

## Additions to the Bryophyte flora of Tawang, Arunachal Pradesh, India

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**Abstract:** Rawat, K.K; Sahu, V.; Singh, C.P.; Verma, P.K. (2017): Additions to the Bryophyte flora of Tawang, Arunachal Pradesh, India. *Frahmia* 14:1-17.

A total of 30 taxa of bryophytes are reported for the first time from Tawang district of Arunachal Pradesh, India, including 10 taxa as new to Arunachal Pradesh.

### 1. Introduction

The district Tawang in Arunachal Pradesh, India, is located in extreme western corner of the state between 27°25' & 27°45'N and 91°42' & 92°39' E covering an area of 2,172 km<sup>2</sup> and is bordered with Tibet (China) to North, Bhutan to south-west and west Kameng district towards east. The bryo-floristic information of the area was unknown till Vohra and Kar (1996) published an account of 82 species of mosses from Arunachal Pradesh, including 12 from Tawang. Rawat and Verma (2014) published an account of 23 species of liverworts from Tawang. Recently Ellis et al (2016a, 2016b) reported two mosses viz., *Splachnum sphaericum* Hedw. and *Polytrichastrum alpinum* (Hedw.) G.L. Sm. from Tawang. The present paper provides additional information of 30 more bryophyte taxa from Tawang district of Arunachal Pradesh, making a sum of 67 bryophytes known so far from the district.

### 2. Material and methods

The plant samples were collected from various localities of Tawang district (Fig. 1) during a survey of the area in June 2015. Samples were brought to laboratory and deposited in CSIR-National Botanical Research Institute's Bryophyte Herbarium (LWG). Identification was made with the help of available literature. The map of the study area (Fig.1) was generated using

Landsat ETM+ true colour composite satellite data. Actual in-field GPS readings were used to mark various localities on map.

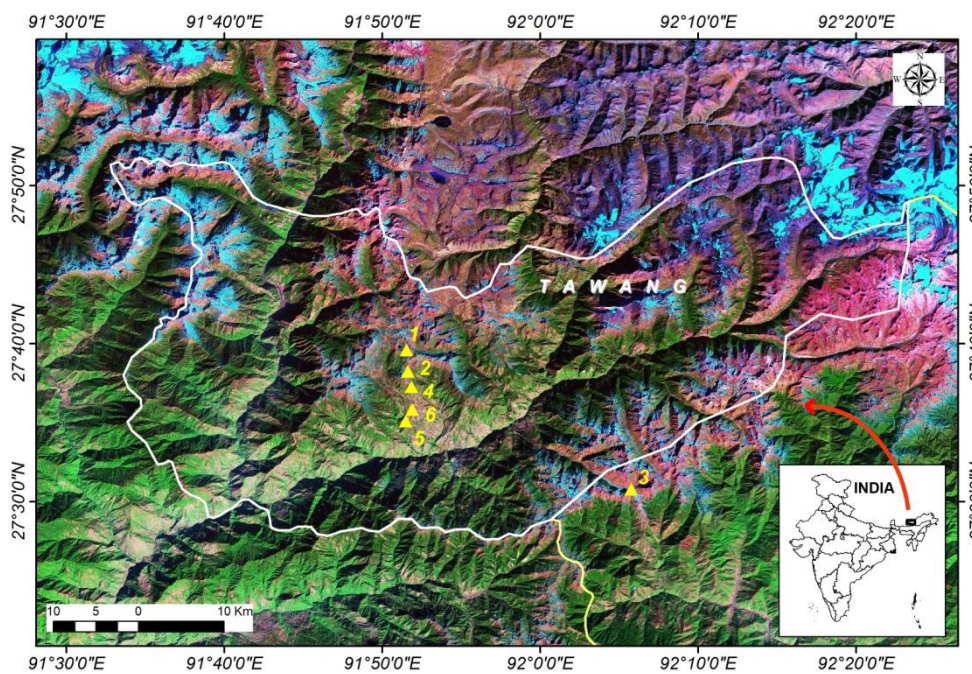


Fig. 1. Map of the study area showing various sampling sites (1. Near Nagula lake, 2. Near P.T. Tso lake, 3. Se La pass, 4. Near Manglem Gompa, 5. On way to Tawang monastery, 6. Tawang Monastery)

