, Biologiezentrum der Oberösterr. Landesmuseen.

Hayne F. G. 1813: Getreue Darstellung und Beschreibung der in der Arzneykunde gebräuchlichen Gewächse, wie auch solcher, welche mit ihnen Verwechselt werden können **3.** – Berlin: auf Kosten des Verfassers.

Hidalgo O. & Vallès J. 2012: First record of a natural hexaploid population for *Valeriana officinalis*: genome size is confirmed to be a suitable indicator of ploidy level in the species. – Caryologia **65:** 243–245.

Holub J. 1983: Some neglected subspecies names from Schübler and Martens, Flora von Württemberg (1834). – Folia Geobot. Phytotax. **18:** 325–328.

Holub J. & Kirschner J. 1997: *Valerianaceae* Batsch – kozlíkovité. – In: Slavík B. (ed.), Květena České republiky [Flora of the Czech Republic] **5:** 510–527. – Praha: Academia.

Hornemann J. W. 1815: Hortus regius botanicus Hafniensis […] **2.** – Hauniae: typis E. A. H. Mölleri.

Kirschner J. 2002: *Valerianaceae* Batsch – kozlíkovité. – Pp. 491–495 in: Kubát K., Hrouda L., Chrtek J. jun., Kaplan Z., Kirschner J. & Štěpánek J. (ed.), Klíč ke květeně České republiky [Key to the flora of the Czech Republic]. – Praha: Academia.

Kirschner J. 2007: *Valeriana officinalis* Linnaeus. – P. 913 in: Jarvis C., Order out of chaos. Linnaean plant names and their types. – London: Linnean Society of London & Natural History Museum London.

Kirschner J., Kirschnerová L. & Štěpánek J. 2007: Generally accepted plant names based on material from the Czech Republic and published in 1753–1820. – Preslia **79:** 323–365.

Kirschner J. & Raab Straube E. von 2017+ [continuously updated]: *Valeriana officinalis* aggr. – In: Raab Straube E. von & Henning T. (ed.), *Valerianaceae*. Euro+Med PlantBase – the information resource for Euro-Mediterranean plant diversity. – Published at http://ww2.bgbm.org/EuroPlusMed/ [accessed 9 Oct 2017].

Koch [W. D. J.] 1840: Zusätze und Verbesserungen zu meiner Synopsis florae germanicae et helveticae. – Flora **23:** 353–363.

Maillefer A. 1946: Etude du *Valeriana officinalis* L. et des espèces affines. – Mém. Soc. Vaud. Sci. Nat. **8:** 277–340.

McNeill J., Barrie F. R., Buck W. R., Demoulin V., Greuter W., Hawksworth D. L., Herendeen P. S., Knapp S., Marhold K., Prado J., Prud'homme van Reine W. F., Smith G. F., Wiersema J. H. & Turland N. J. 2012: International Code of Nomenclature for algae, fungi, and plants (Melbourne Code) adopted by the Eighteenth International Botanical Congress Melbourne, Australia, July 2011. – Königstein: Koeltz Scientific Books. – Regnum Veg. **154.**

Oeder G. C. 1771: Flora danica **4(10).** – Kopenhagen: Martin Hallager.

Pleijel C. 1925: Skandinaviens samkönade *Valeriana*-former. – Acta Horti Berg. **8:** 71–87.

Pohl J. E. 1809: Tentamen florae bohemicae **1.** – Prag: Gottlieb Haase.

R Core Team 2016: R: A language and environment for statistical computing. – Published at https://www.r-project.org/ [accessed 15 Feb 2017].

Richter H. E. 1840: Caroli Linnaei systema, genera et species plantarum uno volumine. Codex botanicus Linnaeanus. – Lipsiae: O. Wigand.

Roemer J. J. & Schultes J. A. 1817: Caroli a Linné equitis systema vegetabilium […]. Vol. **1.** – Stuttgardtiae: sumtibus J. G. Cottae.

Rouy G. 1903: Flore de France **8.** – La Rochelle: Société des Sciences naturelles de la Charente-Inferieure.

