



A new species of *Epilobium* (Onagraceae) from Ulleungdo Island, Korea, *Epilobium ulleungensis*

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한국(울릉도)의 1신종: 울릉바늘꽃

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ABSTRACT: A new species, *Epilobium ulleungensis* J. M. Chung (Onagraceae Juss), from Ulleungdo Island (South Korea) was described and illustrated. Among four taxa native to Ulleungdo Island (*E. amurense* Hausskn. subsp. *cephalostigma* (Hausskn.) C. J. Chen, Hock & P. H. Raven, *E. hirsutum* L., *E. pyrricholophum* Franch. Sav., and *E. ulleungensis*), *E. ulleungensis* has a unique tetragonal stigma, which is considered to be an intermediate form between clavate (*E. pyrricholophum*) or capitate (*E. amurense* subsp. *cephalostigma*) and 4-lobed stigmas (*E. hirsutum*). More importantly, this new species is clearly distinguished from the other three taxa distributed on Ulleungdo Island by its height (over 200 cm), decumbent stem, leaf shape, short, dense pubescent covering on the whole plant, large flower size, and a dark pink or red purple flower. According to the stigma shape and other characters, it was estimated that *E. ulleungensis* is a hybrid between *E. hirsutum* and *E. pyrricholophum* or *E. amurense* subsp. *cephalostigma*. The specific epithet “*ulleungensis*” was chosen because the new species was restricted to Ulleungdo Island.

Keywords: Onagraceae, *Epilobium ulleungensis*, new species, hybrid, Ulleungdo Island

적 요: 경상북도 울릉군에서 바늘꽃과 바늘꽃속의 신종인 울릉바늘꽃(*Epilobium ulleungensis* J. M. Chung)을 발견하여 기재 및 도해하였다. 울릉도에 분포하는 바늘꽃속 4분류군(바늘꽃, *E. pyrricholophum*; 돌바늘꽃, *E. amurense* subsp. *cephalostigma*; 큰바늘꽃, *E. hirsutum*; 울릉바늘꽃, *E. ulleungensis*)중에서 울릉바늘꽃의 주두는 4각형으로서 곤봉형인 바늘꽃 또는 두상형인 돌바늘꽃과 4개로 깊게 갈라지는 큰바늘꽃의 중간 형태를 보이고 있다. 중요하게도, 울릉바늘꽃은 200 cm 이상의 큰 키와 비스듬히 누운 줄기, 잎의 형태, 식물체 전체의 짧은 밀모, 그리고 꽃의 크기와 진분홍색 또는 붉은 자주색의 꽃 색은 울릉도에 분포하는 다른 3분류군과 명확하게 구별된다. 주두의 형태와 다른 분류학적 형질들에 의해 울릉바늘꽃은 큰바늘꽃과 바늘꽃 또는 돌바늘꽃과의 잡종으로 추정되었다. 신종의 자생지가 울릉도인 점을 고려하여 ‘*ulleungensis*’이라 신칭하였다.

주요어: 바늘꽃과, 바늘꽃속, 신종, 울릉도, 울릉바늘꽃

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The family Onagraceae Juss. is composed of approximately 650 species worldwide (Chen et al., 1992, 2007). The tribe Epilobieae differs significantly from the six other tribes of the family, because it has minute, heteropycnotic chromosomes (Kurabayashi et al., 1962). The genus *Epilobium* L. is one of two genera currently recognized in the tribe Epilobieae (Solomon, 1982). *Epilobium* is the largest genus in the Onagraceae (Raven, 1976; Solomon, 1982), consisting of ca. 150–200 species in sub-polar to tropical regions (Raven, 1988; Hoch and Raven, 1992; Baum et al., 1994). Species of the genus have large numbers of small, easily dispersed, tufted seeds, and are characterized by vigorous vegetative perennation (Keating et al., 1982). Many hybrids of the genus have been reported (Schmitz, 1988; Krahulec, 1999; Mckean, 1999; Kitchener, 2003). The stigma shape in *Epilobium* has served as an important taxonomic key character among species of the genus (Chen et al., 1992, 2007; Lee et al., 2013)

On the Korean Peninsula, ca. 6 to 16 species of *Epilobium* have been recognized (Nakai, 1909; Chung, 1957; Lee, 1980). More recently, Lee et al. (2013) reported eight taxa native to the peninsula: *E. pyrriholophum* (바늘꽃), *E. amurense* subsp. *amurense* (호바늘꽃), *E. amurense* subsp. *cephalostigma* (돌바늘꽃), *E. fastigiatoramosum* (회령바늘꽃), *E. glandulosum* var. *asiaticum* (줄바늘꽃), *E. hirsutum* (큰바늘꽃), *E. palustre* (버들바늘꽃), and *E. platystigmatosum* (가는민바늘꽃).

