



## A new distribution record of *Scutellaria barbata* D. Don (Lamiaceae) and an erroneously identified *Scutellaria* in Korea

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**ABSTRACT:** Earlier taxonomic studies of Korean *Scutellaria* reported a new record of *Scutellaria hastifolia* L. in Korea based on three herbarium sheets. During a reexamination of these specimens, we found that the leaf characters of these specimens differ from those in the type specimen of *S. hastifolia*. Based on a literature survey and confirmation of the type specimen, the specimens identified as *S. hastifolia* thus far were a misidentification of *S. barbata* D. Don. *S. hastifolia* is clearly different from *S. barbata* by single conspicuous teeth on both sides of the leaf margins and larger leaves. In addition to the distribution sites of the three specimens used in the previous study, a distribution site of the *S. barbata* was newly found in the southern part of Korea. In this study, we report a new distribution of *S. barbata* in Korea, correct a previous report of *S. hastifolia*, describe the morphological characters of *S. barbata*, and suggest a taxonomic key to Korean *Scutellaria* including *S. barbata*.

**Keywords:** Lamiaceae, misidentification, *Scutellaria barbata*, *Scutellaria*, unrecorded species

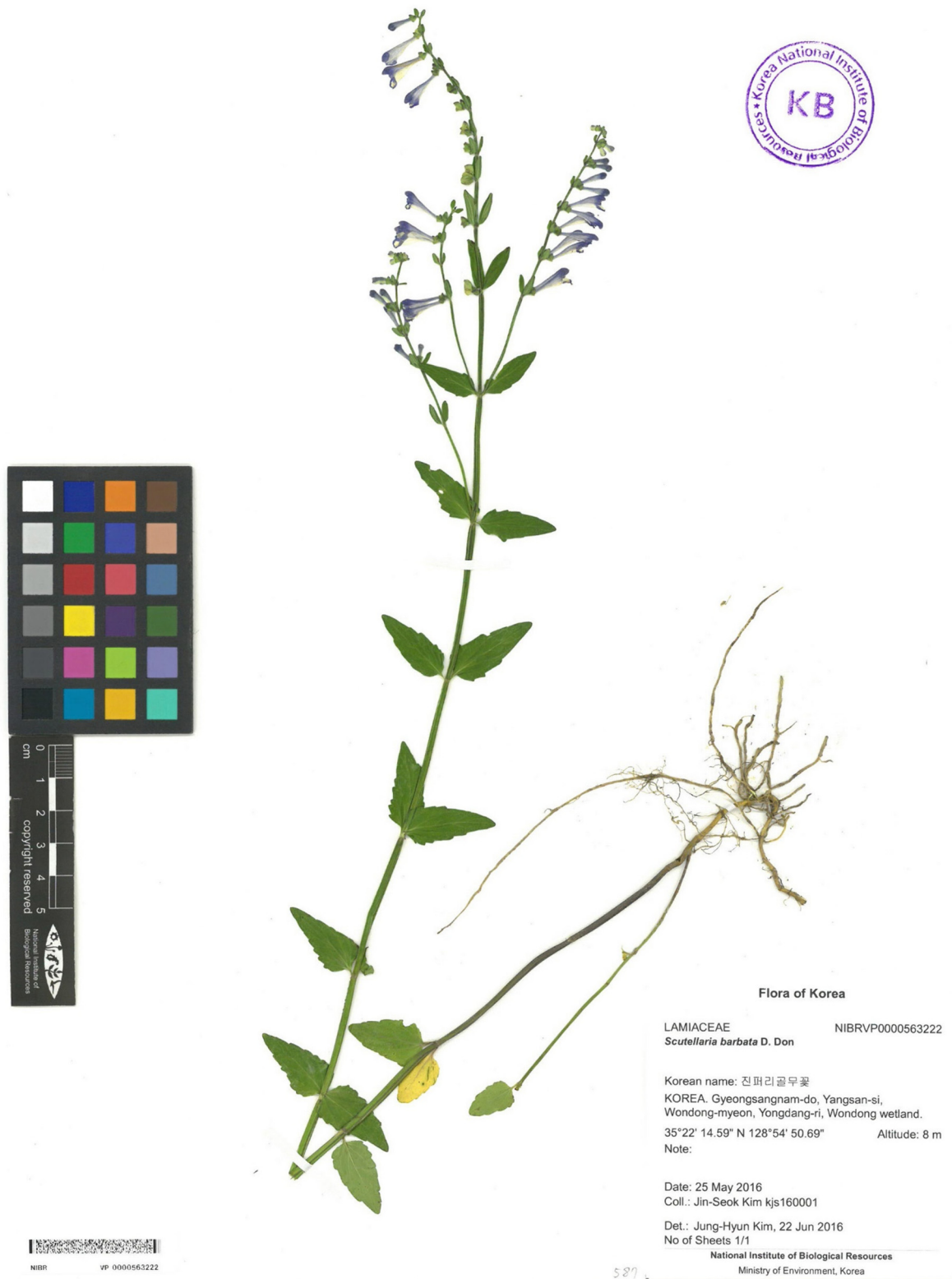
Lamiaceae is the seventh largest family in flowering plants and contains about 236 genera and 7,200 species in the world (Stevens et al., 2017). In Lamiaceae, *Scutellaria* is one of the largest genus containing about 360 taxa including an infraspecific level (Paton, 1990). As annual/perennial herbs or subshrubs *Scutellaria* is characterized by the followings: calyx lips are entire and persistence, gynoeceum has peg-like gynophore, the anterior stamens have unilocular thecae due to the abortion of the upper locule, etc. (Paton, 1990; Kim and Lee, 1995). The current classification system based on a morphological revision of the genus contains seven sections placed in two subgenera, subgenus *Scutellaria* and subgenus *Apelthanthus* (Paton, 1990) and 12 morphological species-groups have been suggested without taxonomic rank in the section *Scutellaria*, the largest section containing ca. 240 species in the genus.