Schübler G. & Martens G. 1834: Flora von Würtemberg. – Tübingen: C. F. Osiander.

Schrader H. A. 1806: Flora germanica **1.** – Gottingae: apud Henricum Dieterich.

Sebald O. 1977: Der Arznei-Baldrian (*Valeriana officinalis* agg.) in Württemberg. – Jahresh. Ges. Naturk. Württemberg **132:** 152–168.

Sebald O. 1996: *Valeriana officinalis* s.lat. – Pp. 24–33 in Sebald O., Seybold S., Philipp G. & Wörz A., Die Farn- und Blütenpflanzen Baden-Württembergs **6.** – Stuttgart: Eugen Ulmer.

Skalińska M. 1947: Polyploidy in *Valeriana officinalis* Linn. in relation to its ecology and distribution. – Bot. J. Linn. Soc. **53:** 159–186.

Skočdopolová B. & Chrtek J. [sen.] 2008: Wallroth's collection of vascular plants in the herbarium of the National Museum, Prague. – Sborn. Nár. Muz. Praze, Řada B, Přír. Vědy **64:** 5–37.

Štěpánek J., Kirschner J., Jarolímová V. & Kirschnerová L. 2011: *Taraxacum nigricans, T. alpestre* and allies in the *Taraxacum* sect. *Alpestria*: taxonomy, geography and conservation status. – Preslia **83:** 537–564.

Thiers B. 2017+ [continuously updated]: Index Herbariorum. A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. – Published at http://sweetgum.nybg.org/science/ih/ [accessed 9 Oct 2017].

Tison J.-M. & Foucault B. de (ed.) 2014: Flora gallica. Flore de France. – Mèze: Biotope Éditions.

Titz E. 1984: Die Arzneibaldriane Deutschlands mit besonderer Berücksichtigung Bayerns. – Ber. Bayer. Bot. Ges. **55:** 25–48.

Titz E. & Titz W. 1981: Die diploiden und tetraploiden Arznei-Baldriane der Schweiz und angrenzender Regionen (*Valerianaceae*). – Bot. Helvet. **91:** 169–188.

Titz W. 1969: Beitrag zur Kenntnis der österreichischen Sippen des *Valeriana officinalis*-Aggregats und ihrer Chromosomenzahlen. – Österr. Bot. Z. **116:** 172–180.

Titz W. & Titz E. 1982: Analyse der Formenmannigfaltigkeit der *Valeriana officinalis*-Gruppe im zentralen und südlichen Europa. – Ber. Deutsch. Bot. Ges. **95:** 155–164.

Vahl M. 1805: Enumeratio plantarum vel ab aliis, vel ab ipso observatum […] **2.** – Hauniae & Lipsiae: apud J. H. Shubothe.

Vázquez Pardo F. M., Devesa J. A. & López Martínez J. 2007: *Valeriana* L. – Pp. 205–223 in: Devesa J. A., Gonzalo R. & Herrero A. (ed.), Flora iberica **XV.** *Rubiaceae-Dipsacaceae*. – Madrid: Consejo Superior de Investigaciones Científicas.

Ворошилов В. [Voroshilov V.] 1959: Лекарственная валериана [Lekarstvennaya *Valeriana*]. – Москва: Изд-во Академии наук СССР [Moscow: Publishing house of Soviet Academy of Sciences].

Wahlenberg G. 1824: Flora suecica […] **1.** – Upsaliae: Palmblad & C.

Walther E. 1949: Zur Morphologie und Systematik des Arzneibaldrians in Mitteleuropa. – Mitt. Thüring. Bot. Ges., Append. **1:** 1–108.

Wibel A. W. E. C. 1799: Primitiae florae werthemensis. – Ienae: sumtibus Goepferdti.

Wisskirchen H. & Haeupler H. 1998: Standardliste der Farn- und Blütenpflanzen Deutschlands. – Stuttgart: Bundesamt für Naturschutz & Eugen Ulmer.

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