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Research Communication

Check list of Anthoceroophyta and Marchantiophyta of Pakistan and Kashmir

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Abstract

In the present study, a review of previously published literature regarding Anthoceroophyta and Marchantiophyta of Pakistan and Kashmir has been done in order to know the diversity of these groups. Previous contributions collectively reveal 122 taxa distributed in 36 genera and 24 families. Of these 118 taxa (97.52%) are belonging to the Marchantiophyta, while the rest of 4 species (3.30%) members to Anthoceroophyta. Aytoniaceae is the largest family with 16 species. Genera-wise, *Riccia* is the largest genus with 12 species. An average number of species/genera is c. 3.36. A major portion of Pakistan is still un-explored especially Sindh and Balochistan province of Pakistan, and on the basis of this study it can be said that many more taxa will be added to the list.

Keywords

Anthoceroophyta; Bryoflora; Marchantiophyta; Pakistan

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Introduction

Bryophyte diversity of Pakistan and Kashmir is still modestly known. Previously, some attempts have been made to explore the magnitude of the bryophytes in Kashmir and in the provinces of Pakistan (Fig.1). J.F. Duthie (1898), the earliest person how had reported a liverwort i.e. *Grimaldia dichotoma* Raddi from Chitral. Stephani (1900-1924) was the next bryologist who had provided the first account of the liverwort species of Kashmir. Gola was the third one who had documented 11 taxa of hepatics. Prof. Kashyap (1929, 1932), who is known as the first bryologist

for the Indian region, dealt with the hornworts and liverworts from the North-Western Himalayan region and adjacent Punjab plains. He published his valuable findings in the form of two volumes entitled "Liverworts of the Western Himalayas and Punjab Plains". He provided a detailed taxonomic account 165 species including many new genera and species. Later on Herzog (1938) recorded a liverwort species (i.e. *Madotheca platyphylloidea* (Sch.) Dumort. from the Upper Dir, N.W.P. province (now this province is known as Khyber Pakhtunkhaw). After 26 years of Herzog, Froehlich (1964), a German bryologist, recorded few from

Table 1. Check list of Anthocerophyta and Marchantiophyta of Pakistan and Kashmir based on previously published literature

S.No.	Family	Species	Altitude	Distribution	Referece(s)
MARCHANTIOPHYTA					
1.	Aneuraceae	<i>Aneura blasioides</i> (Horik.) Furuki, J.	600m-3150m	Chanjal, between Besham and Mansehra Mansehra District: Kaghan Valley, Lake Saiful Maluk.	Mizutani <i>et al.</i> (1994)
2.	Aneuraceae	<i>Aneura pinguis</i> (L.) Dumort.		Mansehra District: Kaghan Valley, Sharan; Sikyan near Nadi. Astore District: Nanga Parbat, Rupal-Naga Parbat Base Camp; Mazino Base Camp Punjab: Sialkot, Lahore.	Kashyab (1929); Kashyap and Chopra (1932) as <i>Aneura indica</i> St.; Furuki <i>et al.</i> (1993); Mizutani <i>et al.</i> (1994)
3.	Aneuraceae	<i>Riccardia multifida</i> (L.) Gray	700-2370m	Kashmir: Rajouri Mansehra District: Kaghan Valley, Sharan.	Mizutani <i>et al.</i> (1994); Rashid <i>et al.</i> (2012)
4.	Antheliaceae	<i>Anthelia julacea</i> (L.) Dumort.	1200m	Kashmir: Zanskar, Ladakh	Kashyap & Chopra (1932)
5.	Aytoniaceae	<i>Asterella leptophylla</i> (Mont.) Pande et al.		Kashmir: Punch, Toli pir, east of Rawalakot; Rajouri	Kashyap (1929) as <i>Fimbriaia reticulata</i> Kashyap; Furuki <i>et al.</i> (1993), Rashid <i>et al.</i> (2012) as <i>Asterella reticulata</i> (Kash.) Pande
6.	Aytoniaceae	<i>Asterella angusta</i> (Steph.)Kachroo		Kashmir: Rajouri	Rashid <i>et al.</i> (2012)
7.	Aytoniaceae	<i>Asterella blumeana</i> (Nees) Pande.	2400m	Kashmir: Kashmir, Punch, Mt. Toli Pir; Rajouri	Furuki <i>et al.</i> (1993); Rashid <i>et al.</i> (2012)
8.	Aytoniaceae	<i>Asterella gracilis</i> (T. Weber) Underw.	13000ft.	Kashmir: Lidar Valley	Kashyap (1929) as <i>Fimbriaria parvipora</i> St.
9.	Aytoniaceae	<i>Asterella multiflora</i> (Stephani) Pande et al.		Punjab: Lahore	Kashyap(1929) as <i>Fimbriaria pathankotensis</i> Kashyap
10.	Aytoniaceae	<i>Asterella mussooriensis</i> (Kashyap) Verd.		Punjab: Lahore	Kashyap(1929) as <i>Fimbriaria mussuriensis</i> Kashyap
11.	Aytoniaceae	<i>Mannia androgyna</i> (L.) A.Evans		Chitral:Jambotai Kashmir Punjab (specific locality not known).	Duthie (1898) as <i>Grinaldia dichotoma</i> ; Kashyap(1929) as <i>Fimbriaria calciatii</i> Gola; Dandotiya <i>et al.</i> (2011)
12.	Aytoniaceae	<i>Mannia foreau</i> Udar & V. Chandra	900-1500m	Kashmir:Rajouri	Rashid <i>et al.</i> (2012)
13.	Aytoniaceae	<i>Mannia indica</i> Stephani Kachroo	10,000ft.	Waziristan: Miranshah Punjab: Lahore.	Kashyap (1929) as <i>Grumaldia indica</i> St.
14.	Aytoniaceae	<i>Plagiochasma appendiculatum</i> Lehm.& Lindenb.	900m-2500m	Mansehra Disrict: Kaghan valley, Kawai, Kamal ban forest, Shogran, Sithan Gali Kashmir: Rajouri Waziristan: Miranshah Punjab: Lahore; Rawalpinsi; Murree.	Kashyap (1929); Mizutani <i>et al.</i> (1994); Rashid <i>et al.</i> (2012); Ali (2015)

