A new species of *Fimbristylis* (Cyperaceae): *F. jindoensis* J. Kim & M. Kim

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하늘지기속(사초과)의 신종: 진도하늘지기 (*Fimbristylis jindoensis* J. Kim & M. Kim)

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ABSTRACT: A new species, *Fimbristylis jindoensis* J. Kim & M. Kim, is herein named and described. It is found on wet lowland mountain slopes in Jindo-gun, Jeollanam-do, Korea. *Fimbristylis jindoensis* shares several characteristics (long-creeping rhizomes, oblong spikelets, brown scales, and three-sided achenes) with the related species *F. pierotii* Miq. It is, however, distinct from *F. pierotii*, which has terete culms with five to six furrows that are 9–48 cm tall, flowers in June to July, a dry grassland habitat, fewer than ten spikelets, and simple anthela inflorescences. In contrast, the new species has shallow furrowed oval culms which are 57–93 cm tall, flowers in July to August, a wet mountain habitat, more than twenty spikelets, and compound anthela inflorescences.

Keywords: *Fimbristylis jindoensis*, *Fimbristylis*, Cyperaceae

적 요: 사초과의 하늘지기속 신종인 진도하늘지기(*Fimbristylis jindoensis* J. Kim & M. Kim)를 전라남도 진도군의 저지대 산지 습지에서 발견하여 기재하였다. 진도하늘지기는 길게 뻗는 지하경이 발달하여 들하지기(*F. pierotii* Miq.)와 유사하다. 그러나 들하지기는 줄기 단면이 5–6개의 홈이 있는 원형이고, 화경이 짧으며 (9–48 cm) 화기가 6–7월이고, 건조한 초지에 자라며, 소수가 10개 미만 달리는 단순한 화서인 반면에 진도하늘지기는 줄기 단면이 얇은 홈이 있는 타원형이고, 화경이 길며(57–93 cm) 화기가 7–8월이고 축축한 저지대 산지습지에 자라며, 20개 이상의 소수가 여러 번 갈라지는 복잡한 화서인 점에서 뚜렷이 구별된다.

주요어: 진도하늘지기, 하늘지기속, 사초과

The genus *Fimbristylis* Vahl (Cyperaceae) consists of approximately 200–300 species and is distributed primarily in tropic, subtropic, and temperate zones of the Northern Hemisphere (Ohwi, 1944; Kral, 1971; Kern, 1974; Ball et al., 2002; Zhang et al., 2010).

Fimbristylis species are generally characterized by the presence of leaf blades, leaf sheaths without long silk hairs at the apex, and nutlets without persistent style bases (Kim and

Kim, 2013, 2015). Twenty *Fimbristylis* taxa are found in Korea (Lee, 1980; Lee, 1996; Im, 2000; Lee, 2006; Oh, 2007). Of these, *F. dichotoma* (L.) Vahl and *F. autumnalis* (L.) Roemer & Schultes are widely distributed, while *F. hookeriana* Boeckeler and *F. pierotii* Miq. are rarer and more sporadically distributed (Oh, 1991; Oh and Park, 1997; Kim and Kim, 2013).

A new species of *F. jindoensis* was discovered for the first time at wet lowland mountain slopes, Jindo-gun, Jeollanam-do Province, Korea. The new species shares several characteristics (long creeping rhizomes, oblong spikelets, brown scales, and 3-sided achenes) with a related species, *F.*

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pierotii Miq., but it was distinguished by 57–93 cm tall culms, flowers in July to August, a wet mountain habitat, more than 20 spikelets, and compound anthela inflorescences. Thus, we named this new taxon as *Fimbristylis jindoensis* J. Kim & M. Kim.

Taxonomic Treatment

Fimbristylis jindoensis J. Kim and M. Kim, *sp. nov.* Figs. 1–3.

TYPE: Jisan-myeon, Jindo-gun, Jeollanam-do Province, Korea. 22 July 2014. *J. H. Kim 141308* (Holotype, JNU; Isotypes, JNU. KH); Imhoe-myeon, Jindo-gun, Jeollanam-do. 22 July 2014. *J. H. Kim 141288* (Paratype, JNU).

Korean name: 진도하늘지기 (Jin-do-ha-neul-ji-gi)

Perennials. Rhizomes 1.5–2.5 mm diam., long-creeping, covered with ovate brown scales. Culms solitary, 57–93 cm

Fig. 1. Photographs of *Fimbristylis jindoensis* J. Kim and M. Kim. A. Habit; B. Inflorescence; C. Rhizome; D. Culm cross section; E. Spikelet; F. Achene; G. Pistil.

Fig. 2. Illustrations of *Fimbristylis jindoensis* J. Kim and M. Kim. A. Habit; B. Rhizome; C. Ligule; D. Inflorescence; E. Spikelet; F. Culm cross section; G. Scale; H. Leaf apically; I. Pistil; J. Flower; K. Downside view of achene; L. Achene.

tall, 1.7–3.2 mm diam, compressed oval, 3–5 striate, glabrous, apically scabrid, with 3–5 leaves at base. Ligule very short, ciliate. Leaves shorter than culm, leaf blade 7–51 cm long, 1–3 mm wide, flat, upper margin finely serrulate, apex acute. Involucral bracts 2–4, 1.7–10.2 cm long, suberect, setaceous to leaves, much shorter than inflorescence, sometimes longer than inflorescence, base dilated, margin finely serrulate. Inflorescence compound anthela with more than 20 spikelets, 2.2–8.0 cm long, 1.1–4.5 cm wide, rays 3–11, 0.8–5.7 cm long, slightly striate. Spikelets 5–15 flowered whirl, solitary, oblong or narrowly ovoid, 4.2–7.2 mm long, 1.2–1.7 mm wide, apex acute. Scales broadly ovate, pale brown to yellowish brown, 2.8–3.6 mm long, 2.0–2.9 mm wide, margin hyaline, strongly folded by a 3-veined keel, veins yellowish green projecting into a acute. Stamens 3, anthers yellow, 1.8–2.3 mm long. Style not ciliate, 3-angled. 1.6–1.8 mm long, stigmas 3, 0.9–1.5 mm long. Achene white or yellowish white, obovoid 3-sided, 0.7–0.9 mm long, 0.5–

Fig. 3. Holotype of *Fimbristylis jindoensis* J. Kim and M. Kim.

