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## A catalogue of the liverworts and hornworts of Himachal Pradesh, India

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**Abstract.** This catalogue includes a total of 150 valid names from the State of Himachal Pradesh, India, of them 140 taxa (128 species, 6 subspecies, 5 varieties and 1 forma) belonging to liverworts and 10 species to hornworts, based on literature and authors' own survey and documentation of the two groups from the State since 2001. Fifty four taxa (including three new species and one new variety) are recently added by the authors alone to the area. Literature reference for each species and synonyms from the area has been given with their correct name in the catalogue.

### Introduction

The State of Himachal Pradesh is a green pearl nestled in the western Himalayan mountain range. The State is bordered by Jammu and Kashmir on North, Punjab on West and South-west, Haryana and Uttar Pradesh on South, Uttarakhand on South-east and by China (Tibet) on the East. Geographically it is located between 30° 22' 40" N to 33°12' 20" N latitudes 75° 45' 55" E to 79° 04' 20" E longitudes. It has an area of over 55,673 sq. km comprising 595 sq. km of mountain ranges spreading along the Indus – Sutlej river system, with a deeply dissected topography and complex geological structure. The elevation varies from 350 m to 6,975 m above m.s.l. The State has five perennial rivers i.e. Chenab (Chandra-Bhaga), Ravi, Beas, Sutlej and Yamuna which are perennial and are fed by snow and rainfall. Due to extreme variation in elevation, the climate in the State varies from hot and sub-humid tropical in the southern tracts to cold, alpine and glacial in the northern and eastern mountain ranges with more elevation. The State has areas like Dharamsala that receive very heavy rainfall, as well as those like Lahaul and Spiti that are cold deserts and almost rainless. Broadly the State experiences three seasons, viz. summer, winter and monsoon. Summer lasts from mid April till the end of June and most parts become very hot (except the alpine zone which experience mild summer) with the average temperature ranging from 28 -32°C. Winter lasts from late November till mid March. Snowfall is common in alpine areas. Vegetation of the State varies with elevation and precipitation. At lower elevation, both tropical dry broadleaf forests and tropical and subtropical moist broadleaf forests occur which are dominated by Sal, Sisham, Chir pine and dry deciduous forests. The temperate region has Oaks, Deodar, Blue pine,

Fir and Spruce. The overall phytoclimatic conditions met within the State provide ideal habitats for the rich and diverse bryophyte flora in general and liverwort and hornwort in particular.

Taxonomic and floristic studies on liverworts and hornworts of West Himalaya (in which bryogeographic region the of State of Himachal Pradesh lies) perhaps began with a brief note on liverworts from Mussoorie by Royle (1839). Mitten's (1860-1861) 'Hepaticae Indiae Orientalis' was the first extensive list of liverworts for the Indian subcontinent where he listed 39 genera and 205 species of hepatics, based on materials collected by J. D. Hooker from Himalaya, Hooker and Thomson in Khasi hills and Gardner and Thwaites in Ceylon etc., including few from the Western Himalaya and Himachal Pradesh. Stephani (1900 – 1924), while dealing with hepatic flora of the world in his 'Species Hepaticarum' described several species from India, including a few from the State of Himachal Pradesh.

Kashyap (1914 – 1932) aptly known as 'father of Indian bryology' was the first Indian who made notable contributions on the liverwort and hornwort of the region and published a series of papers (Kashyap, 1914a,b, 1915, 1916, 1917, 1919a, b, 1920, 1921) dealing with several aspects of liverworts from the Western Himalaya in general and Himachal Pradesh in particular. His treatise on 'Liverworts of the Western Himalaya and Punjab plains' (Kashyap, 1929, 1932), included 87 species from the State of Himachal Pradesh. Since then several contributions have been made for the region by different workers. Kachroo (1954) recorded 6 species of the family Rebouliaceae (= Aytoniaceae) from the Himachal Pradesh. Bir and Chopra (1972) listed 31 species of thallose liverworts from Dalhousie. Bir (1975) listed 27 species of the thallose liverworts from Shimla. Awasthi and Srivastava (1987) described *Tuzibeanthus chinensis* (Steph.) Mizut. from Shimla. Srivastava and Srivastava (1989) described *Heteroscyphus inflatus* from Chandartal. Vishvakarma and Kaul (1989) reported *Megaceros tjobodensis* Campb. [*M. flagellaris* (Mitt.) Steph.] from Dalhousie. Srivastava and Srivastava (1993) described *Scapania udarii* S.C.Srivast. & Anshu Srivast. a new species from Manali. Hasegawa (1994a) described *Phaeoceros striatisporus* J.Haseg. a new species from Kullu, and later he raised it to the status of a genus viz., *Hattorioceros* J.Haseg. on the basis of canaliculate-striate surface of spores (Hasegawa 1994b). Srivastava and Srivastava (1995) described *Scapania verrucosa* Heeg from Dalhousie. Kapila and Kumar (1995) reported *Monosolenium tenerum* Griff. from Sunder Nagar and Baijnath.

In recent years a number of additions have been to the liverwort and the hornwort flora of Himachal Pradesh including four new taxa to the science, (Narayan *et al.* 2001; Singh 2002; Singh & Singh, 2003a, b, 2004, 2005 a, b, 2006a,b, 2007a-d, 2008a,b, 2009). As such, while there is no census or checklist of liverworts and hornworts available for this hilly State lying in the Himalaya, which is one of the global biodiversity hot spots, the taxonomic status of many of the species reported earlier also needed validation in light of the current concepts.

