Two new hybrids of *Epilobium ciliatum* (*Onagraceae*)

Dvě nové hybridní kombinace *Epilobium ciliatum* (*Onagraceae*)

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Dedicated to František Procházka on the occasion of his 60th birthday

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Krahulec F. (1999): Two new hybrids of *Epilobium ciliatum* (*Onagraceae*). – Preslia, Praha, 71: 241–248.

Hybrids of *Epilobium ciliatum* Rafin. with *E. alpestre* (Jacq.) Krocker (*E.* ×*prochazkae*) and with *E. alsinifolium* Vill. (*E.* ×*josefi-holubii*) are described from the Krkonoše Mts. It is highly probable that *E. ciliatum* hybrids will be more common in alpine areas in future, because this species has become a regular component of the ruderal flora even in area above the timberline. Hybrids between *E. anagallidifolium* Lam. and *E. palustre* L. (*E.* ×*dasycarpum* Fries) as well as *E. alpestre* and *E. collinum* C. C. Gmelin (*E.* ×*hectori-leveilleanum* Thell.) are reported for the first time from this area of the Czech Republic.

K e y w o r d s : *Epilobium*, hybrids, Czech Republic

Introduction

One of the characteristic features of the genus *Epilobium* (considered here in a narrower sense, excl. *Chamerion*) is the common formation of hybrids. Species belonging to different sections hybridize freely, and hybridization is common between species occurring on different continents (e.g. Raven & Raven 1976, Smejkal 1995b). Hybrids are usually intermediate and highly sterile, but not completely. Hybrids resulting from crossing of almost all combinations of *Epilobium* species have already been described, and most of these occur within the Czech Republic (Smejkal 1995a). Undescribed hybrids are those of native species with introduced ones. One example of a common, adventive species is *Epilobium ciliatum* Rafin. This native North American species has now spread throughout central Europe, hybridizing with native *Epilobium* species. Most of these hybrids have already been described (cf. Smejkal 1974, 1995b). However, hybrids between *E. ciliatum* and native European alpine Epilobiums have not yet been described

During field work in the Krkonoše Mts I have collected several willowherb hybrids, two of which were identified as *E. ciliatum* hybrids and two others are recorded here for the first time in the Czech Republic.

Epilobium ×*josefi-holubii* Krahulec, nothospecies nova

E. alsinifolium Vill. × *E. ciliatum* Rafin. (Fig. 1)

Descriptio: Plantae morphologia inter parentes intermedia, humiles, 10–24 cm altae, infra glabrae; caules ad basin 2–3 mm in diametro, lineis duabus prominentibus subangulati, ad basin abundante ramosi ramis

horizontaliter plagiotropicis (= procumbentibus) apicibus ascendentibus floriferisque; innovationes subterraneae absunt; inflorescentia strigulosa pilis glandulosis raris usque densis obducta, ante anthesin nutans, floribus numero 5–12; folia inferiora late lanceolata, dense et minute denticulata, 4.5–5.5 cm longa, 1.0–1.5 cm lata, petiolis 2–3 mm longis; folia superiora serrulata, glabra, pagina superiori non nitente; petalae 4–5 mm longae, dilute purpureae (obscure malvaceae); alabastra pubescentia et rarissime glandulosa; capsulae 4.5–5.0 cm longae, dense pubescentes glandulosaeque; semina 1.0–1.2 mm longa, papillosa.

Holotypus: Krkonoše Mts, Strážné: Zadní Rennerovky settlement, edge of the spring in the centre of the meadow complex near the Grohmanova bouda chalet, alt. 1240 m. Coll. F. Krahulec, 24. 8. 1997. PR No. 11 487.

Etymologia: This hybrid is named in honour of late Josef Holub (1930–1999) who has contributed substantially to the knowledge of *Epilobium ciliatum* in Central Europe.

Comparison of both parents and their hybrid is given in Table 1. The reddish colour and leaf shape is characteristic of *E. ciliatum*, and the plant size and nodding inflorescence of *E. alsinifolium*. The dense branching at the base visible on most of plants has no parallel at any of the parents.