On Ulleungdo Island, three species of *Epilobium* have been recognized: *E. amurense* subsp. *cephalostigma*, *E. hirsutum*, and *E. pyrriholophum* (Chung et al., 2011). Since 2005, we have surveyed the flora on Ulleungdo Island and reported a total of 487 native vascular plant taxa (422 species) and 36 endemic plant taxa on the island (Chung et al., 2011).

Ulleungdo Island, located 120 km east of the Korean Peninsula, is a volcanic island of 73 km². Because of its maritime climate, many temperate deciduous plants and warm-



Fig. 1. Photographs of *Epilobium ulleungensis* J. M. Chung in its natural habitat on Ulleungdo Island. **A.** Habitat. **B.** Habit. **C.** Flower, front view. **D.** Flower, side view.

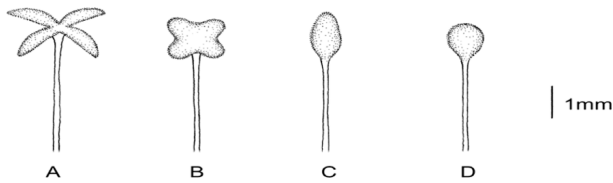


Fig. 2. Stigma shape of four species of *Epilobium*. **A.** *E. hirsutum*. **B.** *E. ulleungensis*. **C.** *E. pyrriholophum*. **D.** *E. amurensis* subsp. *cephalostigma*.

temperate plants occur on the island, forming a distinctive flora (Lee and Yim, 2002). In 2009, I discovered a morphologically distinct species of *Epilobium* on Ulleungdo Island (Fig. 1). It has a unique tetragonal stigma and is distinct from *E. pyrriholophum* with a clavate stigma, from *E. amurensis* subsp. *cephalostigma* with a capitate stigma, and from *E. hirsutum* with a 4-lobed stigma (Fig. 2). Other characteristics (such as height over 200 cm, relatively short [7.9–9.5 cm] lanceolate to long elliptic leaf shape, dark pink or red purple petal, and loosely villous pubescent surface) were distinguished

from *E. hirsutum* (Table 1, Figs. 1, 2). According to the stigma shape and other characters, it was conjectured that *E. ulleungensis* is a hybrid between *E. hirsutum* and *E. pyrriholophum* or *E. amurensis* subsp. *cephalostigma*. In the future, we will conduct karyotypic and molecular genetic studies to prove that this species is a hybrid. Therefore, presently, we described the taxon restricted to Ulleungdo Island as a new species, *E. ulleungensis* J. M. Chung.

Taxonomic Treatment

Epilobium ulleungensis J. M. Chung, sp. nov. (Figs. 1–4).

TYPE: KOREA. Gyeongsangbukdo Province, Ulleungdo Island, 37°30'N, 130°50' E, elev. 368 m. 4 Aug 2016, *Chung J. M. JMC15101* (holotype: KH; isotypes: KH [2 sheets]).

Korean name: Ul-leung-ba-neul-kkot 울릉바늘꽃.

Diagnosis: *Epilobium ulleungensis* is clearly distinguished from its related taxa by its tetragonal stigma, over 200 cm tall

Table 1. Comparison of some morphological characteristics between *Epilobium ulleungensis* and its related species, *E. hirsutum*, *E. pyrriholophum*, and *E. amurensis* subsp. *cephalostigma*.

