



## A new species of *Dianthus* (Caryophyllaceae) from Republic of Korea

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### Abstract

*Dianthus koreanus* sp. nov., from Gyeongsangbuk-do, Republic of Korea, is described and illustrated. It is a chasmophyte growing on the rocks on the seashore in the eastern coast of Korea. The new species is similar to *D. chinensis* by its vegetative and floral morphology. Differential characters refer to the leaves (oblanceolate to oblong and greenish-gray coriaceous), and the bracts (3 pairs, each bract being elliptic to obovate with apex acute). The conservation status of *D. koreanus* was assessed according to the IUCN Red List criteria.

**Key words:** East Asia, *Dianthus chinensis*, endemic species, IUCN

### Introduction

*Dianthus* Linnaeus (1753: 409) is one of the largest genera of Caryophyllaceae Juss. consisting of approximately 300 species of herbaceous annuals, biennials, and perennials plants, that are common in Europe, Asia and North Africa, whereas some species occur in North America and South Africa (see e.g., Reeve 1967, Mabberley 2008, Vaezi *et al.* 2014). This genus is easily distinguished from the other genera belonging to Caryophyllaceae by its epicalyx scales (bracts), tubular calyx, and peltate seeds (Bittrich 1993, Bacchetta *et al.* 2010, İlçim *et al.* 2013).

An important center of diversity for *Dianthus* is the central Mediterranean area (Sardinia, Corsica, Sicily, Italian Peninsula, and Croatia) where the number of taxa is high (Conti *et al.* 2005, Peruzzi *et al.* 2015), while only 10 taxa are recorded in NE-Asia (Charkevicz 1996, Dequan & Turland 2001, Akiyama 2006, Hong 2007).

Recent field investigations carried out in the eastern coast of Korea allowed us to discover an unusual and rather isolated population of *Dianthus*, which appears to be morphologically well different from the other known taxa. After examining the various floras and herbarium specimens of Korea and adjacent countries, we concluded that the collected specimens could be proposed as a new species for Science, named *Dianthus koreanus*.

### Taxonomic treatment

*Dianthus koreanus* D.C. Son & K. Lee, sp. nov. (Figs. 1, 2)

**Type:**—KOREA. Prov. Gyeongsangbuk-do, Uljin-gun, Giseong-myeon, Mangyang-ri, Giseongmangyang beach, elevation 30 m, 36.83455°N, 129.44336°E, 16 July 2015, Lee 2453 (holotype KH-1460258!, isotype KH-1460259!).

**Diagnosis:** Herbs perennial, 25–50 cm tall. Roots woody. Stems laxly caespitose, ascending at base, often somewhat woody towards base, densely pubescent. Leaves sessile, coriaceous; cauline leaves opposite, oblanceolate to oblong (2.5–4.5 × 0.5–1.5 cm), mid-vein prominent, apex acute to obtuse, base cuneate to attenuate, base amplexicaule, margins short ciliate, both surfaces densely pubescent, greenish-gray coloured; sterile shoot leaves similar to cauline ones, developing at flowering season. Flowers solitary or in dense cymes; pedicel 0.5–1.4 cm long; bracts 3 pairs, elliptic to obovate, about 1/4–1/2 as long as calyx, margin membranous-ciliate, apex acute. Calyx gamosepalous, cylindrical, 1.5–2.5 cm long, 5-toothed, with many parallel veins. Petals limb bright red, purple-red or pink-coloured, obovate-triangular (1.3–1.5 cm long), apex irregularly toothed; throat spotted and laxly bearded. Stamens 10, exserted,

versatile; filaments long, slender; anthers blue-colored. Ovary 1-locular, on a short gynophore, with chartaceous cap; ovules many on free central placenta; styles 2, linear, longer than ovary, pubescent. Capsule cylindrical, 2.0–2.5 cm long, surrounded by calyx, apex 4-toothed. Seeds black, flat, orbicular.