### 3. Enumeration of taxa

#### 3.1 Marchantiophyta

1. *Anastrepta orcadensis* (Hook.) Schiffn., Hepat. (Engl.-Prantl.): 85, 1893. *Jungermannia orcadensis* Hook., Brit. Jungermann. 71, 1814. *Anastrepta sikkimensis* Steph., Sp. Hepat. 6:119, 1917.

**Specimen examined:** India, Arunachal Pradesh: Tawang- near Nagula lake, alt. N27°39'36.0" E91°51'31.6", 4137 m., 15.06.2015, K.K. Rawat 300165L, 300177A, 300183C, 300189D (LWG). Near P.T. Tso lake, alt. N27°38'14.3" E91°51'35.6", 3982m., 15.06.2015, K.K. Rawat 300215A (LWG); Near Manglem Gompa, alt. N27°37'16.2" E91°51'49.3", 3656m., 15.06.2015, K.K.

Rawat 300228F (LWG). Se La pass, alt. N27°30'47.1" E92°05'45.0", 4120m., 17.06.2015, K.K. Rawat 300246A, 300248A, 300249B (LWG).

**Distribution in India:** Manipur: Ukhrul (Singh et al., 2010); Sikkim: without locality (Mitten, 1861 as *Jungermannia orcadensis*), Tsomgo lake (Herzog, 1939) Dzungri, Dzungri-Olothang, Migothang-Nayathang (Hattori, 1966); West Bengal: Darjeeling, Sandakphu, Phalut (Chopra, 1938 as *Anastrepta sikkimensis*; Srivastava et al., 2013); Arunachal Pradesh: without locality (Majumdar et al., 2013), Tawang (Present study).

**2. *Anastrophyllum alpinum*** Stephani, Sp. Hepat. 6: 103, 1917.

**Specimen examined:** India, Arunachal Pradesh, Tawang: Near Nagula lake, alt. N27°39'36.0" E91°51'31.6", 4137 m., 15.06.2015, K.K. Rawat 300175B, 300176A, 300183A, 300198A (LWG). Se La pass, alt. N27°30'47.1" E92°05'45.0", 4120m., 17.06.2015, K.K. Rawat 300246B, 300248B, 300255A (LWG).

**Distribution in India:** Uttarakhand: Chakrata (Nath et al., 2002, misidentified as *A. joergensenii*; Long et al., 2006; Srivastava et al., 2013) on way to Hemkund (Nath et al., 2010); Sikkim without specific locality (Schill and Long, 2003 as *A. joergensenii*; Long et al., 2006; Srivastava et al., 2013); Arunachal Pradesh: Anjaw, on way to Jachhup from Hotspring (Majumdar et al., 2016), Tawang (Present study).

**3. *Anastrophyllum donnianum*** (Hook.) Stephani, Hedwigia 32: 140, 1893. *Jungermannia donniana* Hook., Brit. Jungermann. 39, 1813.

**Specimen examined:** India, Arunachal Pradesh, Tawang: Near Nagula lake, alt. N27°39'36.0" E91°51'31.6", 4137 m., 15.06.2015, K.K. Rawat 300189E (LWG). Near Maglem Gompa; alt. N27°37'16.2" E91°51'49.3", 3656m., 15.06.2016, K.K. Rawat 300228A, 300229B (LWG).

**Distribution in India:** Sikkim: without specific locality (Mitten, 1861 as *Jungermannia donniana*), Chhurong Chhu valley, Dzungri, Dzungri-Olothang, Migothang-Nayathang, Tsomgo lake (Hattori, 1966; Schill & Long, 2003; Srivastava et al., 2013); Uttarakhand: on way to Hemkund (Nath et al., 2010); West Bengal: Darjeeling (Chopra, 1938); Arunachal Pradesh: Tawang (*new to Arunachal Pradesh*).