The present catalogue is an outcome of extensive review of literature available to the authors together with their own systematic study of liverworts and hornworts of the State since 2001. Altogether 150 taxa are assigned to 57 genera in 31 families, of which 140 (128 species, 6 subspecies, 5 varieties and 1 forma) in 52 genera and 29 families belong to three orders of liverworts and the rest 10 species to hornwort order Anthocerotales. The figures in parentheses against each order, family and genus indicate the number of species currently recorded within the group from the State.

The taxa are arranged alphabetically within two classes Hepaticopsida (liverworts) and Anthocerotopsida (hornworts). The author's names have been abbreviated as per Brumitt and Powell (1992), or the guidelines provided by them. Currently accepted names are shown in bold face italic font, and synonyms in normal italic font in the list. Literature sources are shown within small brackets following the taxon name, and a full reference list is provided following the alphabetical checklist.

**SYNOPSIS OF THE CHECK-LIST**

## CLASS HEPATICOPSIDA (LIVERWORTS)

## ORDER JUNGERMANNIALES (86)

**Antheliaceae:** *Anthelia* (1); **Calypogeiaceae:** *Metacalypogeia* (1); **Cephaloziaceae:** *Cephalozia* (1); **Geocalycaceae:** *Chiloscyphus* (3), *Geocalyx* (1), *Heteroscyphus* (4), *Lophocolea* (3); **Jubulaceae:** *Frullania* (8); **Jungermanniaceae:** *Jamesoniella* (3), *Jungermannia* (6), *Liochlaena* (1); *Lophozia* (2), *Solenostoma* (1); **Lejeuneaceae:** *Lejeunea* (3), *Lopholejeunea* (1), *Ptychanthus* (1), *Trocholejeunea* (2), *Tuzibeanthus* (1); **Lepidoziaceae:** *Bazzania* (1); **Plagiochilaceae:** *Plagiochila* (14); **Porellaceae:** *Porella* (14); **Pseudolepicoleaceae:** *Blepharostoma* (1); **Radulaceae:** *Radula* (5); **Scapaniaceae:** *Scapania* (8).

## ORDER METZGERIALES (13)

**Allisoniaceae:** *Calycularia* (1); **Aneuraceae:** *Aneura* (1); *Riccardia* (2); **Blasiaceae:** *Blasia* (1); **Fossombroniaceae:** *Fossombronia* (1), *Sewardiella* (1); **Metzgeriaceae:** *Apometzgeria* (1), *Metzgeria* (3); **Pelliaceae:** *Pellia* (2).

## ORDER MARCHANTIALES (41)

**Aytoniaceae:** *Asterella* (5), *Cryptomitrium* (1), *Mannia* (4), *Plagiochasma* (4), *Reboulia* (1); **Cleveaceae:** *Athalamia* (2), *Sauteria* (1); **Conocephalaceae:** *Conocephalum* (1); **Cyathodiaceae:** *Cyathodium* (2); **Exormothecaceae:** *Exormotheca* (1), *Stephensoniella* (1), *Aitchisoniella* (1); **Marchantiaceae:** *Dumortiera* (1), *Marchantia* (3) *Preissia* (1) **Monosoleniaceae:** *Monosolenium* (1); **Ricciaceae:** *Riccia* (8); **Targioniaceae:** *Targionia* (2); **Wiesnerellaceae:** *Wiesnerella* (1).

## CLASS ANTHOCEROTOPSIDA (HORNWORTS)

## ORDER ANTHOCEROTALES (10)

**Anthocerotaceae:** *Anthoceros* (2), *Hattorioceros* (1), *Megaceros* (1), *Phaeoceros* (3)  
**Notothyladaceae:** *Notothylas* (3).

**ALPHABETICAL CHECKLIST OF THE TAXA**

## HEPATICOPSIDA (LIVERWORTS)

*Aitchisoniella himalayensis* Kashyap (Kashyap 1914a, 1929).

*Aneura indica* Steph. ex Kashyap = *Aneura pinguis* (L.) Dumort. [Srivastava & Udar 1976].

*Aneura levieri* Schiffn. ex Steph. = *Riccardia levieri* Schiffn. [Srivastava & Udar 1976].

*Aneura pinguis* (L.) Dumort. (Singh & Singh 2008b, 2009; Kashyap 1917, 1929 and Bir & Chopra 1972 as *Aneura indica* Steph. ex Kashyap).

*Anthelia julacea* (L.) Dumort. (Kashyap 1932).

*Apometzgeria pubescens* (Schränk) Kuwah. (Srivastava & Udar 1975a; Singh & Singh 2008b, 2009; Kashyap 1929 and Bir & Chopra 1972 as *Metzgeria pubescens* Raddi).

*Asterella khasyana* (Griff.) Pande *et al.* (Singh & Singh 2008a, 2008b, 2009; Kashyap 1929 as *Fimbriaria blumeana* auct. non Nees).

*Asterella leptophylla* (Mont.) Grolle (Kashyap 1917 as *Fimbriaria reticulata* Kashyap).

*Asterella multiflora* (Steph.) Kachroo (Kashyap 1929 as *Fimbriaria sanguinea* Lehm. & Lindenb).

*Asterella mussuriensis* (Kashyap) Verd. subsp. *mussuriensis* (Singh & Singh 2008a, 2008b, 2009; Bir & Chopra 1972; Bir 1975 as *Fimbriaria mussuriensis* Kashyap).

