

# New records of mosses to Sichuan Province, China

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**Abstract:** Based on field investigation and identification of more than 1 000 specimens collected from Gongga Mountain, the highest peak in Sichuan Province, 321 species, 133 genera and 40 families of mosses are recognized. Among them, 12 species belonging to 12 genera, 10 families are new to Sichuan Province and reported in detail herewith.

**Key words:** Mosses; Sichuan Province; Gongga Mountain; new records

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## 四川省藓类植物新记录

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**摘要:** 在对四川省第一高峰贡嘎山的野外调查和 1 000 余份采集标本鉴定的基础上, 现已知贡嘎山有藓类植物 40 科, 133 属, 321 种。其中, 隶属于 10 科, 12 属的 12 种为四川省苔藓植物新记录种。该文就新记录种进行详细报道, 为中国和四川省的苔藓植物区系研究提供新的资料。

**关键词:** 藓类植物; 四川省; 贡嘎山; 新记录

Sichuan Province, in China's western hinterland, covers most of the Sichuan Basin and is surrounded by mountains. It is gifted with lush mountains and exquisite waters, and abounds in historical and cultural resources. Sichuan is known as the "land of abundance, the heaven of animals and plants". Sichuan also is one of provinces with the richest biodiversity of mosses in China. Based on literature survey before 1996, Redfearn *et al.* in a newly updated and annotated checklist of Chinese mosses listed 649 species belonging to 224 genera and 53 families of mosses from Sichuan (Redfearn *et al.*, 1996). Since then, the publication of Flora Bryophytorum Sinicorum volumes 1-4, 6-8 (Gao, 1994, 1996;

Li, 2000, 2006; Wu, 2001; Hu & Wang, 2005; Wu & Jia, 2004), Moss Flora of China (English version) volumes 1-4, 6-8 (Gao & Crosby, 1999, 2003; Li & Crosby, 2001, 2007; Wu & Crosby, 2002, 2005; Hu *et al.*, 2008) and Bryoflora of Hengduan Mountains (Wu, 2000) added many new mosses to Sichuan Province. Also the bryophytes from some famous areas such as Dujiangyan (Jia *et al.*, 2002; He, 2005), Southeast of Chongqing (He, 2005), Mt. Emei (Pei, 2006) etc. in Sichuan have been investigated and reported. According to the literatures concerned until 2010, 1166 species belonging to 302 genera, 59 families of mosses are recorded from Sichuan Province before present research.

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Gongga Mountain, the highest peak in Sichuan Province, especially in Hengduan Mountains, is located at 29°20'—30°00' N, 101°30'—102°10' E with altitude from 1 680 m to 7 556 m above sea level (Shen *et al.*, 2004). It is the transition zone between Sichuan Basin and Qinghai-Tibet Plateau, and also an intersection region in a variety of natural elements, with sub-tropical, temperate and frigid zones on the mountain. Mt. Gongga is one of 25 global hot-spot areas of biodiversity conservation in the world. However, no special field survey for bryophytes has been carried out on the Mountain. Only 85 species belonging to 52 genera, 27 families have been recorded in Flora Bryophorum Sinicum volumes 1—4, 6—8, Moss Flora of China Volume 1—4, 6—8 and Bryoflora of Hengduan Mts, as well as some ecological studies from the mountain (Yan & Bao, 2008; Zhang, 2007; Guan *et al.*, 1984; Wang, *et al.*, 2007).

In order to better understand the bryoflora of Sichuan Province as well as China, a field investigation for bryophytes was carried out on Mt. Gongga in 2009—2010 and more than 1 000 specimens of mosses were collected from different elevations and habitats. Based on field investigation and identification of the collected specimens, 321 species, 133 genera and 40 families of mosses from Mt. Gongga in Sichuan Province of China are recorded for the first time. (It will be reported in a separate paper). Among them, 12 species belonging to 12 genera, 10 families are new records for Sichuan and reported here in detail. All specimens cited are deposited at Herbarium of Shanghai Normal University (SHNU).