**4. *Asterella leptophylla*** (Mont.) Pande et al. ex Grolle, Feddes Repertorium 87: 246, 1976. *Fimbraria leptophylla* Mont., Ann. Sci. Nat., Bot., ser. 2, 18: 16, 1842. *Fimbriaria reticulata* Kashyap, J. Bombay Nat. Hist. Soc. 25: 279, 1917. *Asterella evansii* Kachroo, J. Hattori Bot. Lab.

19: 3, 1958. *Asterella reticulata* (Kashyap) Pande, K.P. Srivast & Sultan Khan ex Kachroo, J. Hattori Bot. Lab. 19: 4, 1958. *Asterella kashyapii* Maheshw., Taxon 18: 599, 1969.

**Specimen examined:** India, Arunachal Pradesh, Tawang, on way to Tawang monastery, N27°35'49.8", E91°51'53.7", 2999 m., 16.06.2016, K.K. Rawat, 300239A (LWG).

**Distribution in India:** Assam (Long, 2006); Jammu and Kashmir: Kashmir (as type of *Fimbriaria reticulata* Kashyap), Mendhar (Langer & Tanwir, 2002 as *A. reticulata* auct. non. A. Evans); Himachal Pradesh: Lahul, Keylong (Kashyap, 1929 as *F. reticulata*); Kerala: Munnar, Silent valley, Devicolam, Vagavurrai, Periavurrai, Peermade, Lakkidi (Udar & Jain, 1984), Eravikulam National Park (Madhusudanan et al., 2007), Agasthyamalai Biosphere Reserve, Ponkalappara (Manju et al., 2009a as *A. reticulata* auct. non. A. Evans); Maharashtra: Mahabaleshwar (Joshi & Biradar, 1984 as *A. reticulata* auct. non. A. Evans), Kas Plateau (Bagwan & Kore, 2012 *A. reticulata* auct. non. A. Evans); Meghalaya: Langkyrdem to Dwaki road, Shillong, Nongstoin, Jaintia hills (Singh & Nath, 2007), Khasi hills (Long, 2006); Sikkim: Rathong Chhu valley, Prek Chhu-Bakkim, Chhurong chhu valley, Toska-Jamlingthang, Chaunrikhiang, Phephedang-Toska, Dzungri, Rabom, Chungthang (Long 2006); Tamil Nadu: Nilgiri hills (Type), Nilgiri (Montagne, 1842 as *F. leptophylla*), Ootacamund (Long, 2006); Uttarakhand: Mussoorie (Kachroo, 1954 as *A. reticulata* auct. non. A. Evans) Mukteshwar (Asthana & Sahu 2013a); West Bengal: Phalut (Bapna & Kachroo, 2000), Darjeeling (Bapna & Kachroo, 2000 as *A. evansii* Kachroo); Arunachal Pradesh: Tawang (*new to Arunachal Pradesh*).

**5. *Bazzania tricrenata*** (Wahlenb.) Trevis, Mem. Reale Lst. Lombardo Sci., ser. 3, Cl. Sci. Mat. 4: 415, 1877.

**Specimen examined:** India, Arunachal Pradesh: Tawang-near Nagula lake, alt. N27°39'36.0" E91°51'31.6", 4137 m., 15.06.2015, K.K. Rawat 300165F (LWG). Near P.T. Tso lake, alt. N27°38'14.3" E91°51'35.6", 3982m., 15.06.2015, K.K. Rawat 300218C (LWG).