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15. Aytoniaceae	<i>Plagiochasma cordatum</i> Lehm.	2940m-2550m	Mansehra District: Kaghan valley, Kamal Ban Forest, Shogran, Punjab:Murree	Mizutani <i>et al.</i> (1994)
16. Aytoniaceae	<i>Plagiochasma intermedium</i> Lindenb. & Gottsche	900-2500m	Kashmir:Rajouri	Rashid <i>et al.</i> (2012)
17. Aytoniaceae	<i>Plagiochasma pterospermum</i> Mass.	900-2500m	Mansehra District: Sithan Gaki Kashmir: Ladakh; Rajouri; Punch, Mt. Toli Pir, Abbottabad District: Dungagali-Murree Waziristan: Miranshah Punjab: Murree; Lahore.	Kashyap (1929) ; Rashid <i>et al.</i> (2012) and Ali (2015) as <i>Plagiochasma articulatum</i> Kashyap; Furuki <i>et al.</i> (1993); Mizutani <i>et al.</i> (1994)
18. Aytoniaceae	<i>Plagiochasma rupestre</i> (Forst.) Steph.	2150-2400m	Azad Kashmir: Punch, Mt.Toli Pir, Abbotabad.	Furuki <i>et al.</i> (1993)
19. Aytoniaceae	<i>Reboulia hemisphaerica</i> (L.) Raddi	900m-3430m	Astore District: Nanga Parbat Base camp Mansehra District: Kaghan Valley, Kawai; Shogran; Paya; Sithan Gali Abbottabad, north of Nathia Gali. Kashmir: Gulmarg Pass; Rajouri Punjab: Murree; Changla Gali, northe of Murree; Lahore Swat: Mingora; Utrot; Matiltan	Kashyap (1929); Karezmarz (1980) Furuki <i>et al.</i> (1993); Mizutani <i>et al.</i> (1994); Dandotiya <i>et al.</i> (2011); Rashid <i>et al.</i> (2012); Ali (2015)
20. Cleveaceae	<i>Athalamia pinguis</i> Falc.	412m-2940m	Mansehra District: Kaghan Valley, Paya; Balakot. Abbottabad District: Dunga Gali Kashmir:Rajouri Punjab: Changla Gali, north of Murree	Furuki <i>et al.</i> (1993); Mizutani <i>et al.</i> (1994); Rashid <i>et al.</i> (2012)
21. Cleveaceae	<i>Athalamia pusila</i> (Stephani)Kashyap	1400-1800m	Kashmir:Rajouri	Rashid <i>et al.</i> (2012)
22. Cleveaceae	<i>Sauteria alpina</i> Nees.	13,000ft.	Kashmir: Lidar Valley	Kashyap (1929)
23. Cleveaceae	<i>Sauteria spongiosa</i> (Kash.) Hatt. in Shimizu et Hattori, J.	2280m	Punjab: Murree Abbottabad: Dungagali Kashmir: Konsa Nag	Furuki <i>et al.</i> (1993)
24. Codoniaceae	<i>Petalophyllum indicum</i> Kashyap		Punjab: Lahore (Ravi Bank)	Kashyap(1929); Kashyap & Chopra (1932)
25. Conocephalaceae	<i>Conocephalum conicum</i> (L.) Andrew.	1000-2860m	Mansehra District: Kagahan Valley, Kawai; Sharan; Shogran-Sali Hut, Shogran-Kawai; Naran Kashmir: Gulmarg Pass; Rajouri Swat: Dargai; Matiltan	Kashyap (1929); Froehlich, 1964; Karezmarz (1980) ; Furuki <i>et al.</i> (1993); Mizutani <i>et al.</i> (1994); Rashid <i>et al.</i> (2012); Ali (2015)
26. Dumortieraceae	<i>Dumortiera hirsuta</i> Reinw. Bl. et. Nees.		Mansehra District: Sithan Gali Kashmir:Rajouri	Ali (2015); Rashid <i>et al.</i> (2012)
27. Fossombroniaceae	<i>Fossombronia himalayensis</i> Kashyap		Punjab: Lahore.	Kashyap (1929)