Epilobium ×prochazkae Krahulec, nothospecies nova

E. alpestre (Jacq.) Krocker × *E. ciliatum* Rafin.

Descriptio: Plantae characteribus morphologicis inter parentes intermediae. Caules recti, 70–120 cm alti, robusti, superne ramosi et glanduloso pubescentes, ad basin glabri vel biseriatim usque tetraseriatim non dense puberuli; inflorescentia ramosa, dense pubescens patensque rare glanduligera, ante anthesin nutans, multiflora; folia basalia verticillata, elongate lanceolata, 7–8 cm longa et 1–2 cm lata, ad basin rotundata, serrulata, dentibus numero 25–35 utrinque, glabra vel nervis rarissime pubescentibus, petiolis 2 mm longis; folia superiora alterna usque opposita, gradatim decrescentia; flores magni petalis 5.5–7.0 mm longis, dilute purpureis, alabastro dense pubescente et disperse glanduloso; capsulae 3–4.5 cm. longae et 1.0–1.5 mm latae; semina plerumque sterilia, ea bene adulta 1.2 mm longa.

Holotypus: The Krkonoše Mts, eastern slope of Mt Liščí hora, along a hiking path above the mountain chalet Lyžařská bouda. PR No. 11 488.

Etymologia: Plant is named in honour of František Procházka, who long studied the flora of the Krkonoše Mts and has strongly influenced my interests in plants.

This hybrid is characterized by verticillate leaves resembling *E. ciliatum*, reddish colour of the whole plant, and flowers of a size intermediate to each parent. Comparison of both parents and their hybrid is given in Table 2.

Epilobium ×prochazkae was found on the edge of ruderalized springs along a hiking path, together with both parents. Both hybrids (*E. ×prochazkae* and *E. ×josefi-holubii*) were also found at another locality, a complex of springs, banks of small brooks and ruderal sites in the close vicinity of the mountain chalet Grohmanova bouda in the settlement of Zadní Rennerovky, at the altitude of approximately 1250 m. This locality is situated in the centre of the meadow complex within the forest belt, close to the tree line. For this reason all alpine species found here occur together with different species ascending from lower altitudes. The following *Epilobium* species occur there: *E. alpestre* (Jacq.) Krocker, *E. alsinifolium* Vill., *E. anagallidifolium* Lam., *E. ciliatum* Rafin., *E. montanum* L., *E. nutans* F. W. Schmidt, *E. obscurum* Schreber, *E. palustre* L. In addition the following hybrids were also found here: *E. ×dasycarpum* Fries (*E. anagallidifolium* × *E. palustre*, Fig. 2), *E. ×fossicola* Smejkal (*E. ciliatum* × *E. palustre*), *E. ×haynaldianum*

Fig. 1. – *Epilobium* ×*josefi-holubii*.

