Postprint of the Discovery of Schistostegaceae in Xinjiang, China

Authors: Mamatimin Sulayman

Date: 2023-01-17T00:00:00+00:00

Abstract

This paper reports the discovery of Schistostega pennata (Hedw.) F. Weber & D. Mohr (Schistostegaceae) in the Altai Mountains of Xinjiang, China, representing the second record in China and a new record for Xinjiang, and describes and discusses its morphological characteristics and ecological environment.

Full Text

Discovery of the Moss Family Schistostegaceae in Xinjiang, China

Mamtimin SULAYMAN[1], **Alanur KAHAR**[1], **LIANG Lingwei**[1], **Mamurbieke MAKAN**[2], **WANG Pengjun**[1]
[1]Xinjiang Key Laboratory of Biological Resources and Genetic Engineering, College of Life Science and Technology, Xinjiang University, Urumqi 830046, Xinjiang, China
[2]Wildlife Protection Division, Xinjiang Altai Mountain State Forestry Administration, Altai 836500, Xinjiang, China

Abstract
This paper reports the second record in China and a new provincial record for Xinjiang of *Schistostega pennata* (Hedw.) F. Weber & D. Mohr (Schistostegaceae) from the Altai Mountains in Xinjiang. The morphological characteristics and ecological environment are described and discussed.

Keywords: *Schistostega pennata*; Altai Mountain; new record; Xinjiang

Schistostega pennata (Hedw.) F. Weber & D. Mohr belongs to the phylum Bryophyta, class Bryopsida, order Schistostegales, family Schistostegaceae, genus *Schistostega*. Currently, there is only one species worldwide. In bryophytes, *Schistostega* has always been considered a relatively special group.

Because this plant mostly grows in dark, damp caves, cliff crevices, and under fallen tree roots and can emit a golden-green light, it is called "glowing moss" or "goblin' s gold" [1]. *Schistostega* is widely distributed in temperate regions of the Northern Hemisphere, with records from northern and central-western Europe [2], Russia and Siberia [3], Japan [4], and North America (Canada, USA) [5]. In China, it was first discovered in the crevices of rocks under forests in Changbai Mountain, Jilin Province, northeastern China [6]. Bryologists from various countries have conducted multifaceted research on the plant' s growth and development, protonema structure, and ecological and geographical distribution. Results show that the protonema of *Schistostega* can produce swollen, lens-like cell chains, and these convex cells focus light onto internal chloroplasts, thereby enabling growth in dark habitats and emitting green fluorescence. Kanda [7] and Ignatov [8] studied the growth patterns of *Schistostega* protonema and found that it has significant plasticity and ground-fixing ability.

1 Materials and Methods

1.1 Materials

During a comprehensive biodiversity scientific expedition to the Altai Mountains in Xinjiang in July 2021, the authors discovered a luminous moss plant in a small cave in the Korchiyet Valley, Fuhai County, Altai Mountains. After photographing in the field, a small amount of specimen was collected and prepared as a permanent specimen in the laboratory. The citation specimen is: Xinjiang, Altai Mountains, Fuhai County, Korchiyet Valley, growing on thin soil on rock surface in a small cave, 1756 m, 47°58 06.47 N, 88°41 23.87 E, Mamtimin Sulayman 26167, XJU (Xinjiang University Herbarium).

1.2 Methods

Through classical taxonomic methods, leaf sections were prepared and observed using an Olympus SZM-45B2 microscope. The collected specimens were examined and *Moss Flora of China* [9] was consulted. Representative complete plants were selected and structures such as leaves, leaf cells, and stem cross-sections were observed under a Motic DMB-1223 biological digital microscope. Plant line drawings were made (Figures 7[Figure 7: see original paper]~12).

2 Results

2.1 Morphological Characteristics of *Schistostega pennata* (Hedw.) F. Weber & D. Mohr

Schistostega pennata is small in size, gray-green to brown-green, with a height of only 2–3 mm. Its main characteristics are: protonema is well-developed and persistent, often emitting bright green light in dark places; sterile stems are single, sterile plant bodies are slender and flat, with leaves only on the upper part; reproductive stems grow to 3.3 mm, with leaves on the apical part.

Leaves are arranged in two lateral rows, asymmetrical; leaf lamina is membranous, transparent, without a midrib, acuminate, with decurrent leaf base and indistinctly differentiated margins. Leaf cells are rectangular or long-hexagonal, with thin walls. The species is dioecious, with male and female reproductive branches growing on the same protonema. The seta is slender, the capsule is erect, broadly ovate or nearly spherical, wide at the base and small at the mouth; without annulus, the peristome teeth are divided, smooth. The calyptra is cucullate, smooth (Figures 7[Figure 7: see original paper]~12).

