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Studies on the bryodiversity of Ladakh (Trans-Himalaya) - III. *Riccia frostii* Aust.: an addition to the hepatic flora of Ladakh

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ABSTRACT

Dolma K. & Langer A. 2013. Studies on the bryodiversity of Ladakh (Trans-Himalaya) - III. *Riccia frostii* Aust.: an addition to the hepatic flora of Ladakh. Geophytology 42(1): 65-69.

The paper reports occurrence of *Riccia frostii* Aust. inhabiting moist soil near a stream, for the first time, from Nubra Valley of Ladakh, thus raising the number of hepatic taxa reported from the region to 20.

Key-words: Bryodiversity, Hepaticae, *Riccia frostii* Aust., Ladakh, Jammu & Kashmir, India.

INTRODUCTION

Ladakh or 'Little Tibet' encompasses a large tract of high mountains along the Indus River (Jammu & Kashmir, India), north of the main range of West Himalaya. Bounded by two of the world's mightiest mountain ranges, the Karakoram in the north and the Great Himalaya in the south, it is traversed by two other parallel chains, the Ladakh and the Zansker ranges. It lies on the rain shadow side of the Himalaya, where dry monsoon winds reach after being robbed of their moisture in the plains and Himalayan Mountain. The peculiar, though species poor, desert and high altitude flora of Ladakh has attracted the attention of botanists since the second half of the 19th century. Presently, sandwiched between the borders of Pakistan and China, Ladakh remained difficult to access, both on account of its physical geography and on strategic and political grounds. The area has been explored for its flowering plants by a number of workers (Stewart 1916-1917, Kachroo et al. 1977, Kaul 1997, Vishwanathan 1999). So far as the bryoexploration of the region is concerned, very few attempts have been made till date (Kashyap 1929, 1932, Tanwir & Langer 2006, Dolma & Langer in press). As a result of these, 19 hepatic taxa were reported. The present communication puts on record, a new hepatic taxon *Riccia frostii* Aust. from the Nubra valley of Ladakh which lies at the western end of Trans-Himalaya.

MATERIAL AND METHOD

Plants of *Riccia frostii* were collected from Sumoor in Nubra valley during August-November 2010. Information on various ecological characters (habitat, altitude, patch plant associates, etc.) and morphological parameters (plant texture, colour) was recorded in the field. Thalli were brought to laboratory for detailed morpho-anatomical study of various gametophytic and sporophytic structures.

OBSERVATION

Plants of *Riccia frostii* inhabited moist soil of a stream bank showing receding water, under fully exposed conditions (Plate 1, figure 1), at an altitude of 3146 m. Thalli appeared in the field during last week of August; forming perfect red and green rosettes (Plate 1, figures 2-3); red rosettes 0.5-0.9 cm in diameter

each with 5-12 plants (Plate 1, figure 4); green rosettes 0.7-1.5 cm in diameter each with 8-15 plants with overlapping thalli (Plate 1, figure 5). No plant was collected growing in association with the patches of *R. frostii*.

Green thalli 0.2-0.5 cm x 0.1-0.3 cm; red thalli 0.2-0.5 cm x 0.05-0.2 cm; 1-2 times dichotomously branched.

Plants dioecious, male and female plants forming separate patches; male plants comparatively smaller, reddish; female plants larger, greenish. Sex organs appeared during last week of September and persisted till mid-November.

DISCUSSION

Genus *Riccia* comprises 140 species (Kachroo 1955, Khan 1957) distributed all over the world. A total of 33 species have been reported from India (Bapna & Kachroo 2000). The species are essentially terrestrial except *R. fluitans* which is aquatic. The plants can grow under varied habitats from damp soil to extremely exposed conditions and are able to withstand drought. Of the 33 Indian species, some are widely distributed (*Riccia billardieri, R. discolor, R. fluitans, R. gangetica*, etc.), while others have restricted distribution (*R. abuensis, R. pimodii, R. jodhpurensis, R. reticulata*, etc.). From the Jammu & Kashmir state, as many as nine species of *Riccia* have been reported (Table 1) by Kashyap (1929), Kachroo (1955), K. P. Srivastava (1964), S. C. Srivastava (1979), Robinson (1965), Koul and Dhar (1968), Banday et al. (1998), Langer and Tanwir (2002), Gupta (2002), Langer et al. (2003), Tanwir (2005), Tanwir and Langer (2006), Tanwir et al. (2008) and Kapoor (2009).

Riccia frostii, named in honour of C. C. Frost, inhabits very unique habitat as it grows on the moist stream banks after the water recedes. It has been collected in the past from the banks of rivers

Table 1. Distribution of *Riccia* in Jammu & Kashmir state.