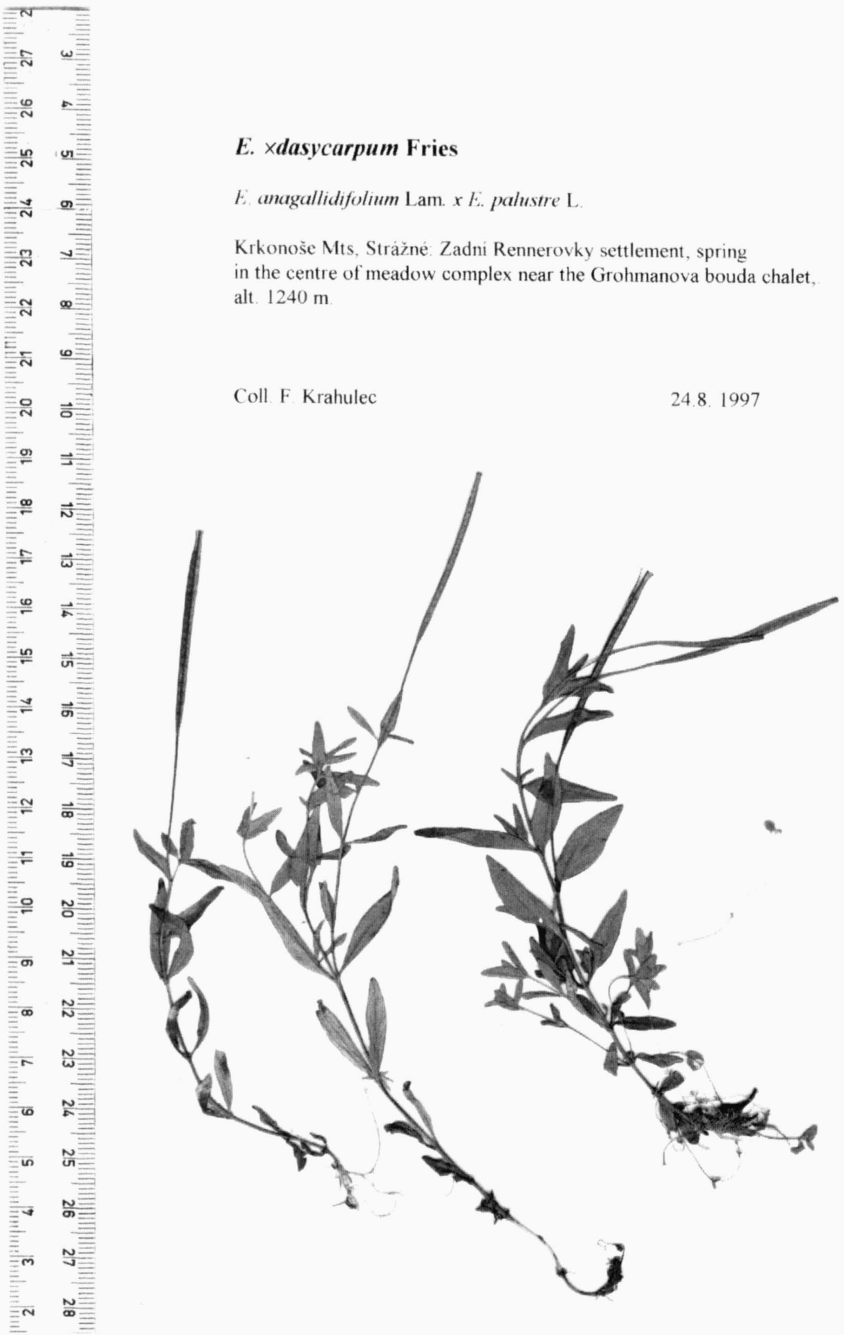

Fig. 2. – *Epilobium ×dasycarpum*.

Table 1. – Comparison of *Epilobium alsinifolium, E. ciliatum* and their hybrid, *E. ×josefi-holubii*. Description of parents is based on Smejkal (1995a) and Raven (1968); data for hybrid are based on collected plants.

	Epilobium alsinifolium	*Epilobium ×josefi-holubii*	*Epilobium ciliatum*
Stem	7–30 (38) cm, 2–3 mm in diameter simple, ascending from decumbent base, glabrous except for 2 (–4) rows of hairs	10–25 cm, 2–3 mm in diameter many branches at the base, branches flowering, spreading and ascending, glabrous, with 2 raised lines	(10) 25–100 (150) cm, 3–8 mm in diameter simple or branched, erect, glabrous or with 2–4 (± pubescent) raised lines
Stolons	hypogeal, long and slender	hypogeal stolons absent, plants branched at base	non-stoloniferous
Inflorescence	glabrescent nodding before anthesis with 2–5 (6) flowers	strigulose, with sporadic to common glands nodding before anthesis 5–12 flowers	densely strigulose, with common glandular hairs strictly erect many flowered
Lower stem leaves	ovate-lanceolate, distantly toothed, teeth indistinct (1.5) 2.0–4.0 (5.0) × (0.7) 1.0–1.5 cm sessile to shortly petiolate	broadly lanceolate, with numerous small teeth 4.5–5.5 × 1.0–1.5 cm petiole 2–3 mm	oblong-lanceolate, numerous small teeth 3.0–11.0 × (1.0) 1.5–3.0 cm petiole (1.5) 2.0–4.0 (5.0) mm long
Upper leaves	entire glabrous to rarely pubescent on the margin shining above	finely serrulate glabrous not shiny	serrulate scarce fine hairs rarely on margin or on nerves not shiny
Petals	7-11 mm long	4-5 mm long	2.5-6.0 mm long
Flower buds	glandular	pubescent, with single glands	appressed pubescent, glandular
Capsules	(3.5) 4.0–6.0 (7.0) cm long ripe (sub) glabrous	4.5–5.0 cm long densely pubescent, glandular	(3.5) 4.0–4.5 (6.5) cm long pubescent, densely glandular
Seeds	(1.3) 1.4–1.5 mm long smooth	1.0–1.2 mm papillose	1 mm papillose