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28.	Fossombroniaceae	<i>Fossombronia wondraczekii</i> (Corda) Dum.	2150-2400m	Kashmir: Punch, Mt. Toli Pir Abbotabad District: Nathia Gali.	Furuki <i>et al.</i> (1993)
29.	Jubulaceae	<i>Frullania polyptera</i> Taylor	-	Kashmir. Punjab: Murree.	Kashyap & Chopra (1932) as <i>Frullania gracillima</i> St. and <i>Frullania pyriflora</i> St.
30.	Jubulaceae	<i>Frullania gaudichaudii</i> (Nees & Mont.) Nees & Mont.	1300-1800m	Kashmir:Rajouri	Rashid <i>et al.</i> (2012)
31.	Jubulaceae	<i>Frullania inflata</i> Gott.	1940m	Azad Kashmir: Muzaffarabad, Mt. Pir Chinasi	Furuki <i>et al.</i> (1993)
32.	Jubulaceae	<i>Frullania muscicola</i> Steph.	1600m-2350m	Mansehra District: Kaghan Valley, Kawai, Kamal Ban Forest, Shogran, Sharan Punjab: Murree.	Mizutani <i>et al.</i> (1994)
33.	Jubulaceae	<i>Frullania neurota</i> Taylor	1300-1800m	Kashmir:Rajouri	Rashid <i>et al.</i> (2012)
34.	Jungermanniaceae	<i>Lophocolea piacenti</i> (Gola)Váňa		Kashmir	Kashyap and Chopra (1932) as <i>Lophozia piacenti</i> Gola
35.	Jungermanniaceae	<i>Gymnocolea inflata</i> (Hud.) Dumort.	900-1200m	Kashmir:Rajouri	Rashid <i>et al.</i> (2012)
36.	Jungermanniaceae	<i>Jungermannia atrobrunnea</i> Amak.	2700m	Mansehra District: Kaghan valley, Shogran	Mizutani <i>et al.</i> (1994)
37.	Jungermanniaceae	<i>Jungermannia confertissima</i> Nees.	3150m	Mansehra District: Kaghan valley, Lake Saiful Mulk.	Mizutani <i>et al.</i> (1994)
38.	Jungermanniaceae	<i>Jungermannia gracillima</i> Sm.	-	Kashmir: Gulmarg Pass	Karezmarz (1980)
39.	Jungermanniaceae	<i>Jungermannia lanceolata</i> L.	900-1500m	Kashmir:Rajouri	Rashid <i>et al.</i> (2012)
40.	Jungermanniaceae	<i>Jungermannia truncata</i> Nees	680m	Chanjal, between Besham and Mansehra.	Mizutani <i>et al.</i> (1994)
41.	Jungermanniaceae	<i>Leiocolea collaris</i> Scjljakov	14-15,000ft.	Kashmir: Zanskar, Ladakh Punjab plains (Lahore?).	Kashyap and Chopra (1932) as <i>Lophozia alpestris</i> (Schleich.) Evans
42.	Jungermanniaceae	<i>Lophozia incisa</i> (Schrad.) Dumort.		Kashmir: Zanskar (Ladakh)	Kashyap and Chopra (1932)
43.	Jungermanniaceae	<i>Lophozia morrisoncola</i> Horik.	2740m	Mansehra District: Kaghan valley, Shogran. Kashmir: Gulmarg Pass	Karezmarz (1980); Mizutani <i>et al.</i> (1994)
44.	Jungermanniaceae	<i>Solenostoma flavorevolutum</i> (Váňa) Váňa & D.G.Long	2850m	Swat Valley: Lake Mahodand (North of Matiltan).	Mizutani <i>et al.</i> (1994) as <i>Jungermannia flavorevoluta</i> Vana.
45.	Jungermanniaceae	<i>Solenostoma duthianum</i> (Stephani) C.Gao		Kashmir Punjab plains:	Kashyap and Chopra (1932) as <i>Jungermannia duthiana</i> St.
46.	Lejeuneaceae	<i>Cololejeunea ornata</i> Evans	2400m	Mansehra District: Sharan forest.	Furuki <i>et al.</i> (1993)
47.	Lejeuneaceae	<i>Lejeunea alba</i> Sande Lac.	800-1100m	Kashmir:Rajouri	Rashid <i>et al.</i> (2012)