**Distribution in India:** Himachal Pradesh (Sharma & Srivastava 1993), Manipur: West Mountain (Singh et al, 2010), Nagaland: Longkhum (Eshuo & Chaturvedi, 2011) Sikkim: without locality (Mitten, 1861 as *Mastigobryum imbricatum*; Stephani 1924 as *M. longanum*), Widely distributed in East and West Sikkim (Hattori, 1966 as *Bazzania imbricata*; Mizutani, 1967; Sharma & Srivastava 1993, as *Bazzania imbricata*; Zhou et al., 2012; Singh et al., 2016); Tamil Nadu: Nilgiri (Stephani, 1908, as *Mastigobryum perrotteti*; Daniels, 2010); Uttarakhand: Valley of Flowers (Sharma & Srivastava, 1993, as *Bazzania imbricata*); West Bengal: Phalut (Hattori, 1966, as *Bazzania imbricata*), Tonglu, Darjeeling, Sandakphu, Chittre above Manebhanjanag (Sharma &

Srivastava, 1993, Mizutani, 1967, as *Bazzania imbricata*); Arunachal Pradesh: Deban, Namdhapa, Tirap, West Siang (Singh, 1996; Singh et al., 2016), Tawang (present study)

**6. *Blepharostoma trichophyllum*** (L.) Dumort., Recueil Observ. Jungerm. 18, 1835.

**Specimen examined:** India, Arunachal Pradesh: Tawang- near Nagula lake, alt. N27°39'36.0" E91°51'31.6", 4137 m., 15.06.2015, K.K. Rawat 300166E, 300167D (LWG).

**Distribution in India:** Widely distributed in Himalayas (Singh et al., 2016). In Arunachal Pradesh, known from West Siang and Anjaw (Singh et al., 2016), Tawang (present study)

**7. *Herbertus aduncus*** (Dicks.) Gray subsp. *aduncus*, Nat. Arr. Brit. Pl. 1: 705, 1821.

**Specimen examined:** India, Arunachal Pradesh: Tawang- near Nagula lake, alt. N27°39'36.0" E91°51'31.6", 4137 m., 15.06.2015, K.K. Rawat 300174A (LWG)

**Distribution in India:** Widely distributed in Eastern Himalayas, North-Eastern Hilly regions and Western Ghats (Singh et al., 2016).

**8. *Herbertus kurzii*** (Steph.) R.S. Chopra, J. Indian Bot. Soc. 22: 247, 1943.

**Specimen examined:** India, Arunachal Pradesh: Tawang- near Nagula lake, alt. N27°39'36.0" E91°51'31.6", 4137 m., 15.06.2015, K.K. Rawat 300175A (LWG)

**Distribution in India:** Sikkim: Dzungri (Hattori, 1966, as *Herberta kurzii*) Dzungri-Prek Chhu (Juslén, 2006; Singh et al., 2008), Arunachal Pradesh: Tawang (*new to Arunachal Pradesh*).

**9. *Herbertus sendtneri*** (Nees) Lindb., in Lindenberg and Lackström, Hep. Scand. Exs. 1 (13) no. IV, 1874.

**Specimen examined:** India, Arunachal Pradesh, Tawang: Se La pass, alt. N27°30'47.1" E92°05'45.0", 4120m., 17.06.2015, K.K. Rawat 300248C (LWG)

**Distribution in India:** Sikkim: without specific locality (Juslén, 2006; Singh et al., 2008), Dzungri-Choktschring Chhu (Hattori, 1966, as *Herberta sendtneri*), West Bengal (Hattori, 1966; Juslén, 2006), Arunachal Pradesh – West Siang (Singh Deo & Singh, 2016), Tawang (present study).

**10. *Lepidozia brevifolia*** Mitt., J. Proc. Linn. Soc., Bot. 5: 104, 1860.

**Specimen examined:** India, Arunachal Pradesh: Tawang- near Nagula lake, alt. N27°39'36.0" E91°51'31.6", 4137 m., 15.06.2015, K.K. Rawat 300165K, 300166A (LWG). Near P.T. Tso lake, alt. N27°38'14.3" E91°51'35.6", 3982m., 15.06.2015, K.K. Rawat 300218B (LWG). near

Manglem Gompa, alt. N27°37'16.2" E91°51'49.3", 3656m., 15.06.2015, K.K. Rawat 300228D (LWG).

**Distribution in India:** Arunachal Pradesh: West Siang (Singh et al., 2016), Tawang (present study); Meghalaya: Elephant falls (Singh & Nath, 2007); Sikkim: between Gangtok and Tsomgo lake, Kupup (Singh et al., 2016); Uttarakhand: Rajaji National Park, Mohand pass (Sharma and Srivastava, 1993); on way to Hemkund (Nath et al., 2010); West Bengal: Ghoom, Phalut, Teesta valley, Kurseong (Sharma & Srivastava, 1993).