The species new to Sichuan Province are reported in detail as follows:

**1 *Dicranodontium porodictyon* Card. et Ther. (Dicranaceae)**

The main distinguished characters of this species are: (1) leaves linear-lanceolate, rather abruptly narrowed from an ovate, slightly concave base to a very long, canalculated and setaceous subula; (2) single cost occupying ca. 1/3 the leaf base width, excurrent in a very long awn; (3) low leaf cells rec-

tangular, thick-walled, porose, becoming narrower and linear toward the margins. This species has been recorded from Guizhou, Hainan, Hunan, Xizang in China (Gao, 1994; Gao & Crosby, 1999).

Specimens examined: Lingshi Lama Temple, alt. 2 790 m, on tree trunks and branches 90832, 90836, T. Cao, ZH Li; Near Jinshan Hotel, alt. 2 900 m, on rocks, 91856, T. Cao, ZH Li; Ganheba, alt. 3 020 m, on rotten wood, 91799, 90360, T. Cao, ZH Li; Changcaoba, alt. 3 600 m, on fallen tree in the running water, 91831, T. Cao, ZH Li; Near Mt. Gongga ropeway station, alt. 3 650 m, on rotten wood, 90190, T. Cao.

**2 *Dicranum setifolium* Card. (Dicranaceae)**

This species is distinguished by slender plants in dense tufts; leaves lanceolate, with long, channeled, linear acumen; cost slender, occupying ca. 1/7 the leaf base, ending in a short hair-point, smooth at back above; and basal cells elongate, strongly thick-walled and porose. The species was only recorded from Changbai Mountain, Jilin, Northeast China before (Gao, 1994; Gao & Crosby, 1999).

Specimens examined: Caohaizi, alt. 2 870 m, on tree trunks, 90504, T. Cao; Near Jinshan Hotel, alt. 2 900 m, on tree trunks, 90104B, T. Cao.

**3 *Campylopus atrovirens* De Not. (Dicranaceae)**

This species is characterized by long and slender leaves with hyaline hair-point at tip; single and brownish cost occupying 1/2 the leaf-base width, and elongate-oval cells with thick walls at upper and middle parts of leaf. The species have been reported from Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Shaanxi, Xizang, Yunnan, Zhejiang in China (Gao, 1994; Gao & Crosby, 1999).

Specimen examined: Changcaoba; alt. 3 600 m. on fallen tree in the running water, T. Cao, ZH Li. 091832.

**4 *Hydrogonium javanicum* (Dozy. et Molk.) Hilp. (Pottiaceae)**

This species is distinguished by small plants, 5—10 mm high; ovate-ligulate leaves with obtuse apex; cost stout, percurrent; upper leaf cells irregu-

larly quadrate to hexagonal, thick-walled, mostly smooth. The species has been recorded from Anhui, Hainan, Henan, Jiangsu, Xizang, Yunnan (Gao, 1996; Li & Crosby, 1999).

Specimen examined: Glacier hot spring, alt. 2 600 m, on stream rocks of hot spring, 90825, T. Cao.

**5 *Ulotia gymnostoma* S. L. Guo, Enroth & Virtanen (Orthotrichaceae)**

*Ulotia gymnostoma* is a species newly described by Guo *et al.* from Hunan, China in 2004 (Guo *et al.*, 2004). It is distinguished from the other species in genus *Ulotia* mainly by the gymnostomous capsule (capsule without peristome). This species superficially somewhat similar to *Orthotrichum*, but it combines an *Ulotia* gametophyte with a *Macromitrium* sporophyte. The new record of this species from Sichuan confirmed this new species in China.

Specimen examined: Jingliuchang, alt. 1 980 m, on tree trunks, 90848, T. Cao.