Characters		<i>E. ulleungensis</i>	<i>E. hirsutum</i>	<i>E. pyrriholophum</i>	<i>E. amurensis</i> subsp. <i>cephalostigma</i>
Plant height (cm)		215–250	25–120 (250)	24–80	31–98
Leaf blade	shape	Lanceolate to oblong	Lanceolate-elliptic to narrowly obovate or elliptic	Ovate to broadly oblong	Ovate to narrowly oblong
	length (cm)	7.9–9.5	4.0–12 (23)	2.1–4.6	3.0–9.5
	width (cm)	2.5–2.8	0.3–4.0 (5.0)	0.7–2.0	0.5–2.5
	hairs	Villous pubescent or tomentose	Densely villous pubescent or white tomentose	Strigillose	Subglabrous with strigillose
Flower	length (cm)	2.1–3.2	1.2–1.5	0.9–1.4	0.8–1.3
	color	Deep-pink to red purple	Pink to dark purple	Pink to purple	White, pink or rose-purple
Petal	length (cm)	1.1–1.6	0.8–2.0	0.5–0.8	0.5–0.8
Sepals	length (cm)	0.8–1.2	0.6–1.2	0.3–0.6	3.3–6.1
	width (cm)	2.5–3.0	0.9–1.2	0.1–0.15	0.9–1.3
Pedicel	length (cm)	0.5–12	0.5–2.0	0.7–1.5	0.3–1.3
Style	length (mm)	7.8–8.2	5.0–9.0	1.5–3.7	1.2–2.6
Stigma	length (mm)	2.0–3.0	1.0–4.0	0.7–2.8	0.9–2.2
	shape	Tetragonal	4-lobed	Clavate	Capitate or broadly capitate
Filament length (mm) short stamens		3.5–4.0	2.5–4.4	1.1–2.6	0.9–2.2
	long stamens	5.5–7.0	7.0–8.0	2.1–3.3	1.7–3.1
Capsule	length (cm)	2.8–6.5	2.5–9.0	2.6–6.7	4.2–6.7
Seed	length (cm)	0.9–1.2	0.8–1.2	1.5–1.8	0.8–1.0