**11. *Lophocolea sikkimensis*** Herzog & Grolle, Rev. Bryol. Lichenol. 27: 164, 1958.

**Specimen examined:** India, Arunachal Pradesh: Tawang- near P.T. Tso lake, alt. N27°38'14.3" E91°51'35.6", 3982m., 15.06.2015, K.K. Rawat 300204A (LWG).

**Distribution in India:** West Bengal: Sandakphu, Tonglu; Sikkim: Gangtok, Nathu La, Tsomgo lake, Dzongri, Dzongri-Olothang (Srivastava & Srivastava, 2002). Arunachal Pradesh: Tawang (*New to Arunachal Pradesh*).

**12. *Metzgeria furcata*** (L.) Corda, Naturalientausch 12: 654, 1829 var. *furcata*. *Metzgeria decipiens* (C. Massal.) Schiffner, Forschungsr. Gazelle 4: 43, 1890.

**Specimen examined:** India, Arunachal Pradesh: Tawang- near Manglem Gompa, alt. N27°37'16.2" E91°51'49.3", 3656m., 15.06.2015, K.K. Rawat 300227A (LWG)

**Distribution in India:** Widely distributed in Himalayas and Western Ghats (Singh et al., 2016).

**13. *Plagiochila semidecurrens*** (Lehm. & Lindenb.) Lehm. & Lindenb., Spec. Hepat. (fasc. 5): 142, 1843.

**Specimen examined:** India, Arunachal Pradesh: Tawang- near Manglem Gompa, alt. N27°37'16.2" E91°51'49.3", 3656m., 15.06.2015, K.K. Rawat 300225A, 300231C (LWG).

**Distribution in India:** Widely distributed in Himalayas and Western Ghats (Rawat & Srivastava, 2007; Singh et al., 2016).

**14. *Tetralophozia filiformis*** (Steph.) Urmi, J. Bryol. 12: 394, 1983. *Chandonanthus filiformis* Steph. Sp. Hepat. 3: 644, 1909.

**Specimen examined:** India, Arunachal Pradesh: Tawang- near Nagula lake, alt. N27°39'36.0" E91°51'31.6", 4137 m., 15.06.2015, K.K. Rawat 300165A (LWG).

**Distribution in India:** Sikkim: Tsomgo lake (Herzog, 1939), Dzongri, Olothang, Gamothang, Migothang, Nayathang; West Bengal: Darjeeling, Phalut (Hattori, 1966, as *Chandonanthus*

*filiformis*; Srivastava et al., 2013) Uttarakhand: Uttarkashi (Govind Wildlife Sanctuary) (Asthana & Sahu, 2015); Arunachal Pradesh: Tawang (*New to Arunachal Pradesh*)

**15. *Scapania ferruginea*** (Lehm. & Lindenb.) Gottsche in Gottsche et al., Syn. Hepat. 72: 1844.

**Specimen examined:** India, Arunachal Pradesh: Tawang- near Nagula lake, alt. N27°39'36.0" E91°51'31.6", 4137 m., 15.06.2015, K.K. Rawat 300166D (LWG). near Manglem Gompa, alt. N27°37'16.2" E91°51'49.3", 3656m., 15.06.2015, K.K. Rawat 300228E (LWG)

**Distribution in India:** widely distributed in Himalayas (Singh et al., 2016)

**16. *Nardia scalaris*** (Schrad.) Gray, Nat. Arr. Brit. Pl. 1: 694, 1821. *Alicularia scalaris* (Schrad.) Corda, Deutschl. Fl. Abt. II Cryptog. 19-20: 32, 1830.

**Specimen examined:** India, Arunachal Pradesh: Tawang- near Manglem Gompa, alt. N27°37'16.2" E91°51'49.3", 3656m., 15.06.2015, K.K. Rawat 300228G, 300231B, 300233B (LWG).

