
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), *Stephensiella* (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. & Udari = *Fossombronia himalayensis* Kashyap [Krayeski *et al.* 2005].
- Fossombronia levieri* Steph. = *Fossombronia himalayensis* Kashyap [Srivastava & Udari 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. (Sivastava & 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. (Sivastava & 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; Sivastava & 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 lindenbergiana 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. [Hässel 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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