*Asterella wallichiana* (Lehm. & Lindenb.) Grolle (Kashyap 1929; Bir & Chopra 1972; Bir 1975; *Fimbriaria angusta* Steph.).

*Athalamia dioca* Kashyap = *Athalamia pinguis* Falc. [Kashyap (1929) himself commented about this species as “doubtfully distinct from *Athalamia pinguis*”. The characters described by

- Kashyap for the species delimitation do not warrant placing it as a separate species, further a study of type specimens of may lead to interesting findings].
- Athalamia pinguis* Falc. (Kashyap 1929; Bir & Chopra 1972; Bir 1975; Singh & Singh 2008a, 2008b, 2009).
- Athalamia pusilla* (Steph.) Kashyap (Kashyap 1929; Bir 1975; Singh & Singh 2008b, 2009).
- Bazzania tricrenata* (Wahlenb.) Lindb. (Sharma & Srivastava 1993; Kashyap 1932 as *Mastigobryum triangulare* (Schleich.) Steph.).
- Blasia pusilla* L. (Kashyap 1929, 1932; Singh & Singh 2008b, 2009).
- Blepharostoma trichophyllum* (L.) Dumort. (Kashyap 1932; Singh & Singh 2008b, 2009).
- Calycularia compacta* Kashyap = *Calycularia crispula* Mitt. [Kashyap (1929) described it as new species and in the note he wrote “possibly a compact form of *Calycularia crispula* adapted to the dry climate of Lahul”. The key character given by the Kashyap for the separation of both species are vegetative ones (Length & thallus anatomy) which are not very much convincing to separate both species as the authors observed both features in a single population].
- Calycularia crispula* Mitt. (Kashyap 1929; Bir & Chopra 1972; Bir 1975; Singh & Singh 2009).
- Calypogeia renistipula* Steph. = *Metacalypogeia alternifolia* (Nees) Grolle [Sharma & Srivastava 1993].
- Cephalozia schusteri* Sushil K. Singh & D.K. Singh (Singh & Singh 2007a, 2008a, 2008b, 2009).
- Chiloscyphus argutus* Nees = *Heteroscyphus argutus* (Nees) Schiffn. [Srivastava & Srivastava 2002].
- Chiloscyphus campanulatus* Steph. (Singh & Singh 2007d, 2008b, 2009).
- Chiloscyphus himalayensis* Steph. (Singh & Singh 2007d, 2008b, 2009).
- Chiloscyphus inflatus* Steph. = *Heteroscyphus inflatus* (Steph.) Abha Srivast. & S.C. Srivast. [Srivastava & Srivastava 2002].
- Chiloscyphus polyanthus* (L.) Corda (Kashyap 1932).
- Conocephalum conicum* (L.) Dumort. (Kashyap 1929; Bir & Chopra 1972; Bir 1975; Singh & Singh 2008a, 2008b, 2009).
- Cryptomitrium himalayense* Kashyap (Kashyap 1929; Bir & Chopra 1972; Bir 1975; Singh & Singh 2003a, 2008a, 2008b, 2009).
- Cyathodium aureonitens* (Griff.) Mitt. (Singh & Singh 2007d, 2008a, 2008b, 2009).
- Cyathodium tuberosum* Kashyap (Bir & Chopra 1972; Bir 1975; Singh & Singh 2003a, 2008a, 2008b, 2009).
- Diplophyllum orientale* Steph. = *Scapania orientalis* Steph. [Srivastava & Srivastava 1995].
- Dumortiera hirsuta* (Sw.) Nees (Kashyap 1929; Bir & Chopra 1972; Bir 1975; Singh & Singh 2008b, 2009).
- Fimbriaria angusta* Steph. = *Asterella angusta* (Steph.) Pande *et al.* = *Asterella wallichiana* (Lehm. & Lindenb.) Grolle [Long 2006].
- Fimbriaria blumeana* auct. non Nees *fide* Kashyap 1929 = *Asterella blumeana* auct non (Nees) Kachroo = *Asterella khasyana* (Griff.) Pande *et al.* [Long 2006].
- Fimbriaria mussuriensis* Kashyap = *Asterella mussuriensis* (Kashyap) Verd. subsp. *mussuriensis* [Long 2006].
- Fimbriaria reticulata* Kashyap = *Asterella reticulata* (Kashyap) Pande *et al.*, non *A. reticulata* A. Evans = *Asterella leptophylla* (Mont.) Grolle [Long 2006].
- Fimbriaria sanguinea* auct. non Lehm. & Lindenb. *fide* Kashyap 1929 = *Asterella multiflora* (Steph.) Kachroo [Long 2006].
- Exormotheca tuberifera* Kashyap (Bir 1975).
- Fossombronia himalayensis* Kashyap (Kashyap 1917, 1929, 1932; Bir & Chopra 1972; Bir 1975).
- Fossombronia kashyapii* S.C. Srivast. & Udar = *Fossombronia himalayensis* Kashyap [Krayeski *et al.* 2005].
- Fossombronia levieri* Steph. = *Fossombronia himalayensis* Kashyap [Srivastava & Udar 1975b].