**Distribution in India:** West Bengal: Darjeeling (Chopra, 1938, as *Alicularia scalaris*); Arunachal Pradesh: Tawang (*new to Arunachal Pradesh*).

### 3.2 Bryophyta (Mosses)

**17. *Anomobryum filiforme*** (Griff.) A. Jaeger var. *concinatum* (Spruce) Loeske, Rev. Bryol. Lichenol 5: 200, 1933.

**Specimen examined:** India, Arunachal Pradesh: Tawang- on way to Tawang monastery, N27°35'49.8", E91°51'53.7", 2999 m., 16.06.2016, K.K. Rawat, 300239C (LWG).

**Distribution in India:** West Bengal: Darjeeling; Himachal Pradesh: Shimla; Uttarakhand: Almora, Mukteshwar, Mussoorie, Nainital, Ranikhet (Asthana & Sahu, 2013a), Valley of flowers (Nath et al., 2010), Pithoragarh (Sahu and Asthana, 2015); Arunachal Pradesh; Kerala; Manipur; Meghalaya: Khasi hills; Mizoram; Sikkim; Tamil Nadu (Manju et al., 2009a). Arunachal Pradesh: Tawang (*new to Arunachal Pradesh*).

**18. *Bryum argenteum*** Hedw., Sp. Musc. Frond. 181, 1801.

**Specimen examined:** India, Arunachal Pradesh: Tawang - Se La Pass; 27°30'47.1" N, 91°51'31.6" E, 4137 m, on Yak dung, 17 June 2015, K.K. Rawat 300254B (LWG).

**Distribution in India:** very widely distributed species in India (Robinson, 1965; Handoo & Srivastava, 1968; Chopra, 1960; Vohra, 1969a, 1969b; Chaudhary & Deora, 1993; Stern, 2000; Chaudhary et al., 2006; Handoo et al., 2009; Sahu & Asthana, 2010; Nath et al., 2010; Choyal &

Sharma 2011; Sharma & Choyal, 2011; Dandotiya et al., 2011; Bansal & Nath, 2013; 2014a, 2014b; Laha & Lalhriatpuia, 2013; Alam *et al.*, 2014; Aruna & Krishnappa, 2014; Sandhya Rani et al., 2014; Hile et al 2015; Bansal & Nath, 2015; Lalhriatpuia & Laha, 2015)

**19. *Dicranodontium uncinatum*** (Harv.) A. Jaeger., Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1877-78: 380, 1880.

**Specimen examined:** India, Arunachal Pradesh: Tawang- near P.T. Tso lake, alt. N27°38'14.3" E91°51'35.6", 3982m., 15.06.2015, K.K. Rawat 300214 (LWG). near Manglem Gompa, alt. N27°37'16.2" E91°51'49.3", 3656m., 15.06.2015, K.K. Rawat 300228B (LWG)

**Distribution in India:** Uttarakhand: Garhwal-Tapovan (Vohra, 1970); West Bengal: Darjeeling; Meghalaya: Khasia Hills; Manipur; Sikkim (Gangulee, 1969-72; Frahm, 1997) Arunachal Pradesh: Tawang (present study, *new to Arunachal Pradesh*).

**20. *Dicranodontium didymodon*** (Griff.) Paris, Index Bryol.: 338. 1896. *Dicranodontium caespitosum* (Mitt.) Paris, Index Bryol.: 337, 1896. *Dicranodontium attenuatum* (Mitt.) Wilson ex A. Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1877-78: 380, 1880.

**Specimen examined:** India, Arunachal Pradesh: Tawang- near Nagula lake, alt. N27°39'36.0" E91°51'31.6", 4137 m., 15.06.2015, K.K. Rawat 300165J (LWG). Near P.T. Tso lake, alt. N27°38'14.3" E91°51'35.6", 3982m., 15.06.2015, K.K. Rawat 300210B (LWG). near Manglem Gompa, alt. N27°37'16.2" E91°51'49.3", 3656m., 15.06.2015, K.K. Rawat 300232C (LWG)

**Distribution in India:** Assam: Upper Brahmaputra valley (Barukiya, 2011); Sikkim; West Bengal: Darjeeling, Phalut; (Gangulee, 1069-72), Kurseong; Meghalaya: Mowflang; Himachal Pradesh: Shimla, Jaunsar; Uttarakhand: Mussoorie, Tehri-Garhwal (Frahm, 1997), Nainital (Chopra, 1960); Arunachal Pradesh: Bomdila (Vohra & Kar, 1996), Tawang (Present study).