A bibliographical study of Korean Lamiaceae summarized

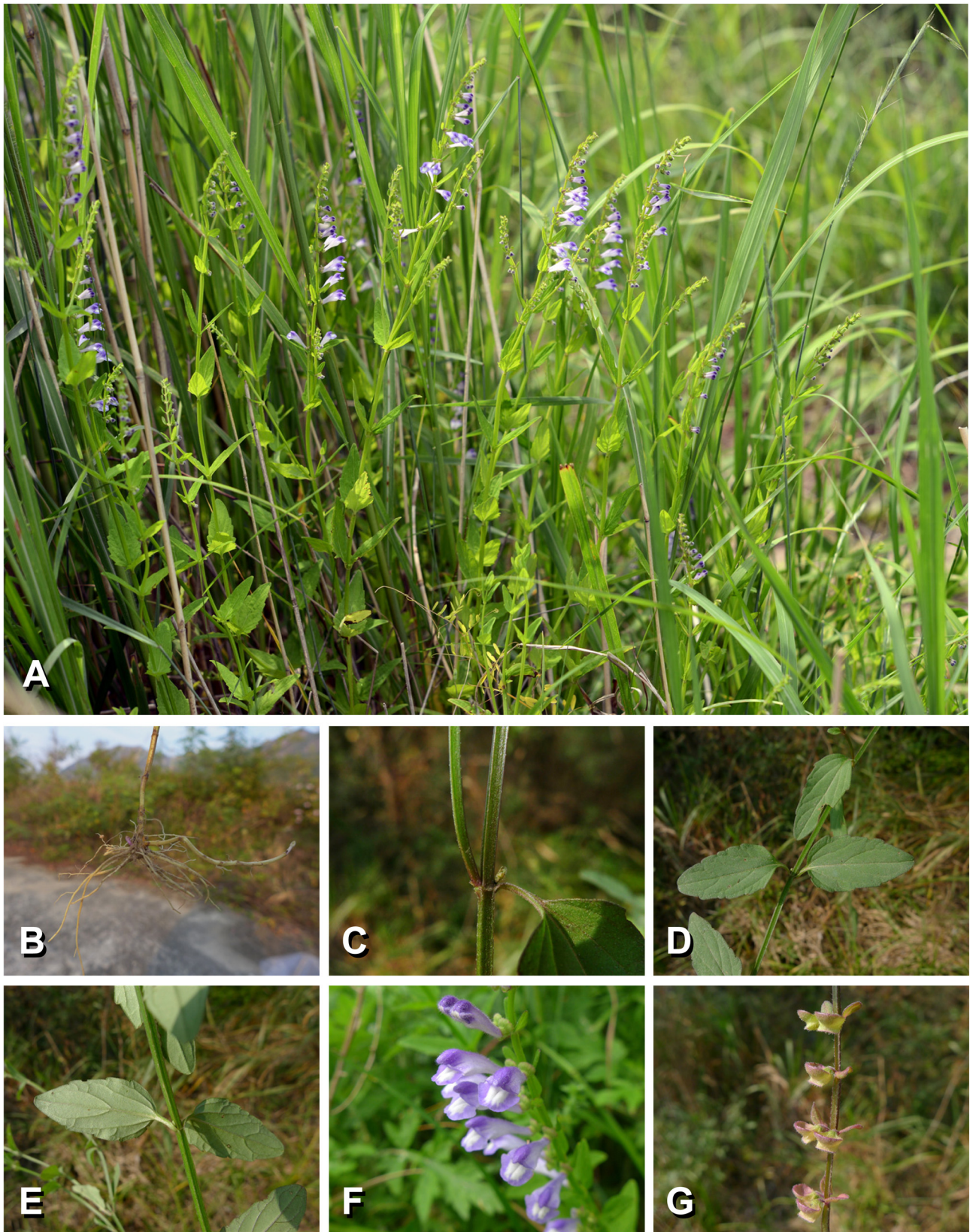
that 26 genera including 65 taxa of Lamiaceae are distributed in Korea (Suh et al., 2007). The taxonomic revision of Korean *Scutellaria* has reported that there are 17 taxa of *Scutellaria* in Korean peninsula: *S. asperiflora* Nakai, *S. baicalensis* Georgi, *S. dependens* Maxim., *S. hastifolia* L., *S. indica* L., *S. indica* var. *alba* S. T. Kim & S. T. Lee, *S. indica* var. *coccinea* S. T. Kim & S. T. Lee, *S. indica* var. *parvifolia* Makino, *S. indica* var. *tsusimensis* (Hara) Ohwi, *S. insignis* Nakai, *S. moniliorrhiza* Kom., *S. pekinensis* var. *alpina* (Nakai) Hara, *S. pekinensis* var. *maxima* S. T. Kim & S. T. Lee, *S. pekinensis* var. *transitra* (Makino) H. Hara ex H. W. Li, *S. pekinensis* var. *ussuriensis* (Regel) Hand.-Mazz., *S. regeliana* Nakai, and *S. strigillosa* Hemsl. (Kim and Lee, 1995). After this study, two new records, *S. orthocalyx* Hand.-Mazz. (Yang, 2004) and *S. tuberifera* C. Y. Wu & C. Chen (Kim et al., 2011), in Korea have been added in the list of *Scutellaria* in Korea, although the distribution of *S. orthocalyx* have not been confirmed again