2.2 Ecological Environment of *Schistostega pennata*

Schistostega pennata grows on thin soil on rock surfaces in small caves in the Korchiyet Valley, Fuhai County, Altai Mountains, Xinjiang. The Altai Mountains are the southernmost distribution area of the Arctic taiga forest. *Schistostega* was discovered in the dark coniferous forest belt at an altitude of 1756 m. The main constructive tree species of the forest are *Picea schrenkiana*, *Pinus sibirica* Fisch. et Mey., *Picea obovata* Tour., and *Larix sibirica*. The forest understory is cool and moist, with humus covering the ground, the soil is brown coniferous forest soil, and the canopy density reaches 65%~75%. Within the forest, in small caves (Figure 2[Figure 2: see original paper]), it forms sparse single-species communities, appearing to sparkle when viewed from certain angles. The moss plant coverage reaches 65%~75%. The main moss species in the understory include *Ptilium crista-castrensis* (Hedw.) De Not., *Dicranum scoparium* Hedw., *Hylocomium splendens* (Hedw.) Schimp., and *Rhytidiadelphus triquetrus* (Hedw.) Warnst. The moss species found growing in the microhabitat where *Schistostega* was discovered include: *Distichium capillaceum* (Hedw.) Bruch & Schimp., *Pohlia cruda* (Hedw.) Lindb., *Pylaisia polyantha* (Hedw.) Schimp., *Plagiothecium laetum* (Hedw.) Schimp., *Drepanocladus aduncus* (Hedw.) Warnst., and *Amblystegium varium* (Hedw.) Lindb.

3 Discussion

With in-depth research on Chinese mosses, more distribution records of *Schistostega* are expected to be discovered in northern China. Cao et al. [12] listed *Schistostega* in the first national red list of Chinese endangered bryophytes. The discovery of *Schistostega* in Xinjiang is the second record point in China. It is recommended to strengthen environmental protection at the collection site in the Altai Mountains of Xinjiang.

Acknowledgments

Professor Cao Tong from Shanghai Normal University provided enthusiastic help and guidance, and revised the full text, for which we express our sincere gratitude.

References

[1] Crum H A, Anderson L E. Mosses of Eastern North America[M]. New York: Columbia University Press, 1981, 1: 663.
[2] Bruch P, Schimper W P, Gumbel T[C]//Schimper W P. Bryologia Europaea seu Genera Muscorum Europaeorum Monographice Illustrata. Stuttgartiae Schweizerbart. Whitefish: Kessinger Publishing, 1851, Ill: 268.
[3] Ignatov M S, Afonina O M. Checklist of mosses of the former USSR[J]. Arctoa, 1992, 1: 1-85.
[4] Noguchi A, Iwatsuki Z. Moss Flora of Japan 2[M]. Nichinan: Hattori Botanical Laboratory, 1988: 243-491.
[5] Grout A J. Moss Flora of North America. 2[M]. Vermont: Newfane, 1933-1940: 1-284.
[6] Cao T, Fu Xing, Gao Qian, et al. Discovery of a moss family Schistostegaceae in Changbai Mountain China[J]. Acta Phytotaxonomica Sinica, 1999, 37(4): 403-406.
[7] Kanda H. *Schistostega pennata* Hedw. In Hokkaido: Its ecology and germination[J]. Hikobia, 1971, 6(2): 60-75.
[8] Ignatov M S, Ignatova E A, Belousova A A. Additional observations on protonemata of *Schistostega pennata* (Bryophyta)[J]. Arctoa, 2012, 21: 1-20.
[9] Li X J, Marshall R. Crosby(Editors in Chief). Moss Flora of China Vol. 2[M]. Beijing: New York: Science Press & Missouri Botanical Garden(St. Louis), 2001.
[10] Lye K A. Studies in Norwegian bryophytes. 1. The family Schistostegaceae[J]. Lindbergia, 1972, 1: 205-213.
[11] Ochyra R, Szmajda P, Bochenski W, et al. *Schistostega pennata* (Hedw.) Web. & Mohr[C]// Tobolewski Z, Wojterski T. Atlas Rozmieszczenia Roslin Zarodnikowich Polsce. Ser. 5 Mchy (Musci). Poznan, 1988, 4: 15-17.
[12] Cao T, Zhu R L, Tan B C, et al. A report of the first national red list of Chinese endangered bryophytes[J]. Journal Hattori Botanical Laboratory, 2006, 99: 275-295.

Note: Figure translations are in progress. See original paper for figures.