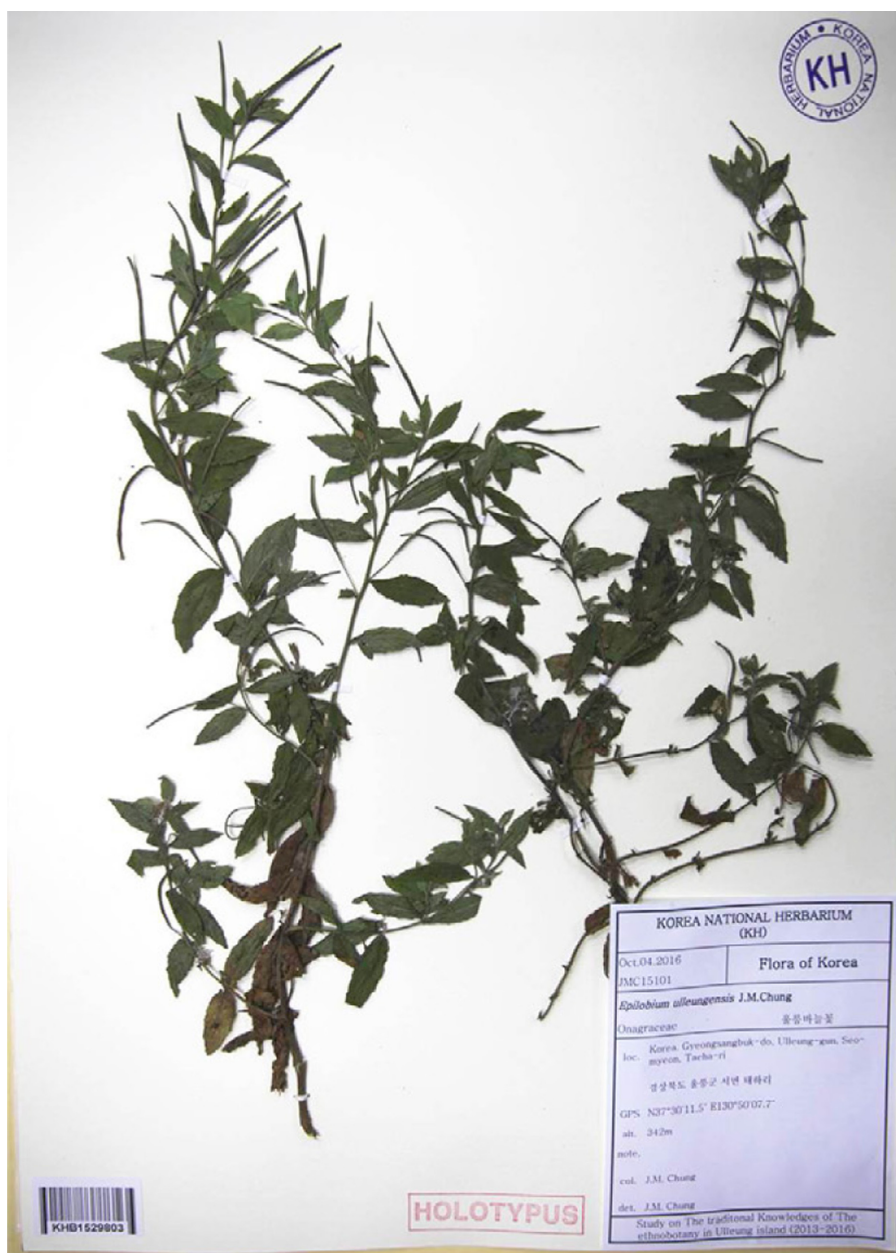


Fig. 3. Holotype of *Epilobium ulleungensis* J. M. Chung.

height, decumbent stem, lanceolate to oblong leaf blade, short and dense pubescent covering on the whole plant, a large flower size, and a dark pink or red purple flower (Figs. 2, 4).

Herbaceous perennial with clumped, leafy, basal soboles. Stem 2.2–2.4 m tall, decumbent, well-branched, pubescent with villous or tomentose trichomes. Leaves simple, opposite, sessile or clasping stem. Cauline leaves, blade lanceolate to oblong, 79–95 × 25–28 mm, base rounded, clasping, margin serrulate with 10–60 teeth per side, apex acute to acuminate, adaxial

surface rarely pubescent, deep green, abaxial surface pubescent, margin serrulate or denticulate. Inflorescence terminal and axillary, solitary, ebracteate; pedicels 5–12 mm long, pubescent. Flowers erect, actinomorphic; sepals 4, fused, 8.0–12 × 2.5–3 mm, slightly keeled, lanceolate, pubescent; petals 4, dark pink to purple, 11–16 × 9–12 mm, obcordate; stamens 8, heteromorphic in lengths; filament 3.5–4.0 mm in short stamens, 5.5–7.0 mm in long stamens; anther 1.2–1.6 mm long, dehiscent along longitudinal slit; ovary inferior; style 8 mm long; stigma tetragonal, 2.0–3.0 × 2.5–3.0 mm. Fruit capsules,