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**Fig. 1.** A specimen of *Scutellaria barbata* D. Don (NIBRVP0000563222) collected from new distribution site reported in this study (Wondong wetland, Gyeongsangnam-do, Korea).



**Fig. 2.** Photographs of *Scutellaria barbata* D. Don. **A.** Habit. **B.** Rhizome. **C.** Stem. **D.** Leaf (adaxial surface). **E.** Leaf (abaxial surface). **F.** Flower. **G.** Nutlets.

after the original report (Yang, 2004).

The distribution of *S. hastifolia* in Korea have been newly reported in a previous study by Kim and Lee (1995) and assigned Korean name as Chang-gol-mu-kkot (창골무꽃), although it is based on only three herbarium specimens. While performing a comprehensive review of Korean *Scutellaria*, we found that the specimens of *S. hastifolia* used in previous taxonomic revision (Kim and Lee, 1995) were conspicuously different in leaf shapes from its isotype specimen of *S. hastifolia* (Royal Botanical Gardens, Kew, 2006). Furthermore, we recently found that the new natural distribution sites of this taxon in southern part of Korean peninsula and questioned its identification. After the literature survey of *Scutellaria* in the neighboring nations including China, Japan, and Russia, we concluded that these specimens are *S. barbata* D. Don., instead of *S. hastifolia* based on the character comparison of these specimen with original description and type specimen of *S. barbata*, especially leaf characters.

In this study, we report new distribution site of *S. barbata* in Korea and corrected a previous report for *S. hastifolia*. We provided morphological description and assigned the Korean name of *S. barbata*. We also represented an updated key of the reviewed Korean *Scutellaria* including *S. barbata*.

## Taxonomic Treatment

*Scutellaria barbata* D. Don, Prodr. Fl. Nepal. 109, 1825 (Figs. 1, 2).