S. No	Taxon	Place of collection	References
1.	*Riccia aravalliensis*	Jammu (Poonch), Jammu (Patnitop and its adjoining areas)	Tanwir 2005 Tanwir et al. 2008
2.	*R. crystallina*	Jammu city	Langer et al. 2003
3.	*R. discolor*	Jammu(Poonch)	Langer & Tanwir 2002, Tanwir 2005
		Jammu University	Langer et al. 2003
		Jammu (Patnitop and its adjoining areas)	Tanwir et al. 2008
4.	*R. fluitans*	Kashmir	Srivastava 1979, Koul & Dhar 1968
5.	*R. frostii*	Kashmir	Kashyap 1929, Srivastava 1979
6.	*R. himalayensis*	Kashmir	Koul & Dhar 1968, Srivastava 1979
7.	*R. melanospora*	Jammu University Kashmir	Langer et al. 2003 Kashyap 1929
8.	*R. pathankotensis*	Kashmir	Kashyap 1929
9.	*R. warnstorfii*	Jammu (Poonch)	Tanwir & Langer 2007

Brahmaputra (Griffith 1849a, b), Ganga (Stephani 1898) and Ravi (Kashyap 1916) and reported under different names such as *R. microspora* (Stephani 1898) and *R. sanguinea* (Kashyap 1916). *R. frostii* is widely distributed throughout the world. It has been collected from U.S. (Underwood 1894), South -West Africa (Arnell 1957a, b), Pakistan (Khan 1957), Bangladesh, Turkey and Europe (Bapna & Kachroo 2000). In India also, the species grows throughout the country (Table 2) in gardens, playgrounds and on the banks of rivers.

It is quite evident from Table 2 that the species has been reported from all the bryogeographical regions of Indian sub-continent. As far as its distribution in Jammu & Kashmir state is concerned, the species has been

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Plate 1

1-2. Plants of *Riccia frostii*, inhabiting moist soil under fully exposed conditions at Sumoor. 3-5. Thalli forming perfect red and green rosettes. Note a red rosette with about 12 thalii in Figure 4 and a green rosette with about 14 thalli in Figure 5.

Plate 1

collected only from the Kashmir valley (Srivastava 1979). It has not yet been collected from the Jammu region of the state, although work on hepatic diversity has been done largely in this region of the state from where more than 100 liverwort taxa have so far been collected from various districts (Langer et al. 2003, Tanwir 2005, Tanwir et al. 2008).

The bryophytes are one of the least studied groups of plants in Ladakh. They have been studied so far by Kashyap (1932) and Tanwir and Langer (2006) recording the occurrence of 16 liverwort species from the region. Both reported 9 hepatic taxa each. Among these collections, only 2 taxa (*Marchantia polymorpha* and *Preissia quadrata*) were common. Thus a total of 16 hepatic taxa were recorded.

Bryofloristic studies carried out by Dolma and Langer (in press) at different sites in Ladakh region revealed 3 more species (*Marchantia palmata*, *Plagiochasma appendiculatum* and *P. intermedium*). With the present collection of *Riccia frostii* Aust., for the first time from Ladakh, the number of hepatic taxa from this region is raised to 20.

The present report needs special mention as the species has been collected from an altitude of 3146 m.

Table 2. Distribution of *Riccia frostii* in India.

S. No.	Place of Collection	References
1.	Pathankot, Kulu, Lahore	Kashyap 1929
2.	South India, Sikkim Himalaya and Bengal	Chopra 1938a, b
3.	Himalaya and Gauhati	Chopra 1943
4.	Gauhati	Kachroo 1950, 1952
5.	Assam	Pande & Udar 1957
6.	South India	Pande & Udar 1958
7.	Mt. Abu, Aravalli Hills	Bapna 1958
8.	Mt. Abu (Rajasthan)	Bapna & Vyas 1962
9.	South India, North-West Himalaya, Eastern Himalaya, Assam, Central India and Indo-Gangetic Plains.	Kachroo & Bapna 1963
10.	Allahabad, Mt. Abu, Banda, Sikkim	Srivastava 1964
11.	Allahabad, Bengal, Lucknow, Rajasthan, South India	Kachroo et al. 1977
12.	Kashmir valley	Srivastava 1979
13.	Mt. Abu, Himalaya, Pachmari, South-India	Joshi & Biradar 1984
14.	Assam, Kashmir, Sikkim	Bapna & Kachroo 2000
15.	Maharashtra	Dabhade 2007

Further exploration of the un- and underexplored areas of Ladakh is likely to provide more information about the distribution of the taxon in the region.

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