- Frullania dilatata* (L.) Dumort. subsp. *dilatata* (Singh & Singh 2007d, 2008b, 2009).  
*Frullania duthiana* Steph. var. *duthiana* (Hattori 1973).  
*Frullania ericoides* (Nees) Mont. (Singh 2008b, 2009; Kashyap, 1932 as *Frullania squarrosa* Gottsche *et al.*; Singh & Singh 2003a as *F. squarrosa* Gottsche *et al.* f. *ericoides* Verd.).  
*Frullania gollanii* Steph. ('gollani') = *Frullania polyptera* Taylor [Hattori & Lin 1985].  
*Frullania gracillima* Steph. (Indian collection), possibly = *Frullania polyptera* Taylor [Hattori 1980].  
*Frullania larjiana* Sushil K. Singh & D.K. Singh (Singh & Singh 2005a, 2008a, 2008b, 2009).  
*Frullania muscicola* Steph. (Narayan *et al.* 2001; Singh & Singh 2008b, 2009).  
*Frullania pariharii* S. Hatt. & Thaith. f. *pariharii* (Singh & Singh 2007d, 2008b, 2009).  
*Frullania polyptera* Taylor (Kashyap 1932 as *Frullania pyriflora* Steph., *Frullania gollanii* Steph. and *Frullania gracillima* Steph.).  
*Frullania pyriflora* Steph. = *Frullania polyptera* Taylor [Hattori 1974].  
*Frullania retusa* Mitt. var. *retusa* (Kashyap 1932; Singh & Singh 2008b, 2009).  
*Frullania squarrosa* Gottsche *et al.* = *Frullania ericoides* (Nees) Mont. [Hattori & Lin 1985].  
*Frullania squarrosa* Gottsche *et al.* f. *ericoides* Verd. = *Frullania ericoides* (Nees) Mont. [Hattori & Lin 1985].  
*Geocalyx graveolens* (Schrad.) Nees (Singh & Singh 2007d, 2008b, 2009).  
*Gollaniella pusilla* Steph. = *Athalamia pusilla* (Steph.) Kashyap [Kashyap 1929].  
*Grimaldia dichotoma* Raddi = *Mannia androgyna* (L.) A. Evans [Grolle 1983].  
*Grimaldia indica* Steph. = *Mannia indica* (Steph.) Kachroo [Kachroo 1958].  
*Heteroscyphus argutus* (Nees) Schiffn. (Srivastava & Srivastava 2002; Kashyap 1932 as *Chiloscyphus argutus* Nees).  
*Heteroscyphus inflatus* (Steph.) Abha Srivast. & S.C. Srivast. (Srivastava & Srivastava 1989, 2002; Kashyap 1932 as *Chiloscyphus inflatus* Steph.).  
*Heteroscyphus orbiculatus* Abha Srivast. & S.C. Srivast. (Singh & Singh 2003b, 2008b, 2009).  
*Heteroscyphus pandei* Abha Srivast. & S.C. Srivast. (Singh & Singh 2007d, 2008b, 2009).  
*Jamesoniella autumnalis* (DC.) Steph. (Singh & Singh 2007d, 2008b, 2009).  
*Jamesoniella elongella* (Taylor) Steph. (Kashyap 1932; Singh & Singh 2008b, 2009).  
*Jamesoniella nipponica* S. Hatt. (Kumar & Udar 1985).  
*Jungermannia crenulata* Sm. (Kashyap 1932 as *Solenostoma crenulata* Sm.).  
*Jungermannia indrodayana* Sushil K. Singh & D.K. Singh (Singh & Singh 2007b, 2009).  
*Jungermannia infusca* (Mitt.) Steph. (Singh & Singh 2007d, 2008b, 2009).  
*Jungermannia leiantha* Grolle = *Lioclaena lanceolata* Nees [Hentschel *et al.* 2007].  
*Jungermannia oblongifolia* Kashyap (Kashyap & Chopra 1932).  
*Jungermannia purpurata* Mitt. (Kashyap 1932 as *Solenostoma purpurata* (Mitt.) Steph.).  
*Jungermannia subrubra* Steph. (Singh & Singh 2007d, 2008b, 2009).  
*Lejeunea discreta* Lindenb. (Singh & Singh 2007d, 2008b, 2009).  
*Lejeunea flava* (Sw.) Nees (Singh & Singh 2004, 2008b, 2009).  
*Lejeunea obfusca* Mitt. (Singh & Singh 2007d, 2008b, 2009).  
*Lophocolea alata* Mitt. ex Larter = *Lophocolea cuspidata* (Nees) Limpr. [Srivastava & Srivastava 2002].  
*Lioclaena lanceolata* Nees (Singh & Singh 2008b, 2009 as *Jungermannia leiantha* Grolle; Kashyap 1932 as *Solenostoma lanceolata* (L.) Steph.).  
*Lophocolea cuspidata* (Nees) Limpr. (Srivastava & Srivastava 2002; Singh & Singh 2007d, 2009 and Kashyap 1932 as *Lophocolea alata* Mitt. ex Larter).  
*Lophocolea heterophylla* (Schrad.) Dumort. (Mitten 1860-1861; Srivastava & Srivastava 2002).  
*Lophocolea minor* Nees (Kashyap 1932; Srivastava & Srivastava 2002; Singh & Singh 2009).  
*Lopholejeunea sikkimensis* Steph. var. *tenuicostata* Sushil K. Singh & D.K. Singh (Singh & Singh 2005b, 2008b). [In a recent monograph on Asian *Lopholejeunea*, Zhu & Gradstein (2005) categorized *L. nigricans* (Lindenb.) Schiffn. into five main phases and treated *L.*

*sikkimensis* as a synonym under it stating that the type material of the latter “belongs” to phase 2 of the former. A careful perusal of the characters assigned to different phases reveals that while the species included in phase 1, 3, 4 and 5 (the last one representing the “type specimens” of *L. nigricans*) have a distinctly 4-keeled perianth, *L. sikkimensis* is distinct from all of them in having 5-keeled perianth. Further, except the species consigned to phase 3 by Zhu & Gradstein (*l.c.*) others in the above phases show leaves with acute–apiculate apices as against rounded–obtuse in *L. sikkimensis*. It is thus suggestive of the considerable distinctiveness of *L. sikkimensis* from *L. nigricans*].