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	Lejeuneaceae	<i>Trocholejeunea sandvicensis</i> Mizut.	700-1800m	Kashmir: Punch, Banjosa; Rajouri	Furuki <i>et al.</i> (1993); Rashid <i>et al.</i> (2012)
48.	Lejeuneaceae	<i>Tuzibeanthuns chinensis</i> (Stephani) Mizut.	700-1700m	Kashmir: Rajouri	Rashid <i>et al.</i> (2012)
49.	Lepidoziaceae	<i>Lepidozia reptans</i> (L.) Dumort.	2200-2600m	Swat Valley: Desan Forest (south of Utrot), Mansehra District; Kaghan Valley, Shogran; Sharan Kashmir	Kashyap and Chopra (1932); Mizutani <i>et al.</i> (1994)
50.	Lophocoleaceae	<i>Chiloscyphus campanulatus</i> Stephani		Kashmir	Dandotiya <i>et al.</i> (2011)
51.	Lophocoleaceae	<i>Chiloscyphus himalayensis</i> (A.Srivast. ex S.C.Srivast.) J.J. Engl		Kashmir	Dandotiya <i>et al.</i> (2011)
52.	Lophocoleaceae	<i>Chiloscyphus humilis</i> (Hook. f. & Taylor) Hässel de Menéndez		Punjab: Lahore	Kashyap(1929); Kashyap and Chopra (1932) as <i>Jungermannia humilis</i> Kashyap
53.	Lophocoleaceae	<i>Chiloscyphus pallescens</i> (Ehrh. ex Hoffm.) Dumort.	1780-2250m	Azad Kashmir: Punch, chotagara, Mansehra: Shogran, Abbottabad District: Nathia gali Punjab: Murree	Furuki <i>et al.</i> (1993)
54.	Lophocoleaceae	<i>Chiloscyphus polyanthos</i> (L.) Corda	2070m-2370m	Swat Valley: Matiltan-Lake Mahodand, Mansehra District: Kaghan valley, sharan, Dunga Gali Kashmir: Mughul Gardens Punjab: Murree.	Karezmarz (1980) as <i>Chiloscyphus polyanthus</i> ; Mizutani <i>et al.</i> (1994)
55.	Lophocoleaceae	<i>Lophocolea bidentata</i> (L.) Dumort.		Kashmir: Gulmarg	Karezmarz (1980)
56.	Lophocoleaceae	<i>Lophocolea minor</i> Nees.	1940m-2600m	Gilgit: Naltar vy Kashmir: Muzaffarabad, Mt. Pir Chinasi Abbotabad District: Dungagali, Mansehra District: Kaghan valley, Kamal Ban forest, Sharan; Shogran, Sali Hut; Sikyan near Nadi Swat valley: Desan forest	Furuki <i>et al.</i> (1993); Mizutani <i>et al.</i> (1994); Gruber and Peer (2012)
57.	Marchantiaceae	<i>Marchantia emarginata</i> subsp. <i>emarginata</i>		Kashmir: Rajouri Punjab: Lahore, Sialkot	Kashyap (1929), Ali (2015) Rashid <i>et al.</i> (2012) as <i>Marchantia palmata</i> Nees.
58.	Marchantiaceae	<i>Marchantia linearis</i> Lehm. and Lindenb.		Kashmir Pakistan:	Bischler (1989); Dandotiya <i>et al.</i> (2011)
59.	Marchantiaceae	<i>Marchantia paleacea</i> Bert.	680m-2800m	Chanjal, between Mansehra and Besham; Patagram (Batagram?) Mansehra District: Kaghan Valley, Kawai; Kamal Ban Forest; Shogran; Lake Saful Maluke; Batakundi Swat: Matiltan	Mizutani <i>et al.</i> (1994)