0.6 mm wide, with sparsely verruculose. Flowering and fruiting July to August.

Distribution: Southern Korea (Jindo-gun, Jeollanam-do).

Etymology: The specific epithet was derived from the type locality, Jindo island, Korea.

Habitat: This new species grows on wet lowland mountain slopes in Southern Korea.

Flowering and Fruiting: July to August

Notes: The new species, *F. jindoensis* J. Kim & M. Kim, closely resembles *F. pierotii* as it has long-creeping rhizomes, but is distinguished by its wet lowland habitat, July to August flowering period, and compound anthela inflorescences. Its inflorescence are similar to those of *F. complanata* var. *exaltata* (T. Koyama) Y. C. Tang ex S. R. Zhang and T. Koyama, but it is distinguishable from that species having short rhizome, 13–48 cm tall culms, and flowers in August to October.

Using the IUCN Red List Categories and Criteria (IUCN, 2011), *F. jindoensis* is categorized as endangered (EN) species because of its small population located only on wet lowland mountain slopes.

Table 1. Comparison of morphological characters of *Fimbristylis pierotii*, *F. jindoensis* and *F. complanata* var. *exaltata*.

Character	<i>F. pierotii</i> *	<i>F. jindoensis</i>	<i>F. complanata</i> var. <i>exaltata</i> *
Plant length	9–48 cm	57–93 cm	13–48 cm
Rhizome	long-creeping	long-creeping	very short
Culm cross section	5–6 furrowed circle	shallow furrowed oval	shallow furrowed oval
Inflorescences	simple anthela	compound anthela	compound anthela
Spikelet shape	oblong	oblong	oblong
Spikelet length	4.8–13.2 mm	4.2–7.2 mm	4.4–9.6 mm
Spikelet width	1.7–3.2 mm	1.2–1.7 mm	1.2–1.6 mm
Scale color	brown	brown	brown
Scale apex	sub-acute	acute	acute
Scale length	4.0–5.2 mm	2.8–3.6 mm	2.2–3.2 mm
Stamen numbers	3	3	3
Style length	2.5–3.1 mm	1.6–1.8 mm	1.4–1.9 mm
Stigma	3	3	3
Anther length	1.9–2.3 mm	1.8–2.3 mm	1.2–1.6 mm
Achene shape	3-sided	3-sided	3-sided
Achene length	1.2–1.4 mm	0.7–0.9 mm	0.7–0.8 mm
Achene width	0.9–1.1 mm	0.5–0.6 mm	0.4–0.6 mm
Habitats	dry grasslands	mountain wetlands	mountain wetlands
Flowering	Jun. to Jul.	Jul. to Aug.	Aug. to Oct.

*Data from Kim (2015).

Key to *Fimbristylis jindoensis* and its related taxa.

1. Spikelets very narrowly ovoid to linear
..... *F. hookeriana*. 바위하늘지기
1. Spikelets ovoid, oblong, narrowly oblong and ovoid-ellipsoid.
2. Inflorescences 1 spikelet ... *F. subbispicata* 풀하늘지기
2. Inflorescences 2 or more spikelets.
3. Achene terete, cross section circle
..... *F. stantonii* 밭하늘지기
3. Achene obovoid 3-sided, cross section biconvex or 3-sided.
4. Style compressed and ciliate, stigmas 2.
5. Style base with long hairs
..... *F. squarrosa* 민하늘지기
5. Style base glabrous.
6. Scale less than 1.5 mm
..... *F. aestivalis* 좁민하늘지기
6. Scale longer than 2 mm.
7. Leaf blade folded, achene sub-smooth
..... *F. sieboldii* 갯하늘지기
7. Leaf blade flat, achene with reticulation.
8. Spikelet narrowly oblong, achene with hexagonal reticulation *F. longispica* 큰하늘지기

8. Spikelet ovoid, ellipsoid, achene with transversely oblong reticulation ... *F. dichotoma* 하늘지기
4. Style 3-sided and not ciliate, stigmas 3 or 2.
9. Rhizomes absent, flowering August to October.
10. Annuals, leaf blade compressed
..... *F. littoralis* 바람하늘지기
10. Perennials, leaf blade flat.
11. Spikelet fewer than 20 flower, scale longer than 2 mm
..... *F. complanata* var. *exaltata* 어른지기
11. Spikelet more than 30 flower, scale less than 1.5 mm.
12. Stamen 2, scale blackish brown, spikelet ovate
..... *F. diphyloides* 검정하늘지기
12. Stamen 1 (rarely 2), scale straw-yellow, spikelet ovated oval *F. drizae* 물하늘지기
9. Rhizomes creeping, flowering May to August.
13. Culms 5–6 furrowed circle and 9–48 cm tall, flowering June to July. fewer than 10 spikelet. simple anthela, sunny dry habitat.
..... *F. pierotii* 들하늘지기
13. Culms shallow furrowed oval and 57–93 cm tall, flowering July to August, more than 20 spikelets, compound anthela, wet lowland habitat.
..... *F. jindoensis* 진도하늘지기

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