***Lophozia alpestris*** (Schleich.) A. Evans (Kashyap 1932).

***Lophozia incisa*** (Schrad.) Dumort. (Kashyap 1932).

*Madotheca acutiphylla* Kashyap = *Porella caespitans* (Steph.) S.Hatt. [Hattori 1978].

*Madotheca angusta* Steph. = *Porella gracillima* Mitt. [Hattori 1978].

*Madotheca appendiculata* Steph. = *Porella densifolia* (Steph.) S.Hatt. subsp. *appendiculata* (Steph.) S.Hatt. [Hattori 1978].

*Madotheca campylophylla* Lehm. & Lindenb. = *Porella campylophylla* (Lehm. & Lindenb.) Trevis. var. *campylophylla* [Hattori 1978].

*Madotheca densiramea* Steph. = *Porella chinensis* (Steph.) S.Hatt. [Hattori 1978].

*Madotheca gambleana* Steph. = *Porella chinensis* (Steph.) S.Hatt. [Hattori 1978].

*Madotheca gollanii* Steph. ('gollani') = *Porella campylophylla* (Lehm. & Lindenb.) Trevis. var. *campylophylla* [Hattori 1978].

*Madotheca gracillima* (Mitt.) Steph. = *Porella gracillima* Mitt. [Hattori 1978].

*Madotheca macroloba* Steph. = *Porella obtusata* (Taylor) Trevis. var. *macroloba* (Steph.) S.Hatt. & Zhang [Hattori & Zhang 1985].

*Madotheca obtusifolia* Kashyap = *Porella gracillima* Mitt. [Hattori 1978].

*Madotheca ovalis* Gottsche ex Steph., = *Porella obtusata* (Taylor) Trevis. var. *macroloba* (Steph.) S.Hatt. & Zhang [Hattori & Zhang 1985].

*Madotheca platyphylla* auct non (L.) Dumort. sensu Kashyap 1932 = *Porella platyphylla* (L.) Pfeiff. [Hattori 1978].

*Madotheca plumosa* Mitt. = *Porella plumosa* Inoue [Hattori 1978].

*Madotheca variabilis* Kashyap = *Porella variabilis* (Kashyap) Parihar [Parihar 1961-62].

***Mannia androgyna*** (L.) A.Evans (Singh & Singh 2008a, 2008b, 2009).

***Mannia fragrans*** (Balb.) Frye & L.Clark (Singh & Singh 2003a, 2008b, 2009).

***Mannia indica*** (Steph.) Kachroo (Singh & Singh 2003a, 2008a, 2008b, 2009).

***Mannia perssonii*** Udar & Chandra (Singh & Singh 2007d, 2008a, 2008b, 2009).

*Marchantia nepalensis* Lehm. & Lindenb. = *Marchantia paleacea* Bertol. [Bischler 1989].

***Marchantia paleacea*** Bertol. (Singh & Singh 2008b, 2009; Bir & Chopra 1972 and Bir 1975 as *Marchantia nepalensis* Lehm. & Lindenb.).

*Marchantia palmata* Nees (Indian populations) = *Marchantia papillata* Raddi subsp. *grossibarba* (Steph.) Bischl. [Bischler 1989].

***Marchantia papillata*** Raddi subsp. ***grossibarba*** (Steph.) Bischl. (Singh & Singh 2008b, 2009; Bir & Chopra 1972 and Bir 1975 as *Marchantia palmata* Nees).

***Marchantia polymorpha*** L. (Kashyap 1929; Bir & Chopra 1972; Bir 1975; Singh & Singh 2008b, 2009).

*Marchantia simlana* Steph. = *Marchantia papillata* Raddi subsp. *grossibarba* (Steph.) Bischl. [Bischler 1989].

*Massalonga tenera* Steph. = *Cryptomitrium himalayense* Kashyap [Kachroo *et al.* 1977].

*Mastigobryum triangulare* Schleich. ex Steph. = *Bazzania tricrenata* (Wahlenb.) Lindb. [Sharma & Srivastava 1993].

***Metacalypogeia alternifolia*** (Nees) Grolle (Sharma & Srivastava 1993; Kashyap 1932 as *Calypogeia renistipula* Steph.).