**6 *Aerobryopsis yunnanensis* X. J. Li et D. C. Zhang (Metoriaceae)**

This species is distinguished by having long, robust plants with irregular branches; leaves broad-ovate lanceolate, with distinct crisped apex and toothed margins; leaf cells short-rhombus, with a central papilla. The species is endemic to China and was described from Yunnan in 2003 by Li et Zhang (Li, 2005; Zhang *et al.*, 2003).

Specimen examined: Village near a bridge, alt. 1 830 m, on sandy soil, 90897, T. Cao.

**7 *Hypopterygium formosanum* Nog. (Hypopterygiaceae)**

This species is characterized by plants dendroid; lateral leaves elongate-ovate, asymmetric, with shortly acute apices; leaf margins bordered by 1–2 rows of narrowly elongate cells, serrate throughout; amphigastria small, broadly ovate, symmetric, with short acumens. The species has been recorded from Anhui, Jilin, Liaoning, Taiwan (Wu, 2001; Wu & Crosby, 2002).

Specimens examined: Jingliuchang, alt. 1 980 m, on sandy soil, 90903, T. Cao.

**8 *Pseudoleskeopsis tosana* Card. (Leskeaceae)**

This species is distinguished by primary stems creeping with numerous and short branches in mats; stem leaves broadly lanceolate, gradually tapered to a long acuminate apex; branch leaves ovate to oblong-ovate, acute, usually secund, asymmetric; margins dentate, apical cells projecting and dentate at leaf tips; leaf cells longer, rectangular, smooth, thick-walled. The species has been recorded from Hainan, Shandong, Zhejiang (Wu, 2001; Wu & Crosby, 2002).

Specimen examined: Jingliuchang, alt. 1980 m, on rocks, 90869, T. Cao.

**9 *Bryhnia hultenii* Bartr. (Brachytheciaceae)**

This species is easily recognized by the leaves broadly ovate, concave, acute or apiculate, often cucullate at apex, decurrent at base; leaf cells short, elongate-rhombic with rounded ends, thin-walled; and alar cells distinctly differentiated, quadrate, thin-walled. The species has been recorded from Heilongjiang, Liaoning, Shaanxi, Xizang, Yunnan (Hu *et al.*, 2005, 2008).

Specimens examined: Near Mt. Gongga ropeway station, alt. 3 080 m, on soil, 90251, T. Cao.

**10 *Entodontopsis wightii* (Mitt.) Buck et Ireland (Stereophyllaceae)**

This species is characterized by plants rather slender, glossy, often in closely appressed mats; leaves 4-ranked, complanate, oblong-ovate-lanceolate, rather abruptly acute at apex; cost single, reaching ca. 1/2 the leaf length; and alar cells differentiated, consisting of several rows of shortly rectangular cells. The species has been recorded from Yunnan (Hu *et al.*, 2005, 2008).

Specimen examined: Jingliuchang, alt. 1 980 m, on tree branches, 90862, T. Cao.

**11 *Hypnum recurvatum* (Lindb. et Arn.) Kindb. (Hypnaceae)**

This species is characterized by stem leaves ovate-lanceolate to oblong-lanceolate, falcate-se-cund, concave, slenderly acuminate, with recurved margins below; cost double, weak or absent; alar cells differentiated, subquadrate, thin-walled; and

pseudoparaphylla often present, linear or filamentous. The species has been recorded from Shaanxi, Xizang, Yunnan (Wu & Jia, 2004; Wu & Crosby, 2005).

Specimen examined; Mt. Gongga ropeway station, alt. 3 083 m, on tree trunks, 90257, T. Cao.

## 12 *Macrothamnium javense* Fleisch. (Hylocomiaceae)

This species is distinguished by robust, dendroid plants; stem leaves cordate at base, semi-orbicular, concave, broadly acute or obtuse; margins sharply toothed above; cost distinctly double; branch leaves ovate to oblong-ovate, broadly acute. The species has been recorded from Xizang, Yunnan (Wu & Jia, 2004; Wu & Crosby, 2005).

Specimens examined; Caohaizi, alt. 2 870 m, on tree trunks, 31078, 31079, T. Cao, ZH Li.

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