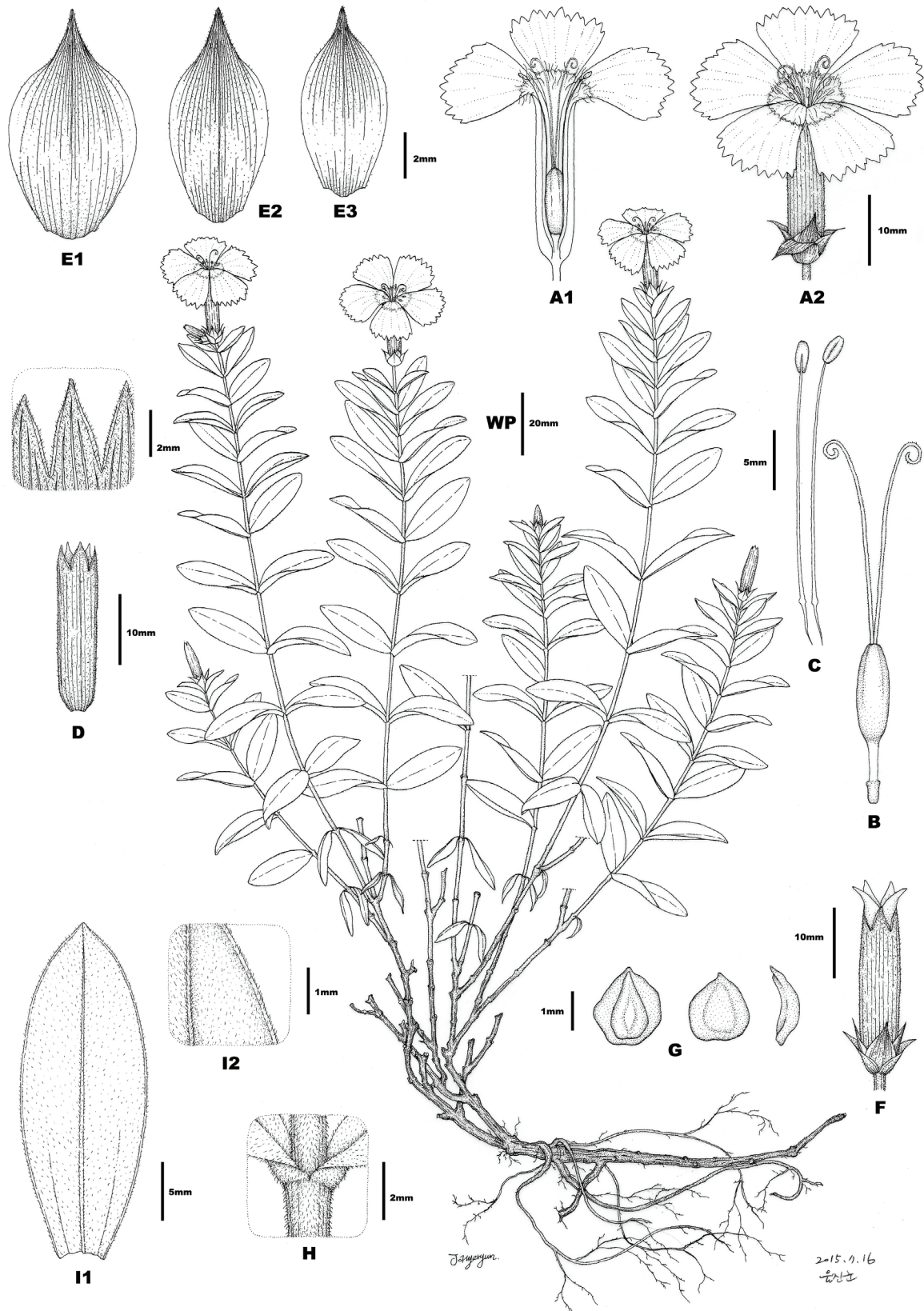