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60.	Marchantiaceae	<i>Marchantia paleacea</i> Bertol. subsp. <i>paleacea</i>	1600-2400m	Kashmir: Muzaffarabad, Chikar, Punjab: Lahore Mansehra District: Shogran-Kawai; Abbottabad District: north of Nathia Gali	Kashyab (1929), Ali (2015) and Rashid <i>et al.</i> (2012) as <i>Marchantia nepalensis</i> Lehm. et Lindenb; Furuki <i>et al.</i> (1993)
61.	Marchantiaceae	<i>Marchantia papillata</i> Reddi subsp. <i>grossibarba</i> (Steph.) Bischl.		Pakistan and Kashmir	Kashyab (1929) as <i>Marchantia simlana</i> Stephani; Bischler (1989); Dandotiya <i>et al.</i> (2011)
62.	Marchantiaceae	<i>Marchantia pappeana</i> Lehm. subsp. <i>robusta</i> (Steph.) Bischl.		Kashmir: Rajouri	Rashid <i>et al.</i> (2012) as <i>Marchantia kashyapii</i> ; Langer and Tanwir (2002)
63.	Marchantiaceae	<i>Marchantia polymorpha</i> L.	2400m-4000m	Gilgit: Naltar vy Baltistan: Skardu Kashmir: Ladakh, Leh, Kargil; Rajouri; Gulmarg Pass Astore District: Nanga Parbat, Tarishing-Rupal; Rupal, Nanga Parbat Base Camp; Shaigiri; Mazino Base Camp Swat Valley: Desan forest; Matiltan; Matiltan lake, Mahdand Mansehra District: Kaghan Valley, Batakundi; Kamal Ban Forest; Shogran; Sharan; lake Saful Maluke	Kashyab (1929); Robinson (1965); Karezmarz (1980); Mizutani <i>et al.</i> (1994); Gruber and Peer (2012); Rashid <i>et al.</i> (2012); Ali (2015)
64.	Marchantiaceae	<i>Marchantia subintegra</i> Mitt.	600-200m	Kashmir: Rajouri	Rashid <i>et al.</i> (2012)
65.	Marchantiaceae	<i>Preissia quadrata</i> (Scop.) Nees	2370-3250m	Gilgit: Naltar vy Baltistan: Atosar valley, upper Hushe vy Kashmir: Gulmarg Pass; Asthanmarg; Ladakh Mansehra: Kaghan Valley, Saiful Maluke lake.	Kashyab (1929); Robinson (1965); Karezmarz (1980); Mizutani <i>et al.</i> (1994); Ali (2015); Gruber and Peer (2012)
66.	Metzgeriaceae	<i>Metzgeria conjugata</i> Lindb.		Kashmir: Gulmarg Pass	Kashyab and Chopra (1932); Karezmarz (1980)
67.	Metzgeriaceae	<i>Metzgeria decipiens</i> (Mass.) Schifren.	2450m	Swat Valley: Matiltan	Mizutani <i>et al.</i> (1994)
68.	Metzgeriaceae	<i>Metzgeria furcata</i> (L.) Corda		Kashmir	Kashyab and Chopra (1932)
69.	Metzgeriaceae	<i>Metzgeria minor</i> (Schiffn.) Kuw.	2020m	Mansehra District: Sikyan near Nadi,	Furuki <i>et al.</i> (1993)
70.	Metzgeriaceae	<i>Metzgeria pubescens</i> Raddi	10-11,000ft.	Kashmir: Burzil Valley	Kashyab and Chopra (1932); Ali (2015)
71.	Pelliaceae	<i>Pellia fabbroniana</i> Raddi.		Swat Valley: Kalam	Mizutani <i>et al.</i> (1994)
72.	Pelliaceae	<i>Pellia epiphylla</i> (L.) Corda		Kashmir: Gulmarg Pass	Karezmarz (1980)
73.	Pelliaceae	<i>Pellia endiviifolia</i> (Dicks.) Dumort.	1600m-2450m	Kashmir: Muzaffarabad, Mt, Pir Chinasi, Punch, Chotgara, Mt, Toli Pir, Mansehra District: Kaghan Valley, Kawai; Shogran-Kawai; Naran Swat: Matiltan Punbab: Murree	Kashyab (1929); (1932) Kashyab and Chopra as <i>Pellia calycina</i> ; Nees.; Furuki <i>et al.</i> (1993); Mizutani <i>et al.</i> (1994); Dandotiya <i>et al.</i> (2011)

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74.	Plagiochilaceae	<i>Plagiochila accedens</i> Steph.	700-2000m	Kashmir:Rajouri	Rashid <i>et al.</i> (2012)
75.	Plagiochilaceae	<i>Plagiochila ambagiosa</i> Mitt.	2020-2350m	Mansehra District: Shogran-Panrang, Sikyan near Nadi	Furuki <i>et al.</i> (1993)
76.	Plagiochilaceae	<i>Plagiochila asplenioides</i> (L.) Dum.		Kashmir:Rajouri	Kashyap and Chopra (1932).status doubtful
77.	Plagiochilaceae	<i>Plagiochila chinensis</i> Stephani	700-200m	Kashmir:Rajouri	Rashid <i>et al.</i> (2012)
78.	Plagiochilaceae	<i>Plagiochila duthiana</i> Stephani	9000ft.	Kashmir. Sonamarg	Kashyap and Chopra (1932) also reported as <i>Plagiochila himalayensis</i> and <i>Plagiochila cavifolia</i> St.
79.	Plagiochilaceae	<i>Plagiochila parvifolia</i> Lindenb.	600-1800m	Kashmir: Rajouri	Rashid <i>et al.</i> (2012)
80.	Plagiochilaceae	<i>Plagiochila phalangea</i> Taylor	700-1900m	Kashmir: Rajouri	Rashid <i>et al.</i> (2012)
81.	Plagiochilaceae	<i>Plagiochila porelloides</i> Torrey ex Nees Lindenb.		Kashmir: Gulmarg Pass	Karezmarz (1980)
82.	Plagiochilaceae	<i>Plagiochila sciophila</i> Nees	2400m	Mansehra District: Shogran, Sharan forest.	Furuki <i>et al.</i> (1993)
83.	Plagiochilaceae	<i>Plagiochila</i> sp.	3100m	Gilgit: Naltar vy	Gruber and Peer (2012)
84.	Plagiochilaceae	<i>Plagiochila woronofii</i> St.	700-200m	Kashmir:Rajouri	Rashid <i>et al.</i> (2012)
85.	Porellaceae	<i>Porella borellii</i> Gola		Kashmir:Sind Valley	Kashyap & Chopra (1932) as <i>Madotheca borellii</i> Gola
86.	Porellaceae	<i>Porella acutifolia</i> (Lehm. & Lindenb.) Trevis	900-1700m	Kashmir:Rajouri	Rashid <i>et al.</i> (2012)
87.	Porellaceae	<i>Porella caespitans</i> (Stephani) S.Hatt. var. <i>nipponica</i> Hatt.	1100-2020m	Kashmir:Rajouri Mansehra District: Sikyan near Nadi.	Furuki <i>et al.</i> (1993); Rashid <i>et al.</i> (2012)
88.	Porellaceae	<i>Porella campylophylla</i> (Lehm. & Lindenb.) Trevis	1300-1800m	Kashmir:Rajouri	Rashid <i>et al.</i> (2012)
89.	Porellaceae	<i>Porella chinensis</i> (Steph.) Hatt. J.Hattori Bot.	1100-2400m	Kashmir: Muzaffarabad; Mt, Pir Chinasi; Mughul Gardens Abbottabad District: Dungagali, Mansehra District: Kaghan Valley, Kawai; Kamal Ban forest; Sharan forest ; Shogran; Naran Swat Valley:Matiltan;Gabral; Desan forest Kashmir:Rajouri Punjab: Murree	Kashyap and Chopra (1932) as <i>Madotheca decurrens</i> St.; Karezmarz (1980) as <i>Porella chinensis</i> var. <i>decurrens</i> ; Furuki <i>et al.</i> (1993); Mizutani <i>et al.</i> (1994); Rashid <i>et al.</i> (2012)
90.	Porellaceae	<i>Porella densifolia</i> (Steph.) Hatt.subsp. <i>appendiculata</i> (Steph.) Hatt.	1600m	Mansehra District: Kaghan Vaelly, Kawai Kashmir	Mizutani <i>et al.</i> (1994); Dandotiya <i>et al.</i> (2011)

