骨生苔藓在中国的新记录

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摘 要：在四川省马边大风顶国家级自然保护区的高山草甸上发现了生长在牦牛骨头上的苔藓。共有四种藓类植物：真藓科的真藓、刺叶真藓、丛藓科的短叶小石藓以及葫芦藓科的中华葫芦藓，它们都是顶蒴藓类。这是骨生苔藓植物在中国的首次记录报道。

关键词：藓类植物；牦牛；骨头

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New records of mosses growing on bones in China

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Abstract: Four acrocarpous moss species growing on the bones of *Bos grunniens* L. were collected in alpine meadow of Mabian Dafengding National Nature Reserve, Sichuan, China. They were *Bryum argenteum* Hedw. of Bryaceae, *Bryum lonchocaulon* C. Muell. of Bryaceae, *Weisia semipallida* C. Muell. of Pottiaceae, *Funaria sinensis* Dix. of Funariaceae. This is the first report of the bryophytes growing on the bones in China.

Key words: moss species; *Bos grunniens*; bone

1 Introduction

Bryophytes, which can be found almost everywhere on earth, grow on various substrates, such as rocks, cement, gravel, tree trunks, rotting timbers, and even phyllosphere of vascular plants, but it is unusual that some moss species can grow on animal bones. Species of *Tetraplodon* in the Splachnaceae, Musci, commonly grow on animal remains, such as hair, bones and carcasses (Koponen, 1983). The substrates of *T. blyttii* Frisvoll in Jan Mayen were excrement of bone, feather and down (Frisvoll, 1983). Someone pointed out that mosses growing on bones of Antarctic petrels were common in continental Antarctica, but there wasn't any formal report. In China, mosses growing on bones had never been found before. This paper will describe some moss species which do not belong to the Splachnaceae that growing on the substrates of mammal bones.

2 Methods

On July 10, 2008, the authors found some bones with mosses growing on them in Mabian Dafengding National Nature Reserve, Sichuan, China. They were found in alpine meadow at 3 910 m al., close to the mountaintop, 103°15′20.3″ E, 28°34′32.8″ N (Fig. 1). Specimens were identified under microscope, imaged by Olympus BX51 and stored in CAU herbarium.

3 Results

3.1 Bones

The bones were identified by Professor ZHANG Zhao-Qun from Institute of Vertebrate Paleontology

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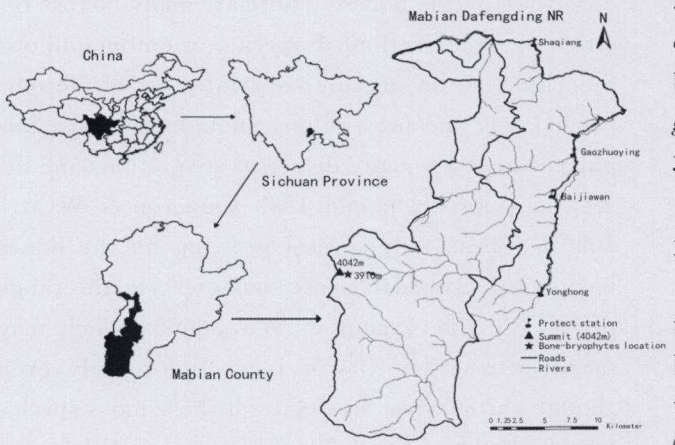

Fig. 1　Location of the bone-mosses collecting site, 103°15′20.3″ E, 28°34′32.8″ N

and Paleoanthropology, Chinese Academy of Sciences. They were metatarsal, radius, cervical vertebra and scapula of a immature Chinese yak (*Bos grunniens*).

3.2 Moss species

There were four moss species growing on the yak bones(Fig. 2).

Bryum argenteum Hedw., plants in loose tufts. Stems ca. 13 mm long, leaves imbricate, broadly ovate or suborbicular, cymbiform, obtuse to acute, cuspidate or shortly acuminate, to 1 mm × 0.5 mm; colorless and hyaline above, reddish below; costa greenish, ending below, or extending to the leaf apex, seta 10—15 mm long. Dominant species on the bones, often occurs on rock, soil, tree base, roofs of old house, base of concrete walls etc; widely distributes throughout the world(Li, 2006).