***Metzgeria consanguinea*** Schiffn. (Singh & Singh 2007d, 2008b, 2009).

- Metzgeria hamata* Lindb. = *Metzgeria leptoneura* Spruce [So 2003].  
*Metzgeria himalayensis* Kashyap = *Metzgeria lindbergii* Schiffn. [So 2003].  
***Metzgeria leptoneura*** Spruce (Singh & Singh 2008b, 2009; Srivastava & Udar 1975a as *Metzgeria hamata* Lindb.).  
***Metzgeria lindbergii*** Schiffn. (Singh & Singh 2007d, 2008b, 2009; Kashyap 1917 & 1929; Bir & Chopra 1972 as *Metzgeria himalayensis* Kashyap).  
*Metzgeria pubescens* Raddi = *Apometzgeria pubescens* (Schränk) Kuwah. [Srivastava & Udar 1975a].  
*Mindal pangiensis* Kashyap = *Reboulia hemisphaerica* (L.) Raddi [Kachroo *et al.* 1977].  
***Monosolenium tenerum*** Griff. (Kapila & Kumar 1995).  
*Pellia calycina* (Taylor) Nees = *Pellia endiviifolia* (Dicks.) Dumort. [Schuster 1992].  
***Pellia endiviifolia*** (Dicks.) Dumort. (Singh & Singh 2008b, 2009; Kashyap 1929 and Bir & Chopra 1972; Bir 1975 as *Pellia calycina* (Taylor) Nees ).  
***Pellia epiphylla*** (L.) Corda (Kashyap 1929; Bir 1975).  
***Plagiochasma appendiculatum*** Lehm. & Lindenb. (Kashyap 1929; Bir & Chopra 1972; Bir 1975; Singh & Singh 2003a, 2008a, 2008b, 2009).  
*Plagiochasma articulatum* Kashyap = *Plagiochasma pterospermum* C.Massal. (Bischler 1979).  
***Plagiochasma intermedium*** Lindenb. & Gottsche (Kashyap 1929; Singh & Singh 2008a, 2008b, 2009).  
***Plagiochasma pterospermum*** C.Massal. (Singh & Singh 2008b, 2009; Kashyap 1929 as *Plagiochasma quadricornutum* Steph.; Bir & Chopra 1972; Bir 1975 and Singh & Singh 2003a as *Plagiochasma articulatum* Kashyap).  
*Plagiochasma quadricornutum* Steph. = *Plagiochasma pterospermum* C.Massal. (Bischler 1979).  
***Plagiochasma rupestre*** (J.R.Forst. & G.Forst.) Steph. (Singh & Singh 2008b, 2009; Kashyap 1917 and Bir 1975 as *Plagiochasma simlense* Kashyap).  
*Plagiochasma simlense* Kashyap = *Plagiochasma rupestre* (J.R.Forst. & G.Forst.) Steph. [Bischler 1979].  
*Plagiochila accedens* Steph. = *Plagiochila korthalsiana* Molk. [So 2003].  
*Plagiochila alata* Inoue = *Plagiochila durelii* Schiffn. [So 2003].  
*Plagiochila ambigua* Mitt. = *Plagiochila uniformis* Mitt. [So & Grolle 2000].  
*Plagiochila dichotomoramosa* Inoue = *Plagiochila fordiana* Steph. [So 2003].  
***Plagiochila durelii*** Schiffn. (Singh & Singh 2007c, 2008b, 2009; Kashyap 1932 as *Plagiochila alata* Inoue, *Plagiochila ferruginea* Steph.).  
***Plagiochila duthiana*** Steph. (Singh & Singh 2007c, 2007d, 2008b, 2009).  
***Plagiochila elegans*** Mitt. (Singh & Singh 2007c, 2007d, 2009).  
*Plagiochila ferruginea* Steph. = *Plagiochila durelii* Schiffn. [So 2003].  
***Plagiochila fordiana*** Steph. (Inoue 1967 as *Plagiochila dichotomoramosa* Inoue).  
*Plagiochila grata* Steph. = *Plagiochila nepalensis* Lindenb. [So 2003].  
***Plagiochila korthalsiana*** Molk. (Singh & Singh 2007c, 2008b, 2009; Kashyap 1932 as *Plagiochila accedens* Steph.).  
***Plagiochila mundaliensis*** Steph. (Singh & Singh 2007c, 2007d, 2008b, 2009).  
***Plagiochila nepalensis*** Lindenb. (Singh & Singh 2007c, 2008b, 2009).  
***Plagiochila ovalifolia*** Mitt. (Singh & Singh 2006a, 2007c, 2008b, 2009).  
***Plagiochila parvifolia*** Lindenb. (Singh & Singh 2007c, 2007d, 2008b, 2009).  
***Plagiochila pseudopoeltii*** Inoue (So 2001).  
***Plagiochila retusa*** Mitt. (Singh & Singh 2007c, 2007d, 2009).  
***Plagiochila richteri*** Steph. ex S.C.Srivast. & R.Dixit (Singh & Singh 2007c, 2007d, 2008b, 2009). [So & Grolle (2000b) placed it under synonym of *P. nepalensis*. However, in having highly alveolate leaf cells with subnodulose to nodulose trigones, it is not only distinct from *P. nepalensis*, but also from other species of the genus as well].  
***Plagiochila sciophila*** Nees (Singh & Singh 2007c, 2007d, 2008b, 2009).