Table 2. – Comparison of *Epilobium alpestre, E. ciliatum* and their hybrid, *E. ×prochazkae*. See Table 1 for the source of data.

	Epilobium alpestre	*Epilobium ×prochazkae*	*Epilobium ciliatum*
Stem	(15) 20–70 (100) cm robust, simple, rarely branched, in lower part glabrous or with (2) 3 (4) hirsute lines	70–120 cm robust, branched in upper part, lower part glabrous or with lines of sparse hairs	(10) 25–100 (150) cm, 3–8 mm in diameter robust, simple or branched lower part glabrous or with 2–4 ± pubescent lines
Inflorescence	with common glandular hairs nodding before anthesis with small number of flowers (3–10)	densely pubescent with spread glandular hairs nodding before anthesis many flowered	densely strigulose, with common glandular hairs strictly erect many flowered
Lower stem leaves	verticillate ovate-lanceolate acuminate (2.5) 3–8 (10) × 1.0–2.5 (3) cm base rounded, sessile, or with short petiole sharply toothed, with 10–20 (23) tooth pairs margins and nerves scarcely pubescent	verticillate oblong-lanceolate 7–8 × 1–2 cm base rounded, with 2 mm long petiole serrulate, 25–35 tooth pairs glabrous, rarely nerves pubescent	opposite oblong-lanceolate 3–11 × (1) 1.5–3.0 cm base rounded or subcordate, petiole (1.5) 2–4 (5) mm long serrulate, (15) 20–35 (40) tooth pairs with fine sparse hairs rarely on margin or on nerves
Petals	large, 5.5–12.5 mm long	large, 5.5–7.0 mm long	small, 2.5–6 mm long
Flower buds	scarcely pubescent	densely pubescent and scarcely glandulose	appressed pubescent, glandular
Capsules	6–8 × 0.25 cm	3.0–4.5 × 0.1–0.15 cm	(3.5–) 4.0–4.5 (–6.5) × 0.15–0.25 cm
Seeds	1.8–2.0 mm long	mostly disturbed, undisturbed 1.2 m long	1 mm long

Hausskn. (*E. alsinifolium* × *E. palustre*), *E.* ×*josefi-holubii* (*E. alsinifolium* × *E. ciliatum*), *E.* ×*prochazkae* (*E. alpestre* × *E. ciliatum*), *E.* ×*schmidtianum* Rostk. in Rostk. et W. L. E. Schmidt (*E. obscurum* × *E. palustre*). The occurrence of other hybrids is highly probable, because all species grow in close vicinity there and open habitats suitable for hybrid establishment are available. Open habitats fall into three types: banks of small brooks which are cleared periodically to drain the meadows; ruderal sites at the path margins; old *Rumex alpinus* stands which have been destroyed leaving a moist, open soil surface.

The discovery of *E. ciliatum* hybrids with *E. alpestre* and *E. alsinifolium* shows that there are no reproductive barriers between these species and hybrid formation was probably limited by the spread of *E. ciliatum* into alpine areas. This species has become a regular component of flora in the vicinity of mountain chalets during last three decades (cf. frequency of this species in Šourek 1969 and Málková et al. 1998). This increased frequency of occurrence must increase the probability of forming hybrids. Indeed, two new localities of *E. alpestre* × *E. ciliatum* hybrid recorded over the past few years support this view.