**21. *Dicranum gymnostomum*** Mitt., J. Proc. Linn. Soc., Bot., Suppl. 1: 14, 1859.

**Specimen examined:** India, Arunachal Pradesh: Tawang- near Nagula lake, alt. N27°39'36.0" E91°51'31.6", 4137 m., 15.06.2015, K.K. Rawat 300189A (LWG).

**Distribution in India:** Sikkim (Type); Uttarakhand: Garhwal (Vohra, 1970); Arunachal Pradesh: Tawang (present study, *new to Arunachal Pradesh*).

**21. *Hypnum macrogynum*** Besch., Ann. Sci. Nat., Bot., ser. 7, 15: 91, 1892.

**Specimen examined:** India, Arunachal Pradesh: Tawang- near P.T. Tso lake, alt. N27°38'14.3" E91°51'35.6", 3982m., 15.06.2015, K.K. Rawat 300203A (LWG)



**Distribution in India:** Arunachal Pradesh: West Kameng (Vohra & Kar, 1996), Tawang (present study); Uttarakhand: Corbett National Park (Asthana & Sahu, 2013b), Pithoragarh, Lohaghat (Sahu & Asthana, 2015); Kerala: Silent valley (Manju et al., 2015).

**23. *Meteoriopsis reclinata*** (Müll. Hal.) Fleisch., Nat. Pflanzenfam. 1(3): 826, 1906.

**Specimen examined:** India, Arunachal Pradesh, Tawang: on way Tawang Monastery, alt. 2999m, 16.06.2015, K.K. Rawat 300240A (LWG).

**Distribution in India:** Himachal Pradesh: Kangra (Choyal & Sharma, 2011) Arunachal Pradesh, Assam, West Bengal: Darjeeling, Meghalaya: Khasi Hills, Manipur, Nagaland, Sikkim, Uttarakhand: Garhwal, Kumaon, Himachal Pradesh: Simla, Tamil Nadu: Coorg, Nilgiri, Palni, Western Ghats (Manju et al., 2009a; 2015); Andhra Pradesh (Sandhya Rani et al., 2014); Mizoram: Mamit (Lalhriatpuia & Laha, 2015)

**24. *Oncophorus wahlenbergii*** Brid., Bryol. Univ. 1: 400, 1826.

**Specimen examined:** India, Arunachal Pradesh: Tawang- near Manglem Gompa, alt. N27°37'16.2" E91°51'49.3", 3656m., 15.06.2015, K.K. Rawat 300226A (LWG)

**Distribution in India:** Sikkim; Kashmir. (Gangulee, 1969-72) also known as type of *O. gracillimus* Dix. from Kashmir (Frahm et al., 1998). Arunachal Pradesh: Tawang (*new to Arunachal Pradesh*).

**25. *Plagiomnium cuspidatum*** (Hedw.) T.J. Kop., Ann. Bot. Fenn. 5: 146, 1968.

**Specimen examined:** Tawang- near Tawang monastery, alt. N27°35'6.5" E91°51'27.7", 2966m., 16.06.2015, K.K. Rawat 300243B (LWG).