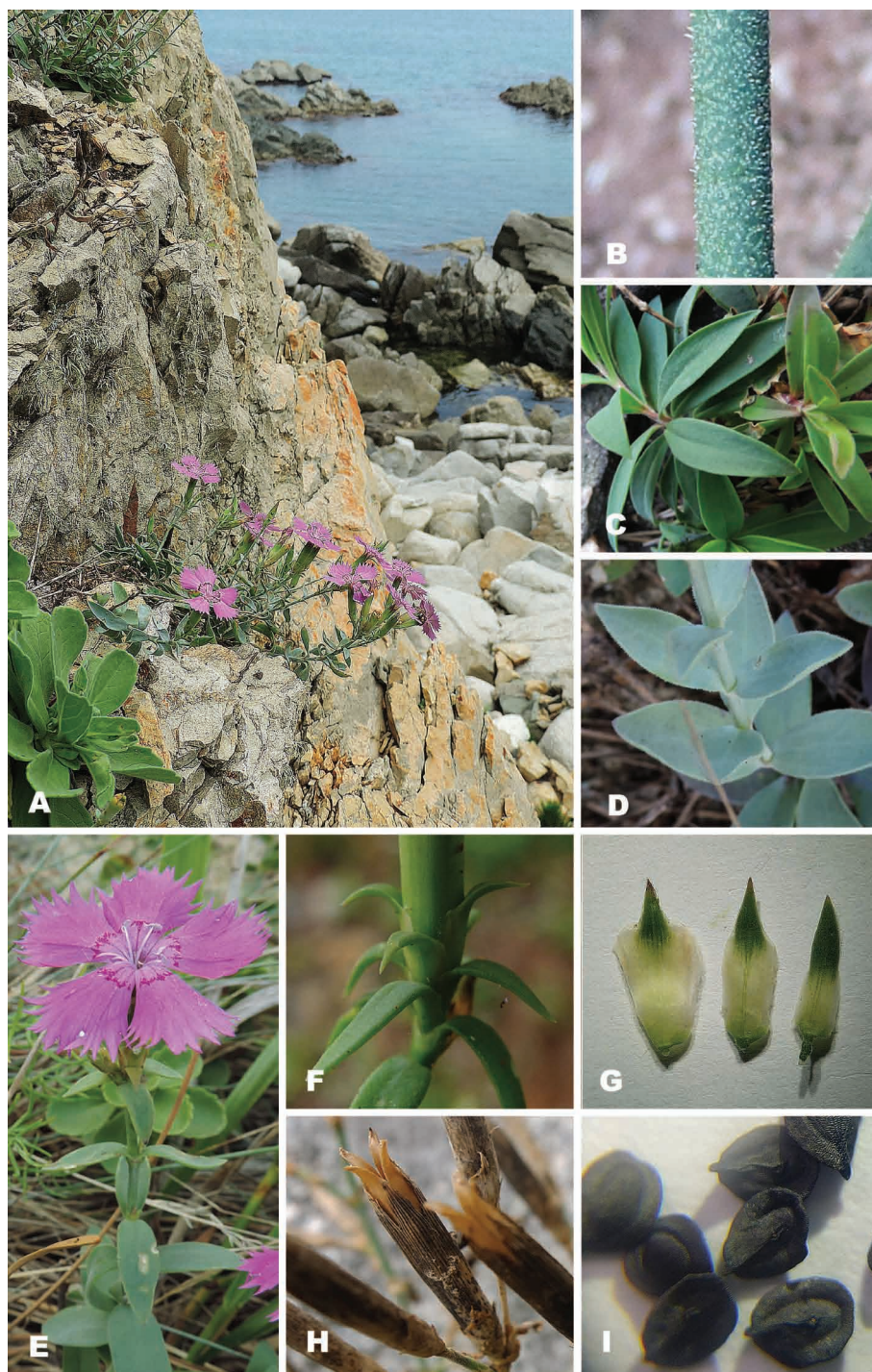


