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## *Salix appendiculata* (*Salicaceae*) found in the Western Carpathians in Slovakia

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**Abstract.** During field research in 2017, two localities of *Salix appendiculata* were discovered in the Veľká Fatra Mts (central Slovakia, Western Carpathians). This species is not reported from the Western Carpathians in the recent floras and keys to the flora. The nearest localities of *S. appendiculata* are known in Austria. Its hybrid, *S. ×attenuata*, was recorded in the Veľká Fatra Mts as well.

**Keywords:** avalanche path, flora, Inner Western Carpathians, *Salix appendiculata*, *Salix ×attenuata*, Slovakia, Veľká Fatra Mts

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**Реферат.** Під час польових досліджень, проведених у 2017 р., було виявлено два локалітети *Salix appendiculata* у гірському масиві Велика Фатра (центральна Словаччина, Західні Карпати). Повідомлення про знахідку цього виду в Західних Карпатах у нещодавно опублікованих флорах і визначниках не наводились. Найближчі до цих локалітетів знахідки *S. appendiculata* відомі з Австрії. Гібрид цього виду, *S. ×attenuata*, також відмічений на території масиву Велика Фатра.

**Ключові слова:** Велика Фатра, Внутрішні Західні Карпати, лавинний шлях, *Salix appendiculata*, *Salix ×attenuata*, Словаччина, флора

### Introduction

*Salix appendiculata* Vill. is an European willow species distributed mainly in the Alps and adjacent mountain ranges located to the north – in the Jura Mountains, in the Black Forest [Schwarzwald] (Heß et al., 1967; Lautenschlager-Fleury, Lautenschlager, 1994; Jordan, Tison, 2014) as well as in the Bohemian Forest [Šumava/Böhmerwald] (Chmelař, Koblížek, 1990; Ekrt, Koutecký, 2013). Other parts of the species range (cf. Jalas, Suominen, 1976, map 232) are (1) the Balkan Peninsula with the scattered distribution from the Dinarides to the Rhodopes (Domac, 1950, 1989; Velchev, 1966; Christensen, 1997; Kailis, Flora Croatica Database, 2004–onward; Eleftheriadou, 2013), (2) the Apennines (Pignatti, 1982), and, questionably, (3) the Massif Central and the Pyrenees (Blanco, 1993;

Jordan, Tison, 2014). Kailis and Eleftheriadou (2013) summarized newer thoughts on reliability of some data on the distribution of this willow species.

*Salix appendiculata* is not listed in the *Flora of Slovakia* (Koblížek, 2006). There are also no available records of the species from Slovakia in the last edition of the key to united flora of Bohemia, Moravia, SW and S Upper Silesia, and Slovakia (Dostál, 1991) and in the *Flora of Czech Republic* (Chmelař, Koblížek, 1990). Heß et al. (1967) included the "Carpathians" in the distribution area of the species, though with a question mark. In the new monograph *Willows of the Czech Republic* (Vašut et al., 2013) it is stated that "... data from the Carpathians are apparently erroneous"; however, no further details on the assessed sources were given.

The aim of this contribution is to present records of *Salix appendiculata* and *S. ×attenuata* from the Veľká