**Korean name:** Chang-gol-mu-kkot (창골무꽃)

Herbs perennial, 35–50 cm tall. Stems erect, branched at inflorescences, glabrous or sparsely appressed pubescent upward. Leaves: petiole 1–5 mm long, sparsely pubescent; leaf blade narrow triangular-ovate to slightly hasti-form, 1.2–2.5 × 0.6–1.5 cm, apex acute, base broadly cuneate to subtruncate, margins obtusely shallow 3- or 4-dentate, subglabrous to sparsely appressed pubescent along veins. Inflorescences loose raceme, terminal; floral leaves similar to stem leaves, bracteoles linear, ca. 0.5 mm long; pedicels 1–2 mm long, puberulent. Flowers axillary; calyx 2–4 mm long, puberulent along veins outside, margins ciliate, to 4.5 mm long in fruit; scutellum ca. 1 mm long, to 2 mm long in fruit; corolla purple blue, 1.2–1.7 cm long, pubescent outside, sparsely pilose on throat inside; tube 30–60° angled at base, ca. 1.5 mm wide at middle, gradually dilated to ca. 3.5 mm wide at throat; upper lip semicircular, ca. 1.5 mm long; middle lobe of lower lip trapeziform, entire; lateral lobes triangular-ovate, apex acute. Nutlets brown, oblate, 1–1.5 mm in diam., papillate.

**Flowering:** May to July.

**Distribution:** Korea, China, India, Japan, Laos, Myanmar, Nepal, Taiwan, Thailand, Vietnam.

**Type:** in the Herbarium of Nepal (not seen). The type specimen of the synonym *Scutellaria komarovii* H. Lév. & Vaniot is in Royal Botanic Garden of Edinburgh.

**Specimens observed:** KOREA. Gyeonggi-do: Yangpyeong-gun, Yangseo-myeon, Yangsu-ri, 5 Jun 1986, *H. J. Jung s. n.* (SWU). Gyeongsangbuk-do: Biseulsan Mt., 12 Jul 1958, *s. n.* (SKK)\*; Uiseong-gun, Anpyeong-myeon, Majeon-ri, 18 Jul 2017, *Won-Jung Lee et al. US171318* (KB)<sup>#</sup>. Gyeongsangnam-do: Gimhae-si, Hallim-myeon, Toerae-ri, 15 Oct 2017, *J.S. Kim kjs17092* (KB)<sup>#</sup>; Haman-gun, Gaya-eup, Sanseo-ri, 13 Sep 2017, *J.S. Kim kjs17052* (KB)<sup>#</sup>; Yangsan-si, Wondong-myeon, Yongdang-ri, Wondong Wetland, 3 Jun 2000, *G. Y. Chung and H. J. Kwon s. n.* (KB)<sup>#</sup>; 25 May 2016, *J.S. Kim kjs160001, 160002, 160003* (KB)<sup>#</sup>. Seoul: Dongjak-gu, Dongjak-dong, 13 Jun 1972, *C. H. Han s. n.* (EWU)\*; 1 Jul 1932, *s. n.* (SNU)\*

Note: \*Three specimens used in previous report on *S. hastifolia* (Kim and Lee, 1995); <sup>#</sup>New distribution sites confirmed in this study.

## Key to Korean *Scutellaria* taxa

1. Rhizomes enlarged up to 3 cm in diam.; cross section of stem obtuse-square or rounded; leaves ovate-lanceolate or lanceolate ..... *S. baicalensis* 황금
1. Rhizomes not enlarged, less than 7 mm in diam.; cross section of stem swollen-edged square; leaves not ovate-lanceolate or lanceolate.
  2. Flowers in terminal racemes.
    3. Leaves narrow-triangular or hastate, base broadly cuneate or subtruncate; stem glabrous ..... *S. barbata* 창골무꽃
    3. Leaves ovate, rounded, or elliptic, base not cuneate or truncate; stem pubescent or glabrous.
    4. Plants more than 50 cm tall, unbranched; petiole less than 3 mm long; flowers longer than 3.5 cm long ..... *S. insignis* 광릉골무꽃
    4. Plants less than 40 cm tall, branched; petiole longer than leaf blade; flowers shorter than 3 cm long.
    5. Base angle of corolla tube rectangular; stems and leaves pubescent; leaf apex rounded ..... *S. indica*
    6. Leaves relatively thin, rounded to widely ovate; veins on adaxial surface not sunk ..... var. *indica* 골무꽃
    6. Leaves relatively thick, triangular cordate; veins on adaxial surface conspicuously sunk.