Table 1 Contd. Check list of Anthocerophyta and Marchantiophyta of Pakistan and Kashmir based on previously published literature

91. Porellaceae	<i>Porella gracillima</i> Mitt.	1600m-2350m	Mansehra Mansehra District: Kaghan valley, Kawai; Kamal Ban forest; Shogran-Parrang, Kund near the Sharan forest, Sikyan near Nadi. Kashmir	Kashyap and Chopra (1932) as <i>Madotheca gracillima</i> Mitt., as <i>Madotheca obtusifolia</i> Kashyap and <i>Madotheca angusta</i> St.; Furuki <i>et al.</i> (1993); Mizutani <i>et al.</i> (1994) ; Dandotiya <i>et al.</i> (2011)
92. Porellaceae	<i>Porella ovalis</i> Gottsde ex Stephani) S.Hatt & G.C. Zhang		Kashmir: Ladakh	Kashyap & Chopra (1932) as <i>Madotheca ovalis</i> Stephani
93. Porellaceae	<i>Porella platyphylla</i> (L.) Pfeiff.	1100-2740m	Kashmir: Rajouri Mansehra District: Kagan (Kaghan) Valley; Shogran-Sali Hut, Shogran-Parrang Kashmir: Liddar Valley; Gulmarg	Kashyap and Chopra (1932) as <i>Madotheca platyphylla</i> (L.) Dum., <i>Madotheca trigonifolia</i> St. and <i>Madotheca virens</i> St.; Furuki <i>et al.</i> (1993); Rashid <i>et al.</i> (2012)
94. Porellaceae	<i>Porella platyphylloidea</i> (D.Suh.) Dum.	2000m	Dir: above Dir	Herzog (1938) as <i>Madotheca platyphylloidea</i> (Sch.) Dum.
95. Porellaceae	<i>Porella plumosa</i> (Mitt.) Parihar	2400m	Mansehra Mansehra District: Sharan forest,	Furuki <i>et al.</i> (1993)
96. Pseudolepicoleaceae	<i>Blepharostoma trichophyllum</i> (L.) Dum.	3100-3150m	Gilgit: Naltar vy Mansehra District: Kaghan Valley, Lake Saiful Maluk Astore-Diamer: Nanga Parbat Base camp.	Mizutani <i>et al.</i> (1994); Gruber and Peer (2012)
97. Radulaceae	<i>Radula lindergii</i> Gottsche		Kashmir	Kashyap and Chopra (1932); Dandotiya <i>et al.</i> (2011)
98. Radulaceae	<i>Radula complanata</i> (L.) Dum.	900-2400m	Kashmir: Rajouri Swat Valley: Utror; Gabral Mansehra District: Kaghan Valley; Sharan forest, Sikyan near Nadi.	Froehlich, 1964; Furuki <i>et al.</i> (1993); Mizutani <i>et al.</i> (1994); Rashid <i>et al.</i> (2012)
99. Radulaceae	<i>Radula constricta</i> Steph.	1800-2480m	Azad Kashmir: Punch, Banjosa, Mansehra District: Kagh Valley, Shogran-Sali Hut, Shogran- Kawai, Sikyan near Nadi.;Naran Punjab: North of Murree, Changla Gali Swat: Gabral;Matiltan	Furuki <i>et al.</i> (1993); Mizutani <i>et al.</i> (1994)
100. Radulaceae	<i>Radula lindenberiana</i> Gottsche ex Hartm.		Punjab plains.	Kashyap and Chopra (1932)
101. Ricciaceae	<i>Riccia cruciata</i> Kashyap		Punjab: Lahore, Ravi bank.	Kashyap(1929)
102. Ricciaceae	<i>Riccia melanospora</i> Kashyap	12,000ft.	Kashmir: Konsa Nag	Kashyap(1929)
103. Ricciaceae	<i>Riccia pathankotensis</i> Kashyap		Punjab: Lahore	Kashyap(1929)
104. Ricciaceae	<i>Riccia aravalliensis</i> Pande & Udar		Kashmir: Rajouri	Rashid <i>et al.</i> (2012)
105. Ricciaceae	<i>Riccia beyrichiana</i> Hampe ex Lehm. et Lindenb.	2020-2400m	Azad Kashmir: Punch, Mt. Toli Pir, Mansehra: Sikyan Abbotabad:	Furuki <i>et al.</i> (1993)