FIGURE 1. Illustration of *D. koreanus* D.C. Son & K. Lee. WP. Plant. A. Flower. B. Pistil. C. Stamen. D. Calyx. E. Bracts. F. Capsule. G. Seed. H. Stem. I. Leaves. Illustrations by Hyeryun Jo.





**FIGURE 2.** Photograph of *D. koreanus* D.C. Son & K. Lee. **A.** Habitat. **B.** Stem. **C.** Sterile shoot leaves. **D.** Leaves. **E.** Flower. **F.** Bracts. **G.** Bracts (outer bract, mid bract, inner bract from left to right). **H.** Capsule. **I.** Seeds. Photographs by Kang-Hyup Lee and Dong Chan Son.

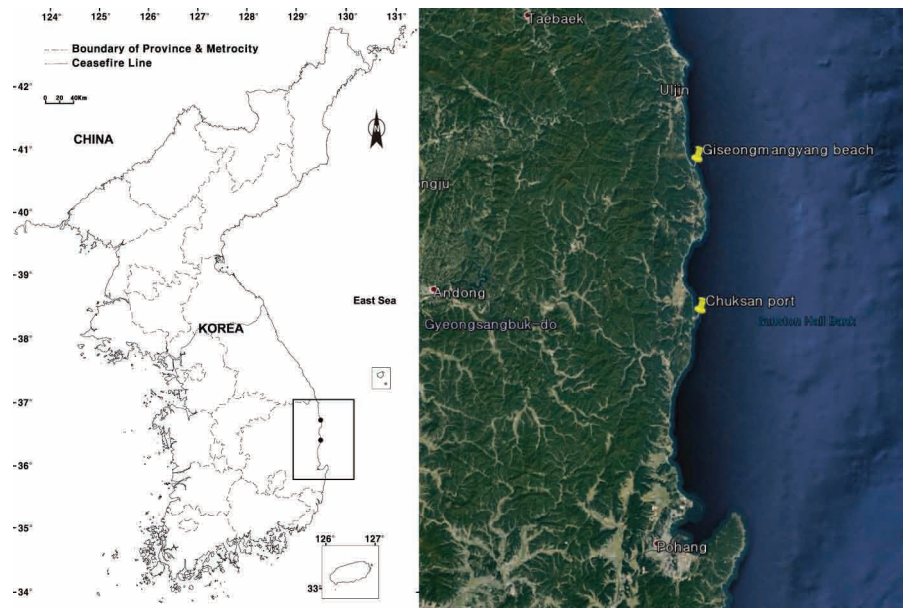
**Etymology:** The specific epithet of the new species is dedicated to the country Korea.

**Phenology:** Flowering time late July–early August; fruiting time late August–September.

**Vernacular (Korean) name:** Gaet-ba-wi-pae-raeng-i-kkot (갯바위패랭이꽃; new Korean name).

**Distribution:** Endemic to the Province Gyeongsangbuk-do (Republic of Korea).

**Habitat and ecology:** *Dianthus koreanus* grows on the rocks on the sunny seashores in the eastern coast of Korea (Figs. 2, 3). Its habitat is dominated by *Pinus thunbergii* Parlature (1868: 388), with *Arabis erecta* Kim & Jang (2016: 280), *Cnidium japonicum* Miquel (1867: 60), *Lathyrus japonicus* Willdenow (1802: 1092) and *Aster spathulifolius* Maximowicz (1871: 216).



**FIGURE 3.** Distribution map of *D. koreanus* D.C. Son & K. Lee (right: zoomed in area in Google Maps of boxed area on left). Illustrations by Dong Chan Son.

**Conservation status:** on the basis of the IUCN Red List categories and criteria (IUCN 2014), *Dianthus koreanus* covers a EOO of approximately 30 km<sup>2</sup>. The new species is here assessed as Critically Endangered (CR, criterion B1a).

**Taxonomic notes:** *Dianthus koreanus* shows morphological similarities with *D. chinensis* Linnaeus (1753: 411) concerning its spotted, toothed petals, and arrangement of cyme flowers (see Charkevicz 1996, Dequan & Turland 2001, Hong 2007). Despite these similarities, there are clearly differences between these two species such as shape and texture of leaves, and number and shape of bracts (Table 1), as well as the habitat (rocky seashore for *D. koreanus* vs. mountains for *D. chinensis*). *D. kiusianus* Makino (1912: 178), which is found in Japan as endemic, and *D. japonicus* Thunberg (1784: 417), which is found in Japan, Korea, and China, also display coriaceous leaves, 3 pairs of bracts, and grows on the seashores (Dequan & Turland 2001, Akiyama 2006, Hong 2007). However, the new species differs from them by its pubescent stem and leaves and throat spotted, and from the latter by its inflorescence shape, apex acute, and elliptic to obovate-shaped bracts, and flat, orbicular seeds (Table 1).