7. Corolla bluish purple .....  
 ..... var. *tsusimensis* 떡잎골무꽃
7. Corolla dark pink .....  
 ..... var. *coccinea* 연지골무꽃
5. Base angle of corolla tube 30–60°; stem and leaves pubescent or glabrous; leaf apex obtuse .....  
 ..... *S. pekinensis*
8. Stem and leaves glabrous or rarely pubescent; leaf base cordate.
9. Leaves 1–1.5 cm long .....  
 ..... var. *alpine* 수골무꽃
9. Leaves 3–5 cm long .....  
 ..... var. *ussuriensis* 호골무꽃
8. Stem and leaves pubescence, especially dense in ridges of stems and veins of leaves; leaf base acute or rounded.
10. Plants less than 25 cm tall; leaves less than 4 cm long; flowers less than 2 cm long, base angle of corolla tube less than 45° .....  
 ..... var. *transitra* 산골무꽃
10. Plants 35–45 cm tall; leaves 5–7 cm long; flowers longer than 2.5 cm long, base angle of corolla tube higher than 60° .....  
 ..... var. *maxima* 왕골무꽃
2. Flowers in axillary racemes.
11. Rhizomes with long leafless stolons at nodes; tubers 5–7 mm in diam. present at the end of stolons .....  
 ..... *S. tuberifera* 제주골무꽃
11. Rhizomes with stolons; no tubers.
12. Base angle of corolla tube less than 10°; corolla less than 8 mm long, upper lip shorter than lower lip .....  
 ..... *S. dependens* 애기골무꽃
12. Base angle of corolla tube higher than 45°; corolla longer than 15 mm long, length of upper lip similar to lower lip.
13. Rhizomes moniliform, with enlarged tuber-like internodes; stems glabrous; leaves narrow ovate .....  
 ..... *S. moniliorrhiza* 구슬골무꽃
13. Rhizomes not moniliform; stems pubescent; leaves linear, lanceolate, ovate or elliptic.
14. Leaves linear to lanceolate, apex acute, margins shallow-serrate .....  
 ..... *S. regeliana* 가는골무꽃
14. Leaves ovate to elliptic, apex obtuse, margins crenate .. *S. strigillosa* 참골무꽃

**Taxonomic Notes:** Although *S. hastifolia* has been reported as a new distribution record in Korea in a previous study (Kim

and Lee, 1995), we concluded that this was a misidentification of *S. barbata* based on reexamination of the herbarium sheets used in the previous study. *S. hastifolia* is different from *S. barbata* by the notation of single conspicuous teeth on the base of leaf margins and larger sized leaves. Notably, the leaf shape of *S. barbata* is also similar to that of *S. dependens*. However, it is clearly distinguished from *S. dependens* by having the following characters: the spike-raceme is placed at the terminal of stem instead of leaf axil, the base of the corolla is curved instead of straight, and the color of corolla is cyanic instead of white (Kim and Lee, 1995).

Li and Hedge (1994) have mentioned in the flora of China that *S. barbata* is distributed in Korea in addition to China and Japan, and that their habitat is specific to the margins of rice paddies, stream sides, and wet grasslands. Im (1999) also have reported the distribution of this species in Korea, but both reports did not include distribution sites in Korea or information of the voucher specimen. As a medicinal plant called ‘Banzhi-lian (半枝蓮),’ this species has been cultivated in China and rarely in Korea. Therefore, the natural distribution of this species in Korea has been debated.

One of new natural distribution site of *S. barbata* found in this study is the Wondong wetland located in Wondong-myeon, Yangsan-si in Gyeongsangnam-do. It is noted that the two populations containing ca. 10 and 20 individuals, respectively, are found in open place of the wetland. They grow together with *Galium dahuricum* var. *tokyoense* (Makino) Cufod., *Agropyron ciliare* (Trin.) Franch. and the dominant species of this area is *Phragmites communis* Trin. Based on a survey of the adjacent area, we concluded that they are natural populations rather than naturalized populations by escaped individuals from a cultivated area, because it is noted that the original habitat described in other countries (Li and Hedge, 1994) is similar to that of the new distribution site in Korea and cultivation of this species in Korea is very rare. We suggest ‘Chang-gol-mu-kkot (창골무꽃)’ as the Korean name of *S. barbata* since this species has long been misidentified as *S. hasfolia* in Korea with same Korean name.

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## Conflict of Interest

Authors declare that there is no conflict of interests.

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