Table 1 Contd. Check list of Anthocerophyta and Marchantiophyta of Pakistan and Kashmir based on previously published literature

106. Ricciaceae	<i>Riccia crytallina</i> L.		Punjab Lahore, Shalamar Gardens, Ravi banks.	Kashyap(1929) as <i>Riccia robusta</i> Kashyap
107. Ricciaceae	<i>Riccia discolor</i> Lehm. and Lindenb.	700-1900m	Kashmir: Rajouri Punjab: Lahore	Kashyap(1929) as <i>Riccia himalayensis</i> St.; Rashid <i>et al.</i> (2012) as <i>Riccia discolor</i> Lehm. and Lindwnb.
108. Ricciaceae	<i>Riccia fluitens</i> L.		Kashmir: Mughul Gardens	Karezmarz (1980)
109. Ricciaceae	<i>Riccia frostii</i> Austin		Kashmir Punjab: Lahore, Ravi banks Peshawar	Kashyap(1929) as <i>Riccia sanguinea</i> Kashyap; Dandotiya <i>et al.</i> (2011)
110. Ricciaceae	<i>Riccia stricta</i> (Gottsche, Lindenb and Nees)Perold		Kashmir Peshawar	Kashyap(1929) as <i>Riccia flutans</i> L.
111. Ricciaceae	<i>Riccia warnstorffii</i> Limpr.ex Warnst.	700-2800m	Azad Kashmir: Punch, Mt. Toli Pir ; Rajouri Swat: Lake Mahodand	Furuki <i>et al.</i> (1993); Mizutani <i>et al.</i> (1994) Rashid <i>et al.</i> (2012)
112. Ricciaceae	<i>Ricciocarpos natans</i> Corda		Kashmir: Dal; Lake(Sahni);Moughul Gar -dens Peshawar	Kashyap(1929) ; Karezmarz (1980)
113. Ricciaceae	<i>Riccia</i> sp.		Baltistan: Hushe-Saltoro and Shyok River	Robinson (1965)
114. Riellaceae	<i>Riella indica</i> Stephani		Punjab: Lahore.	Kashyap and Chopra (1932)
115. Scapaniaceae	<i>Scapania glaucocephala</i> (Taylor)Austin	3100m	Gilgit: Naltar vy	Gruber and Peer (2012)
116. Scapaniaceae	<i>Scapania</i> sp.	3050m	Gilgit: Naltar vy	Gruber and Peer (2012)
117. Scapaniaceae	<i>Scapania verrucosa</i> Heeg	900m-3150m	Mansehra District: Sikyan near Nad.; Sithan Gali Kashmir: Rajouri Punjab plains	Kashyap and Chopra (1932) as <i>Scapania parva</i> St.; Fruuki <i>et al.</i> (1993); Mizutani <i>et al.</i> (1994); Rashid <i>et al.</i> (2012) ; Ali (2015)
118. Targioniaceae	<i>Targionia hypophylla</i> L.	800-1800m	Swat Valley: Kalam; Utror Kashmir:Rajouri	Froehlich (1964); Rashid <i>et al.</i> (2012)
ANTHOCEROPHYTA				
119. Anthocerotaceae	<i>Phaeoceros himalayensis</i> (Kash.) ex Bapna et Vyas	2150m-2400m	Kashmir: Punch, Mt Toli Pir Abbottabad District: Nathia Gali	Kashyap (929) as <i>Anthoceros himalayansis</i> Kashyap; Hasegava (1993)
120. Anthocerotaceae	<i>Phaeoceros parvulus</i> (Schiffn.) Haseg.	2150m	Abbottabad District: North of Nathia Gali	Hasegava(1993)
121. Anthocerotaceae	<i>Phaeoceros laevis</i> (L.) Prosk.	900-200m	Kashmir:Rajouri	Rashid <i>et al.</i> (2012)
122. Anthocerotaceae	<i>Phaeoceros levieri</i> Schiffner	-	Punjab: Lahore	Kashyab (1929) as <i>Anthoceros chambensis</i> Kashyap