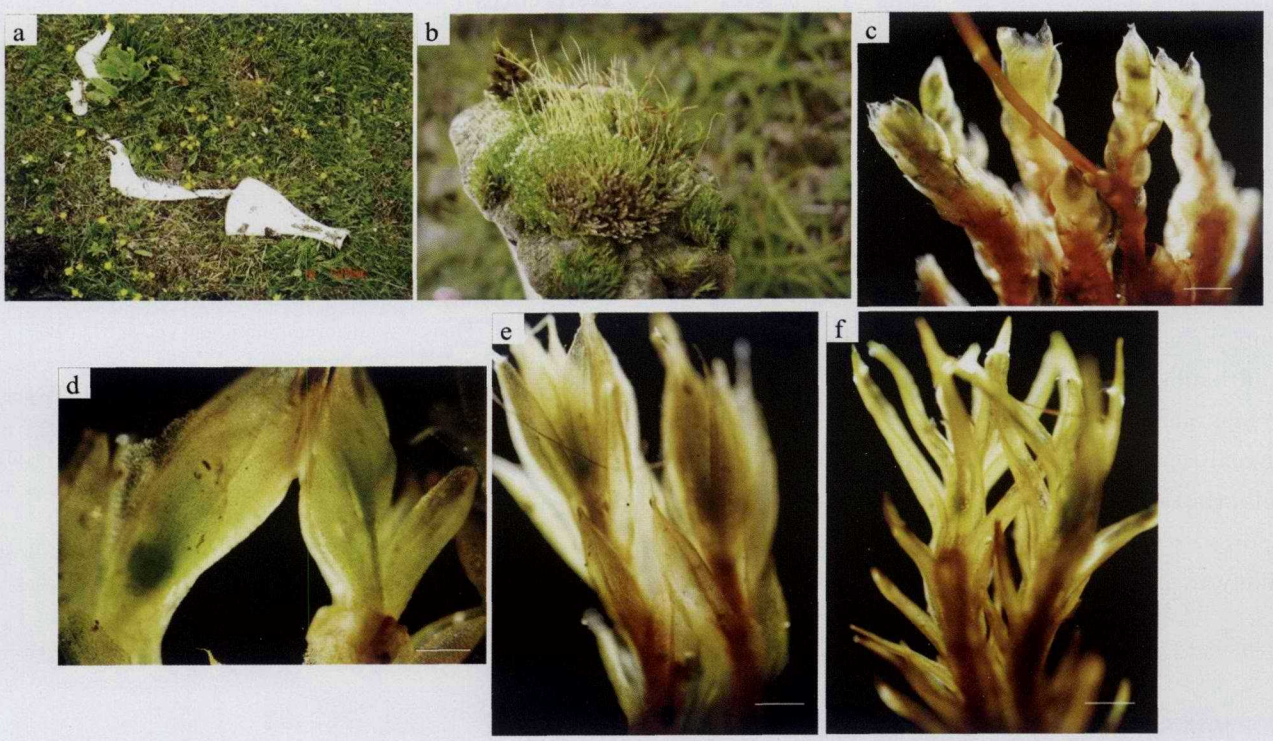

Fig. 2　Species growing on the bone　**a.** distribution site; **b.** bone with mosses; **c.** *Bryum argenteum*; **d.** *Funaria sinensis*; **e.** *Bryum lonchocaulon*; **f.** *Weisia semipallida* (bar=500 μm)

Bryum lonchocaulon C. Muell., plants mixed with *B. argenteum*. Stems ca. 12 mm long, leaves appressed and slightly twisted when dry, oblong to lanceolate, to 3 mm × 1 mm, acuminate, keeled; margins revolute almost throughout the entire length. Accompanied species on the bones, widely occurs on soil in alpine medow of arctic and northern hemisphere(Li, 2006).

Weisia semipallida C. Muell., plants mixed

with *B. argenteum*. Stems ca. 12 mm long, leaves linear-lanceolate, to 3 mm × 0.5 mm, margins strongly involute in the upper half but plane in the lower half; basal laminal cells rectangular and smooth, upper cells hexagonal-rounded, with dense lecotropal papillae. Accompanied species on the bones, widely distributed Chinese endemic species, occurs on soil, stone, walls(Gao, 1996).

Funaria sinensis Dix., plants mixed with *B. argenteum*. Stems ca. 15 mm long, leaves crowded in the upper stem, entire; costa extending to the leaf apex; median laminal cells rectangular or oblong-rectangular, thin-walled, basal cells elongate-rectangular. Accompanied species on the bones, Chinese endemic species, occurs on forest ground, soil over rock, cave edge, etc(Li, 2000).

4 Discussion

The colonization of bryophytes on a new substrate reveals their adaption to the environment, which may depends on their characteristics and reproductive ability. The results show that all these four moss species growing on the bones adapt to multi-substrates, and distribute widely in China. While most moss species rely mainly on various asexual reproduction means, like fragmentation, bulbils, rhizoidal tubers and gammae (Glime, 2006), spores as the sexual reproduction means are more likely to play a significant role in the colonization of mosses on the bones. There are many factors restrict the colonization of species in entomophilous Splachnaceae on organic substrates which decompose slowly and persist long enough, the most important ones are spore dispersal adaptations and insect behaviors(Koponen, 1983; Cameron & Wyatt, 1986). These four species growing on the bones have relatively small spore diameters, in the range of 10 − 20 μm (Zhang & Wu, 2006), which may make their settlements on bones more easily, even though the survival strategies of these moss species were unknown. Further studies are needed to understand their spores dispersal and adaption to this special habitat.

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