**Distribution in India:** Kashmir (Vohra, 1969b); Uttarakhand: Nainital (Chopra, 1960), Tehri-Garhwal (Vohra, 1969a); Mussoorie; Himachal Pradesh: Simla (Chopra, 1975; Gangulee, 1974); Pithoragarh, Lohaghat (Sahu & Asthana, 2015), West Bengal: Darjeeling (Ellis et al., 2013); Arunachal Pradesh: Tawang (as *Mnium cuspidatum* by Vohra & Kar, 1996)

**26. *Plagiothecium denticulatum*** (Hedw.) Schimp., Bryol. Eur. 5: 190 [fasc. 48. Monogr. 12], 1851.

**Specimen examined:** India, Arunachal Pradesh: Tawang- near Nagula lake, alt. N27°39'36.0" E91°51'31.6", 4137 m., 15.06.2015, K.K. Rawat 300189B (LWG).

**Distribution in India:** Sikkim; Kashmir (Gangulee, 1978-80), Uttarkhand: Chakrata (Vohra, 1969a); Kashmir (Vohra, 1969b); Arunachal Pradesh: Tawang (*new to Arunachal Pradesh*)

**27. *Pogonatum microstomum*** (R. Br. ex Schwagr.) Brid., Bryol. Univ. 2: 745, 1827.

**Specimen examined:** India, Arunachal Pradesh: Tawang- near Tawang monastery, alt. N27°35'6.5" E91°51'27.7", 2966 m., 16.06.2015, K.K. Rawat 300244 (LWG)

**Distribution in India:** Himachal Pradesh: Kangra (Sharma & Choyal, 2011) Meghalaya; Nagaland: Naga hills; Sikkim; Uttarakhand: Dhanolti Mukteshwar, Mussoorie; West Bengal: Darjeeling (Asthana & Sahu, 2013a); Kerala: Aralam Wildlife Sanctuary (Manju et al., 2009b) Nilgiri, Palni (Vohra, 1969a); Garhwal (Vohra, 1969a); Nainital (Chopra, 1960); Arunachal Pradesh: Bomdila (Vohra & Kar, 1996), Tawang

**28. *Pogonatum perichaetiale*** (Mont.) A. Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1873-74: 257 (Gen. Sp. Musc. 1: 725), 1875.

**Specimen examined:** India, Arunachal Pradesh, Tawang: near Se La Pass, alt. N27°30'47.1" E92°05'45.0", 4120m., 17.06.2015, K.K. Rawat 300256E (LWG).

**Distribution in India:** West Bengal: Darjeeling; Sikkim; Himachal Pradesh: Beas valley, Dalhousie, Khadrula, Kullu, Lahul, Mandi; Tamil Nadu: Nilgiris; Uttarakhand: Chakrata, Mukteshwar, Mussoorie, Nainital; (Asthana & Sahu, 2013a; Sahu & Asthana, 2013), Valley of Flowers (Nath et al., 2010); Arunachal Pradesh: Bomdila (Vohra & Kar, 1996), Tawang.

**29. *Pohlia minor*** Schwaegr. ssp. *acuminata* (Hoop. & Hornsch.) Wijk & Marg., Taxon, 8: 74 (1959).

**Specimen examined:** India, Arunachal Pradesh: Tawang- near Nagula lake, alt. N27°39'36.0" E91°51'31.6", 4137 m., 15.06.2015, K.K. Rawat 300189C (LWG).

**Distribution in India:** West Bengal: Darjeeling; Sikkim; Uttarakhand: Mussoorie, Pithoragarh. (Sahu and Asthana, 2015) valley of flowers (Nath et al., 2010); Garhwal (Vohra, 1969a); Arunachal Pradesh: West Kameng (Vohra & Kar 1996), Tawang (present study).

**30. *Racomitrium subsecundum*** (Hook. & Grev. ex Harv.) Mitt., Hooker's J. Bot. Kew Gard. Misc. 9: 324, 1857.

**Specimen examined:** India, Arunachal Pradesh: Tawang- near Nagula lake, alt. N27°39'36.0" E91°51'31.6", 4137 m., 15.06.2015, K.K. Rawat 300165 I (LWG).

**Distribution in India:** Nagaland; Sikkim; Tamil Nadu: Nilgiri hills, Palni hills; Uttarakhand: Tihri-Garhwal (Frisvoll, 1988), Valley of flowers (Nath et al., 2010); Arunachal Pradesh: Tawang (*new to Arunachal Pradesh*).

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