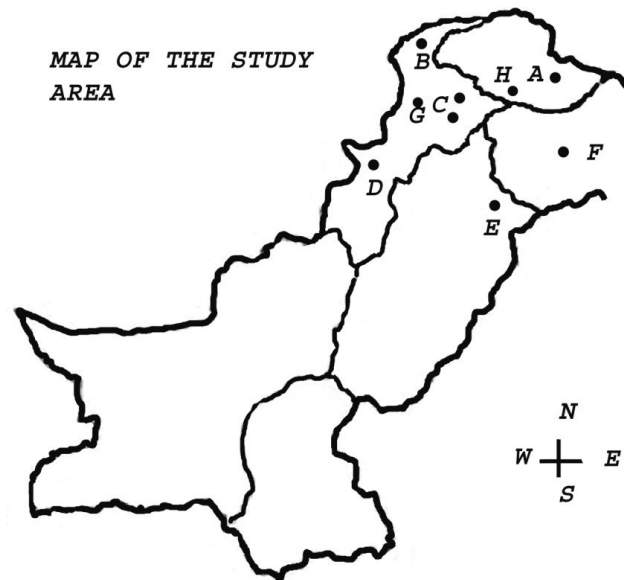


Figure 1. Main explored localities in the study area: A, Baltistan; B, Chitral; C, Hazara Division (Abbottabad and Mansehra District); D, Waziristan; E, Punjab Plains; F, Kashmir; G, Swat; H, Astora.

Kashmir. Kaul and Dhar (1968) Kachroo (1970), and Srivastav (1979) also added some liverwort taxa for Kashmir. Another important contributor was Krezmarg (1980) and he reported 14 liverwort taxa from Gulmarg Pass and Mughul Gardens, Kashmir. In 1991, a Japanese group became active under the leadership of Toshiyuki Nakaike and they botanised some selected sites of the Himalayan and the Karakorum region of Pakistan. During this expedition they focused the cryptogamic flora and also collected remarkable specimens of liverworts and hornworts. Later on, these findings were published by Fruki *et al.* (1993) and Mizutani *et al.* (1994). In the same decade another worker, Siraj-ud-Din, investigated the hornworts and liverworts of Malakand division, NWFP province. He reported 20 species distributed in 7 families and 12 genera (Siraj-ud-Din, 1993). Pandey (1998) and Tanwir (2005, 2006) also studied the liverwort flora of Kashmir and reported some species. Currently Ali (2015) reported 20 species from Sithan Gali, Mansehra District. Here it is interesting to note that these workers have been mainly focused the Himalayan region and adjacent plain areas and major portion of Pakistan is still virgin.

In the current study, an attempt has been made to compile an up dated check list of the Anthoceroophyta (Hornworts) and Marchantiophyta (Liverworts) of Pakistan and Kashmir based on previously published literature. Nomenclature was conformed to The Plant List Database (www.theplantlist.org). Some names were missing in the plant list especially as per mentioned by Khashyap (1929; 1932). However, for these missing names, nomenclatural updates in Khashyap's liverworts flora of Western Himalayas and Punjab Plains (Rawat *et al.*, 2015) is consulted. Details regarding nomenclature, altitude (if mentioned

previously by workers), distribution with the area under consideration and reference(s) have been provided in the Table 1.

Result and Discussion

A cautious review on previous literature regarding Anthoceroophyta and Marchantiophyta of Pakistan and Kashmir suggest that there are overall 121 species, 5 subspecies, and 1 variety distributed under 36 genera and 24 families. Marchantiophyta is dominant group with 118 species (97.52%), 38 genera (97.43%) and 22 families (95.83%). The rest of 4 species (.90%), 1 genus (3.30%) and 1 (3.57%) family belong to Anthoceroophyta. Considering families, Aytoniaceae is the largest family with 16 species (13.22%), followed by Ricciaceae with 13 species (10.74%). Jungermanniaceae (12 spp.; 9.91%), Porellaceae (11 spp.; 9.09%) and Plagiochilaceae (11 spp.; 9.09%) come to next large families. In the remaining families, 3 families with 5-9 species, 9 with 2-4 and 7 with single species each. Genera-wise, *Riccia* is the largest genus with 12 species (9.56%). *Porella* and *Plagiochila* are the next large genera with 11 species (9.09%) each. An average number of species per genus (generic index) is c. 3.36. Maximum concentration of species occurred in Sino-Japanese region.

However, as total covered area and climatic topographic diversity of Pakistan and Kashmir is concerned, number of the above mentioned taxa seems to be very less particularly in provinces of Pakistan. Therefore, a detailed inventory of these groups is extremely needed in order to draw a clear picture of the taxa. If we could not able to document these susceptible groups, many taxa may be extinct in the near future.

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