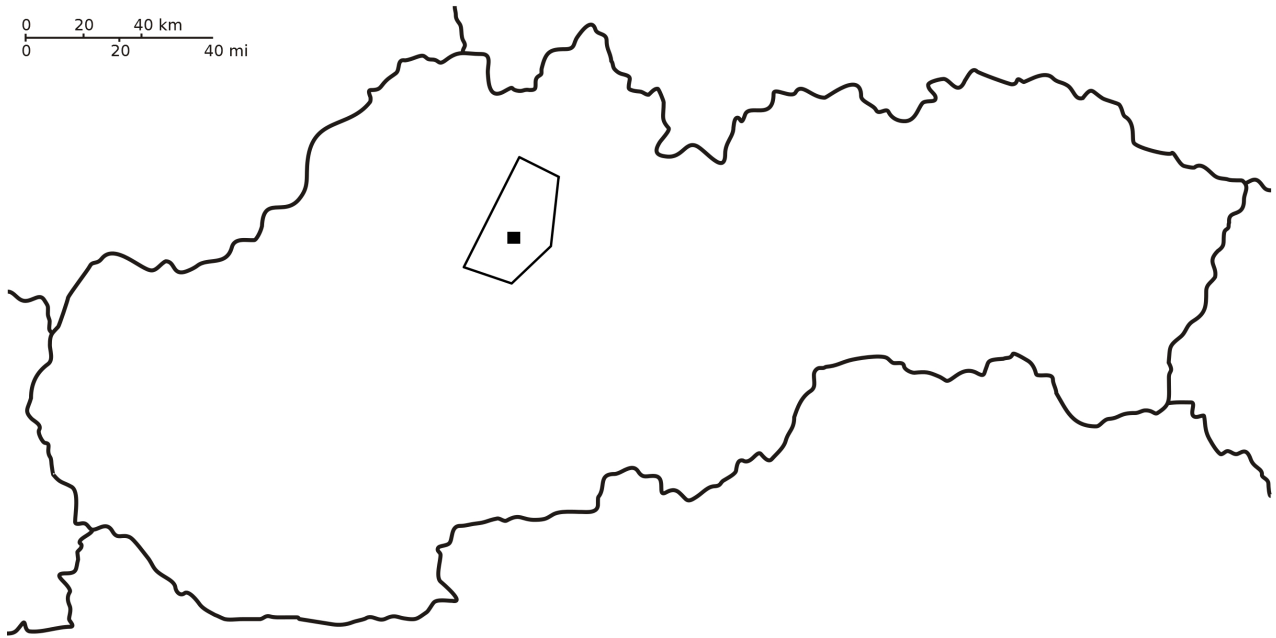


Fig. 1. Location of the locality of *Salix appendiculata* in Slovakia: polygon – Veľká Fatra Mts, black square – Borišov Mt.

Fatra Mts (central Slovakia, Western Carpathians). Plant names follow the checklist of Marhold et al. (1998), *Salix* names not mentioned in this checklist are given according to *The International Plant Names Index* (<http://www.ipni.org/>, accessed 3 November 2017) and some other sources (such as *Plants of the World Online*, <http://www.plantsoftheworldonline.org/>, accessed 13 February 2019). The morphological description mainly follows the format and terminology of Dostál and Futák (1966). Herbarium specimens are deposited in BBZ – reference herbarium of the Botanical Garden of Comenius University, workplace Blatnica (cf. Vozárová, Sutorý, 2001).

#### Locality and habitat of *Salix appendiculata* in the Veľká Fatra Mts

In August 2017, during a field research in the Veľká Fatra Mts (central Slovakia, Fig. 1) I found one shrub of *Salix appendiculata* (a polycormon). This locality (hereinafter referred to as "L1": N 48°56.796', E 19°5.362', ± 11 m, 1,155 m a.s.l., 02.08.2017) is situated in the steep dell with the local name "Prvý Balov" on the northern slope of Borišov Mt. (1,509 m a.s.l.), an isolated mount in the central part of the mountain range, built by carbonate sedimentary formations of the Veporicum unit and the Tatricum unit (Polák et al., 1997).

The second locality of the species I have registered during another field survey in a spatially close site on the same slope of Borišov Mt. within the another dell called "Druhý Balov" (hereinafter referred to as "L2": near coordinates N 48°56.794', E 19°5.162', ± 6 m, ca. 1,125 m a.s.l., 04.10.2017; approx. 250 m apart from L1; Fig. 2): two polycormons were growing there.

The species is not mentioned in the comprehensive flora of the Veľká Fatra Mts (Kliment et al., 2008). The closest known localities of *S. appendiculata* lie approximately 250 km to southwest in Austria, southwestwards from Vienna in the most northeastern ridges of the Alps (e.g., Schneeberg Mt., 08.07.2018, P. Kučera, BBZ).

Site L1 is in the side and site L2 in the bottom of narrow and steep avalanche paths facing to the north, with steep slopes, in the case of L2 with formation of small waterfalls. Surrounding forest vegetation is a montane fir-beech forest, higher on the slopes with transition to old secondary Norway spruce (*Picea abies* (L.) H. Karst.) stands.

Vegetation of the first *Salix appendiculata* locality (L1) is shaped by treeless tall-herb vegetation (frequent avalanches) dominated by *Petasites kablikianus* Tausch which is accompanied by *P. albus* Gaertn., *Dryopteris filix-mas* (L.) Schott, *Athyrium filix-femina* (L.) Roth, *Delphinium elatum* L., *Valeriana excelsa* Poir. subsp.

*sambucifolia* (J.C.Mikan ex Pohl) Holub, *Urtica dioica* L., *Impatiens noli-tangere* L. In the lower herb layer are growing *Dentaria bulbifera* L. (= *Cardamine bulbifera* (L.) Crantz), *Cortusa matthioli* L. (= *Primula matthioli* (L.) V.A.Richt.), *Stellaria nemorum* L., *Primula elatior* (L.) Hill, *Geum rivale* L., and *Chrysosplenium alternifolium* L. Woody species are represented by *Acer pseudoplatanus* L., *Ribes petraeum* Wulfen, *R. alpinum* L., and *Rosa pendulina* L.