An identification key between concerning the Korean *Dianthus* species follows:

- 1. Inflorescences head-like with numerous clustered flower; pedicel short or sessile (less than 0.2 cm long) ..... 2
- Inflorescences loose few-flowered cymes or flower solitary; pedicels usually elongate (more than 0.5 cm long) ..... 3
- 2. Leaves lanceolate; bracts ovate, equaling or slightly longer than calyx ..... *D. barbatus*
- Leaves ovate to ovate-elliptic; bracts elliptic, 1/3–1/2 as long as calyx ..... *D. japonicus*
- 3. Petals lobed to irregularly toothed on upper margin ..... 4
- Petals fimbriate ..... 7
- 4. Flower 3–4 cm in diameter, strongly fragrant; calyx margins ciliate; capsules ovoid ..... *D. caryophyllus*
- Flower 1–2.5 cm in diameter; mildly or inconspicuously fragrant; calyx margins glabrous; capsules cylindrical ..... 5
- 5. Leaves linear-lanceolate, chartaceous; bracts in 1 or 2 pairs, ovate ..... 6
- Leaves oblanceolate-oblong, coriaceous; bracts in 3 pairs, elliptic to obovate..... *D. koreanus*
- 6. Bracts in 1 pairs, apex subulate; calyx 1.2–1.4 cm long ..... *D. repens*
- Bracts in 2 pairs, apex long acuminate; calyx 1.5–2.5 cm long ..... *D. chinensis*
- 7. Bracts in 2 or 3 pairs, obovate, about 1/4 as long as calyx, apex subulate or long acuminate; calyx usually reddish-purple, 2.5–3.0 cm long; capsules as long as or slightly longer than calyx ..... *D. superbus*
- Bracts in 3 or 4 pairs, ovate, about 1/5 as long as calyx, apex mucronate; calyx green, 3.0–4.0 cm long; capsules shorter than calyx ..... *D. longicalyx*

**Additional specimens examined (paratypes):—KOREA.** Prov. Gyeongsangbuk-do, Ulsin-gun, Giseong-myeon, Mangyang-ri, Giseongmangyang beach, 08 September 2016, *Son s.n.* (KH!); Prov. Gyeongsangbuk-do, Yeongdeok-gun, Chuksan-myeon, Chuksan-ri, Chuksan port, 2 November 2016, *Lee 0200* (KH!).



**TABLE 1.** Morphological comparison between *Dianthus koreanus* and related species.

	<i>D. koreanus</i>	<i>D. chinensis</i>	<i>D. kiusianus</i>	<i>D. japonicus</i>
<b>Stems</b>	laxly caespitose, ascending at base, 25–50 cm, pubescent	laxly caespitose, erect, 30–50 cm, glabrous	caespitose, procumbent or ascending at base, upwardly erect, 10–30 cm, glabrous	caespitose, ascending at base, upwardly erect, 15–50 cm, glabrous
<b>Leaves</b>	2.5–4.5 × 0.5–1.5 cm, oblanceolate to oblong, margins ciliate, apex obtuse to acute, both surfaces densely pubescent, coriaceous	3–5 × 0.2–0.4 cm, linear-lanceolate, margins entire or denticulate, apex acuminate, both surfaces sparsely pubescent, chartaceous	3–7 × 1–1.5 cm, oblanceolate to spatulate-oblong, margins ciliate, apex obtuse to acute, both surfaces glabrous, coriaceous	5–9 × 1–2 cm, oblanceolate to oblong, margins ciliate, apex obtuse to acute, both surfaces glabrous, coriaceous
<b>Lower leaves</b>	withered after anthesis	withered after anthesis	withered after anthesis	persistent after anthesis
<b>Inflorescences</b>	solitary or several in cymes, opening one by one	solitary or several in cymes, opening one by one	solitary or several in cymes, opening one by one	capitate clusters, opening simultaneously
<b>Bracts</b>	3 pairs, elliptic to obovate, apex acute, 1/4–1/2 as long as calyx	2 pairs, ovate, apex long acuminate, 1/2 as long as calyx	3 pairs, elliptic, apex acuminate, 1/3 as long as calyx	3 pairs, elliptic, apex long awn, 1/4–1/3 as long as calyx
<b>Petals</b>	limbs 1.3–1.5 cm, bright red, reddish-purple, pink; throat spotted	limbs 1.3–1.5 cm, bright red, reddish-purple, pink or white; throat spotted	limbs 1 cm, reddish-purple; throat not spotted	limbs 0.6–0.7 cm, reddish-purple; throat not spotted
<b>Capsule</b>	2.0–2.5 mm	2.0–2.5 mm	1.5–2.0 mm	1.5–2.0 mm
<b>Seeds</b>	orbicular	orbicular	ovate	ovate

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