- Plagiochila simlana* Steph. = *Plagiochila uniformis* Mitt. [So 2003].  
***Plagiochila uniformis*** Mitt. (Singh & Singh 2007c, 2008b, 2009; Kashyap 1932 as *P. simlana* Steph.).  
***Porella caespitans*** (Steph.) S. Hatt. (Narayan *et al.* 2001; Singh & Singh 2006b, 2008b, 2009; Kashyap 1932 as *Madotheca acutiphylla* Kashyap).  
***Porella campylophylla*** (Lehm. & Lindenb.) Trevis. var. ***campylophylla*** (Singh & Singh 2006b, 2008b, 2009; Kashyap 1932 as *Madotheca campylophylla* Lehm. & Lindenb. and *Madotheca gollanii* Steph.).  
***Porella chinensis*** (Steph.) S.Hatt. (Singh & Singh 2006b, 2008b, 2009; Kashyap 1932 as *Madotheca gambleana* Steph.).  
*Porella chinensis* (Steph.) S.Hatt. var. *decurrens* (Steph.) S.Hatt. = *Porella decurrens* (Steph.) S.Hatt. [Singh & Singh 2009].  
***Porella decurrens*** (Steph.) S.Hatt. (Singh & Singh 2006b, 2008b, 2009).  
***Porella densifolia*** (Steph.) S.Hatt. subsp. ***appendiculata*** (Steph.) S.Hatt. (Kashyap 1932 as *Madotheca appendiculata* Steph.).  
***Porella gracillima*** Mitt. subsp. ***gracillima*** (Narayan *et al.* 2001; Singh & Singh 2006b, 2008b, 2009).  
***Porella gracillima*** Mitt. subsp. ***urogea*** (C.Massal.) S.Hatt. (Udar & Shaheen 1982).  
***Porella hattorii*** Udar & Shaheen (Singh & Singh 2006b, 2008b, 2009).  
***Porella japonica*** (Sande Lac.) Mitt. (Hattori 1967).  
***Porella madagascariensis*** (Nees & Mont.) Trevis. (Singh & Singh 2003a, 2006b, 2008b, 2009).  
***Porella obtusata*** (Taylor) Trevis. var. ***macroloba*** (Steph.) S.Hatt. & Zhang (Singh & Singh 2006b, 2008b, 2009; Kashyap 1932 as *Madotheca macroloba* Steph. and *Madotheca ovalis* Gottsche ex Steph.).  
***Porella platyphylla*** (L.) Pfeiff. (Singh & Singh 2006b, 2008b, 2009; Kashyap 1932 as *Madotheca platyphylla* Dumort.).  
***Porella plumosa*** Inoue (Singh & Singh 2006b, 2008b, 2009; Kashyap 1932 as *Madotheca plumosa* Mitt.).  
***Porella variabilis*** (Kashyap) Parihar (Singh & Singh 2006b, 2008b, 2009).  
***Preissia quadrata*** (Scop.) Nees (Kashyap 1929; Singh & Singh 2008b, 2009).  
***Ptychanthus striatus*** (Lehm. & Lindenb.) Nees (Singh & Singh 2007d, 2008b, 2009).  
***Radula complanata*** (L.) Dumort. (Kashyap 1929; Singh & Singh, 2008b, 2009).  
*Radula douleana* Steph. = *Radula grandifolia* Steph. (Udar & Kumar 1984).  
***Radula grandifolia*** Steph. (Kashyap 1929; Singh & Singh 2008b, 2009).  
***Radula lindenberiana*** Gottsche ex C.Hartm. (Singh & Singh 2003a, 2008b, 2009).  
***Radula obscura*** Mitt. (Singh & Singh 2003a, 2008b, 2009).  
***Radula tabularis*** Steph. (Udar & Kumar 1984).  
***Reboulia hemisphaerica*** (L.) Raddi (Kashyap 1929; Bir & Chopra 1972; Bir 1975; Singh & Singh 2003a, 2008a, 2008b, 2009).  
***Riccardia levieri*** Schiffn. (Srivastava & Udar 1976; Singh & Singh 2008b, 2009; Bir & Chopra 1972 as *Aneura levieri* Schiffn. ex Steph.).  
***Riccardia tenuicostata*** Schiffn. (Singh & Singh 2007d, 2008b, 2009).  
*Riccia robusta* Kashyap = *Riccia crystallina* L. [Srivastava 1964].  
***Riccia beyrichiana*** Hampe (Singh & Singh 2007d, 2008a, 2008b, 2009)  
***Riccia billardieri*** Mont. & Nees (Bir 1975)  
*Riccia bulbifera* Steph. = *Riccia billardieri* Mont. & Nees [Srivastava 1964].  
***Riccia crystallina*** L. (Kashyap 1916 & 1929 as *Riccia robusta* Kashyap).  
***Riccia discolor*** Lehm. & Lindenb. (Kashyap 1929; Bir 1975 and Bir & Chopra 1972 as *Riccia himalayensis* Kashyap).  
*Riccia duplex* Lorh. (Doubtful record from H.P. India, probably terrestrial form of *Riccia fluitans*).