The second locality (L2) has a more rugged relief with abundant shrubs and mostly small young trees (*Fraxinus excelsior* L., *Sorbus aucuparia* L., *S. aria* (L.) Crantz (= *Aria edulis* (Willd.) M.Roem.), *S. austriaca* (Beck) Prain (= *Hedlundia austriaca* (Beck) Sennikov & Kurtto) aggr., *Fagus sylvatica* L., *Salix caprea* L., *Acer pseudoplatanus* L., *Ulmus glabra* Huds., *Daphne mezereum* L.) and also more diversified vegetation and flora. Beside the above-mentioned species, the following taxa were found: *Anthriscus nitida* (Wahlenb.) Hazsl., *Lunaria rediviva* L., *Polystichum aculeatum* (L.) Roth, *Gymnocarpium robertianum* (Hoffm.) Newman, *Cirsium erisithales* Scop., *Rubus idaeus* L., *Valeriana tripteris* L., *Filipendula ulmaria* (L.) Maxim., *Galium schultesii* Vest, *Myosotis* sp. and others (02.08.2017, 04.10.2017, 04.07.2018). Both sites have a developed ground layer flora; however, moss and liverwort species were not sampled.

#### **Morphological description of *S. appendiculata* occurring in the Veľká Fatra Mts**

Selected morphological characters of the collected *S. appendiculata* specimens (deposited in BBZ) from the given sites L1 and L2:

- shrubs up to 5 m tall, branches brown-greyish, decorticated wood without elevated ridges,
- buds and one-year twigs pubescent, only very long terminal twigs somewhat glabrescent (basal half), older twigs glabrescent,
- leaves elongate to elliptic, widest in or near the middle, base cuneate to attenuate, apex cuneate to attenuate, often acuminate on long terminal twigs, leaf margin serrate,
- normally developed leaf blades (8.5) 9.5–12.5 (15) cm long, 3.5–4.5 (5) cm wide, more or less glabrescent above (primary vein pubescent until the leaf fall) and dark green, permanently pubescent beneath (densely on veins) and slightly bluish,
- petiole 10–15 (19) mm long, pubescent,
- leaf veins markedly impressed above and prominent beneath, number of secondary veins of half-blade more

than (15) 17 (–25) (cf. Chmelař, Koblížek, 1990; Jordan, Tison, 2014),

– stipules well developed, especially on long terminal shoots large, shape irregular, margins coarsely dentate, caducous on short twigs, especially deeper in the shrub crown [similarly to those of *S. caprea*].

Occurrence of *S. caprea* at the second locality (L2) makes recognition and differentiation of *S. appendiculata* on the locality much easier (*S. caprea* having wide elliptic, shorter, brighter leaves, with smaller number of secondary veins, apex and base  $\pm$  obtuse). Another remarkable attribute is a different phenological development of the two species: while *S. appendiculata* was here until the date 04.10.2017 still with dark green leaves, brighter green colour of *S. caprea* leaves was already longer fading away as the species was closer before leaf fall.

*Salix appendiculata* descriptions from the Czech Republic (Chmelař, Koblížek, 1990; Vašut et al., 2013) and Austria (Fischer et al., 2008) specify the occurrence of weakly developed elevated ridges on the decorticated wood of twigs. However, this is not the case of other surveys where the decorticated wood is described as flat, without ridges (Heß et al., 1967; Lautenschlager-Fleury, Lautenschlager, 1994; Jordan, Tison, 2014). I suppose that individuals with ridges from the Czech Republic are hybrids/hybridogeneous specimens of *S. appendiculata* (without ridges) and *S. aurita* (with ridges).

#### **Hybrid of *S. appendiculata* in the Veľká Fatra**

Near the second locality (L2) of *S. appendiculata* in the Veľká Fatra, two (tree-formed) shrubs of *S. appendiculata*  $\times$  *S. caprea* (= *S.  $\times$  attenuata* Kern.; syn. *S.  $\times$  macrophylla* Kern., nom. illeg.; Kerner, 1860) are growing. The second of the two individuals (its location – L3: N 48°56.811', E 19°5.179',  $\pm$  12 m, 1,110 m a.s.l., 04.10.2017) developed several treelike stems: due to unstable background the oldest stem is spread above the soil surface of the steep slope and the newest one is entirely upright.

A remarkable feature of this hybrid is its distinct leaf morphology: while the fast-growing long terminal twigs have leaves similar in their shape to those of *S. appendiculata*, leaf margins more coarsely serrate, leaves of the short twigs are, especially in the lower half of the crown, morphologically close to those of *S. caprea*. Leaf colour and the autumn phenology are more similar to those of *S. caprea*.



Fig. 2. Leaves of *Salix appendiculata*. Photo by P. Kučera, 04.10.2017



Fig. 3. Growth form of *Salix appendiculata*. Photo by P. Kučera, 04.10.2017

*Salix* × *attenuata* was identified also on the other two localities of Borišov slopes (L4: N 48°56.493', E 19°5.807', ± 6 m, 1,260 m a.s.l., 04.10.2017, P. Kučera, BBZ; L5: N 48°56.482', E 19°5.840', ± 6 m, 1,265 m a.s.l., 04.10.2017, P. Kučera, not.). Occurrence of *S.* × *attenuata* will be surely discovered on other localities throughout the mountain range of the Veľká Fatra Mts; however, great effort should be put on a reliable identification and differentiation of *S. caprea* from *S.* × *attenuata* as variability of the latter is high due to its long-term hybridization.

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