Two other *Epilobium* hybrids were found in the town of Pec pod Sněžkou, situated in the valley of Zelený Důl. Both hybrids were recorded in 1995, towards the lower slopes of the local road, where shrubs had recently been cut, creating a disturbed habitat. These hybrids were: *E.* ×*hectori-leveilleanum* Thell. [= *E. alpestre* (Jacq.) Krocker × *E. collinum* C. C. Gmelin] and *E.* ×*pseudotrigonum* Borbás [= *E. alpestre* (Jacq.) Krocker × *E. montanum* L.].

In addition to two newly described hybrids, two other hybrids are reported for the first time in this area of the Czech Republic (cf. their absence in Smejkal 1995a): *E.* ×*dasycarpum* from Zadní Rennerovky (Fig. 2) and *E.* ×*hectori-leveilleanum* from Pec. The discovery of hybrids in the field is (in my opinion) limited only by careful observation of suitable habitats, especially the disturbed ones. Hybrids of *E. ciliatum* indicate that this species is successful invasive species; even ecologically specialized species confined to several localities are endangered by hybridization with it.

Acknowledgements

J. Holub helped me with determination of plants from Zadní Rennerovky; J. Hadinec spent some hours with me there; J. Zázvorka and J. Štěpánek helped me to complete descriptions. Hazel Chapman (Christchurch) corrected English. All of them I am indebted with many thanks. This paper is a part of long-term research supported by the Grant Agency of the Czech Republic (grant no. 206/98/0727).

Shrnutí

V práci jsou z Krkonoš nově popsány hybridy mezi *Epilobium ciliatum* Rafin. a dvěma alpinskými druhy rodu *Epilobium*: *E. alpestre* (Jacq.) Krocker (*E.* ×*prochazkae*) a *E. alsinifolium* Vill. (*E.* ×*josefi-holubii*). Vznik těchto hybridů je způsoben současným častým výskytem *E. ciliatum* v alpinských polohách Krkonoš a lokálními terénními úpravami na příslušné lokalitě. Tyto úpravy vytvořily spektrum stanovišť s volným povrchem půdy, což vedlo k uchycení celé řady hybridních rostlin. V práci jsou dále zmíněny dvě hybridní kombinace rodu *Epilobium*, které dosud nebyly z České republiky uváděny. Jde o *E. anagallidifolium* Lam. a *E. palustre* L. (*E.* ×*dasycarpum* Fries); hybrid pochází také ze Zadních Rennerovek. Druhou kombinací je *E. alpestre* a *E. collinum* C. C. Gmelin (*E.* ×*hectori-leveilleanum*); tento hybrid byl nalezen v Peci pod Sněžkou. Na Zadních Rennerovkách byly nalezeny tyto druhy a hybridy: *E. alpestre* (Jacq.) Krocker, *E. alsinifolium* Vill., *E. anagallidifolium* Lam., *E. ciliatum* Rafin., *E. montanum* L., *E. nutans* F. W. Schmidt, *E. obscurum* Schreber, *E. palustre* L.; *E.* ×*dasycarpum* Fries (*E. anagallidifolium* × *E. palustre*), *E.* ×*fossicola* Smejkal (*E. ciliatum* ×

E. palustre), *E.* ×*haynaldianum* Hausskn. (*E. alsinifolium* × *E. palustre*), *E.* ×*josefi-holubii* (*E. alsinifolium* × *E. ciliatum*), *E.* ×*prochazkae* (*E. alpestre* × *E. ciliatum*), *E.* ×*schmidtianum* Rostk. in Rostk. et W. L. E. Schmidt (*E. obscurum* × *E. palustre*). Výskyt dalších hybridů je velmi pravděpodobný vzhledem k těsné blízkosti rodičů a příhodným podmínkám pro uchycení semenáčků.

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Received 1 April 1999
Accepted 30 April 1999