- Riccia fluitans* L. (Bir & Chopra 1972 also as *Riccia duplex* Lorh.).  
*Riccia gangetica* Ahmad (Udar 1959).  
*Riccia himalayensis* Kashyap = *Riccia discolor* Lehm. & Lindenb. [Srivastava 1964].  
*Riccia pathankotensis* Kashyap (Kashyap 1929; Singh & Singh 2008b, 2009).  
*Riccia robusta* Kashyap = *Riccia crystallina* L. [Nicholson 1932].  
*Riccia sorocarpa* Bisch. (Udar 1959).  
*Sauchia spongiosa* Kashyap = *Sautoria spongiosa* (Kashyap) S.Hatt. [Shimizu & Hattori 1954].  
*Sauteria spongiosa* (Kashyap) S.Hatt. (Singh & Singh 2009; Kashyap 1915, 1929 as *Sauchia spongiosa* Kashyap).  
*Scapania aequiloba* (Schwägr.) Dumort. (Bapan & Kachroo 2000).  
*Scapania angusta* Mitt. ex Müll Frib. = *Scapania griffithii* Schiffn. [Potemkin 2002].  
*Scapania ferruginea* (Lehm. & Lindenb.) Gottsche (Singh & Singh 2007d, 2009).  
*Scapania glaucocephala* (Taylor) Austin (Singh & Singh 2007d, 2008b, 2009).  
*Scapania griffithii* Schiffn. (Srivastava & Srivastava 1994 as *Scapania angusta* Mitt. ex Müll Frib.).  
*Scapania orientalis* Steph. (Kashyap 1932 as *Diplophyllum orientale* Steph.).  
*Scapania parva* Steph. = *Scapania verrucosa* Heeg. [Potemkin 2002].  
*Scapania purpurea* Kashyap & R.S.Chopra = *Scapania undulata* (L.) Dumort. [Potemkin 2002].  
*Scapania udarii* S. C. Srivast. & Anshu Srivast. (Srivastava & Srivastava 1993).  
*Scapania undulata* (L.) Dumort. (Kashyap 1932 as *Scapania purpurea* Kashyap).  
*Scapania verrucosa* Heeg. (Kashyap 1932; Srivastava & Srivastava 1995; Singh & Singh 2007d, 2008b, 2009 as *Scapania parva* Steph.).  
*Seardiella tuberifera* Kashyap (Kashyap 1915, 1929 & 1932; Bir & Chopra 1972; Bir 1975).  
*Solenostoma breviflora* Kashyap (Kashyap 1932; Chopra 1943; Parihar 1961–62; Srivastava & Singh 1995 treated it as doubtful species because of unavailability of type specimens).  
*Solenostoma crenulata* (Sm.) Steph. = *Jungermannia crenulata* Sm. [Srivastava & Singh 1995].  
*Solenostoma lanceolata* (L.) Steph. = *Jungermannia leiantha* Grolle [Grolle 1966] = *Liochlaena lanceolata* Nees [Hentschel *et al.* 2007].  
*Solenostoma purpurata* (Mitt.) Steph. = *Jungermannia purpurata* Mitt. [Srivastava & Singh 1995].  
*Stephensiella brevipedunculata* (Kashyap 1929; Bir & Chopra 1972; Bir 1975; Singh & Singh 2008b, 2009).  
*Targionia hypophylla* L. (Bir & Chopra 1972; Bir 1975; Singh & Singh 2008b, 2009).  
*Targionia indica* Udar & Gupta (Singh & Singh 2003a, 2008b, 2009).  
*Trocholejeunea infuscata* (Mitt.) Verd. (Singh & Singh 2007d, 2008b, 2009).  
*Trocholejeunea sandvicensis* (Gottsche) Mizut. (Singh & Singh 2007d, 2008b, 2009).  
*Tuzibeanthus chinensis* (Steph.) Mizut. (Awasthi & Srivastava 1987; Singh & Singh 2008b, 2009).  
*Wiesnerella denudata* (Mitt.) Steph. (Kashyap 1929; Bir & Chopra 1972).

#### ANTHOEROTOPSIDA (HORNWORTS)

- Anthoceros bharadwajii* Udar & A.K.Asthana (Singh & Singh 2007d, 2008a, 2008b, 2009).  
*Anthoceros chambensis* Kashyap = *Phaeoceros laevis* (L.) Prosk. [Asthana & Srivastava 1991].  
*Anthoceros erectus* Kashyap (Bir & Chopra 1972; Bir 1975; Asthana & Srivastava 1991; Kashyap 1915, 1929 and as *Anthoceros longii* Steph.).  
*Anthoceros himalayensis* Kashyap = *Phaeoceros himalayensis* (Kashyap) Prosk. ex Bapna & G.G.Vyas [Asthana & Srivastava 1991].  
*Anthoceros longii* Steph. = *Anthoceros erectus* Kashyap [Asthana & Srivastava 1991].  
*Hattorioceros striatisporus* (J.Haseg.) J.Haseg. (Hasegawa 1994b and Hasegawa 1994a as *Phaeoceros striatisporus* J.Haseg.).

- Megaceros flagellaris* (Mitt.) Steph. = *Megaceros tjibodensis* Campb. [Srivastava per. Lit.].  
***Megaceros tjibodensis* Campb.** (Vishvakarma & Kaul 1989 and Singh 1994 as *Megaceros flagellaris* (Mitt.) Steph.).  
***Phaeoceros carolinianus*** (Michx.) Prosk. (Singh & Singh 2007d, 2008b, 2009).  
***Phaeoceros himalayensis*** (Kashyap) Prosk. ex Bapna & G.G.Vyas (Singh & Singh 2008a, 2008b, 2009; Bir & Chopra 1972 and Bir 1975 as *Anthoceros himalayensis* Kashyap).  
***Phaeoceros laevis*** (L.) Prosk. (Singh & Singh 2008a, 2008b, 2009; Kashyap 1917 and Bir & Chopra 1972 as *Anthoceros chambensis* Kashyap; Asthana & Srivastava 1991 as *Phaeoceros laevis* (L.) Prosk.) subsp. *laevis*).  
*Phaeoceros laevis* (L.) Prosk.) subsp. *laevis* = *Phaeoceros laevis* (L.) Prosk. [Hassel de Menéndez 1987].  
*Phaeoceros striatisporus* J.Haseg. = *Hattorioceros striatisporus* (J.Haseg.) J.Haseg. [Hasegawa 1994b].  
***Notothylas himalayensis*** Udar & D.K. Singh (Singh 2002; Singh & Singh 2008a, 2008b, 2009).  
***Notothylas indica*** Kashyap (Bir 1975).  
***Notothylas levieri*** Schiffin. (Kashyap 1929; Bir & Chopra 1972; Bir 1975).

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