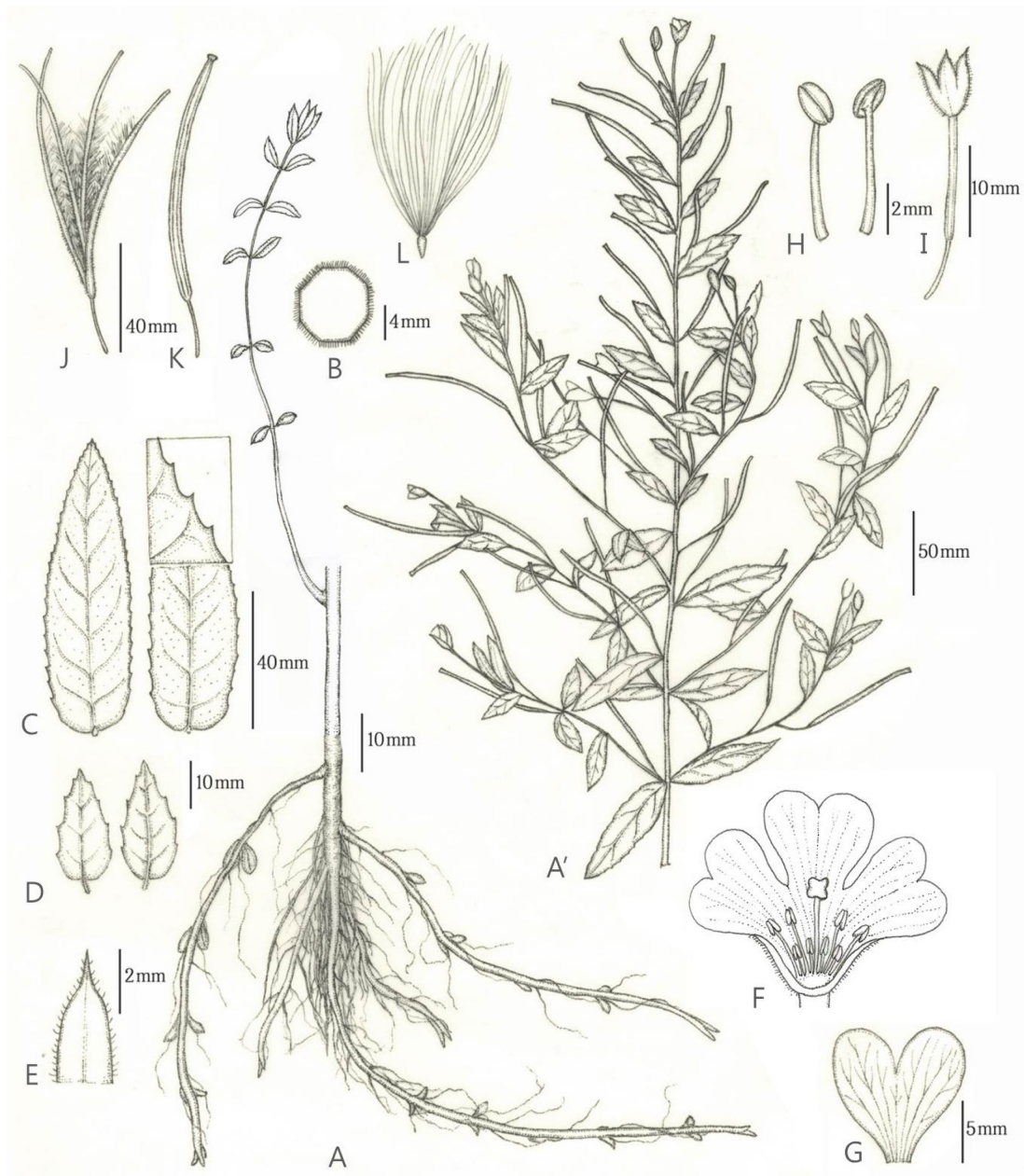


Fig. 4. A, A'. Habit. B. Cross section of stem. C. Cauline leaf. D. Bract. E. Sepal. F. Flower. G. Petal. H. Stamen. I. Pistil. J. Loculicidal dehiscence of capsules. K. Capsules. L. Seed.

2.8–6.5 cm long, pubescent. Seeds numerous, dark brown, ovoid, 9.2–40.6 mm long, surface finely papillose, chalazal collar 6.0–8.7 mm long. Flowering July to Sep, fruiting Aug to Oct.

Additional specimens examined: Korea, Gyeongsangbuk-do, Ulleungdo Island, 37°30'N, 130°50'E, elev. 368 m, 22 Aug 2011, *Chung J. M. JMC12781* (KH); 9 Sep 2009, *Chung J. M. JMC11310* (KH).

Habitat: A population of *E. ulleungensis* was found on a

humid slope beside a stream in the upper part of Taeha valley on Ulleungdo Island (Fig. 1A). There were several populations of *E. ulleungensis* along the valley in the past. The number and size of the population has gradually decreased due to the agricultural road construction and farmland development. At present, the population area is ca. 3 m × 7 m and its size fewer than 100 individuals because of clonal reproduction by runners sprouted from the lower part of the stem. Moreover, the population has been greatly threatened by the pressure of

surrounding vegetation such as *Hovenia dulcis*, *Albizia julibrissin*, *Boehmeria spicata*, *Pueraria thunbergiana*, *Miscanthus sinensis* var. *purpurascens*, *Dystaenia takeshimana*, and *Artemisia montana*, etc. Therefore, a plan for *in* and *ex situ* conservation of the natural population of *E. ulleungensis* is required.

Distribution: Korea (Ulleungdo Island), endemic to Korea.

Etymology: The specific epithet is derived from Ulleungdo Island where this new species is located.

Key to *Epilobium ulleungensis* and its related taxa

1. Stem erect, less than 2 m tall. Stigma deeply 4-lobed, *E. hirsutum* (큰바늘꽃)
1. Stem erect, less than 2 m tall. Stigma entire or shallowly emarginate 2
2. Stem decumbent, over 2 m tall. Stigma tetragonal *E. ulleungensis* (울릉바늘꽃)
2. Stem erect, stem less than 1.5 m long. Stigma clavate or capitate 3
3. Leaves ovate or broadly oblong to lanceolate, sharply serrulate. Stigma clavate *E. pyrricholophum* (바늘꽃)
3. Leaves ovate to oblong-lanceolate, apex acute or acuminate. Stigma capitate *E. amurense* subsp. *cephalostigma* (돌바늘꽃)

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