

An Appraisal of Genus *Riccia* in India with a Note on Diversity and Distribution of Species

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Abstract

A review of Indian *Riccia*'s has been made and 36 valid species are accepted. 12 species viz., *R. attenuata*, *R. ciliata*, *R. crispatula*, *R. crozalsii*, *R. curtisii*, *R. glauca*, *R. haskarliana*, *R. hirta*, *R. mangalorica*, *R. perssonii*, *R. stricta* and *R. warnstorffii* are rare and found in restricted pockets of the country. Except *Riccia abuensis* and *R. fluitans* (aquatic species) all are terrestrial. *Riccia poihaiana* A.E.D.Daniels & P.Daniel is proposed to place under synonymy of *R. billardieri* Mont. & Nees. The occurrence of *Riccia squamata*, *R. duplex* and *R. dictyospora* recorded in Indian bryoflora is treated here doubtful. The notes on *Riccia lucknowensis* A.Gupta & Udar and *R. nagalandensis* D.D.Pant & Bhowmik ex S.K.Chaturv. & S.Chaturv. (both invalid species) are given. The taxonomy, diversity and distribution and notes wherever required are provided.

Keywords: Marchantiophyta, *Riccia*, India, Taxonomy, Distribution.

1. Introduction

The genus *Riccia* is the largest genus of thallose liverwort in India. The members the genus are very simple, primitive in morphology and anatomy and characterized by usually linear or oblong thalli differentiated in to photosynthetic and storage zone and with or without simple air pores, sporophytes embedded in the thallus. They differ from the other bryophytes in having fertile plant without involucre, pseudoperianths, seta, cleistocarpous capsules, elaters etc., and occupy unique position in bryophyte systematics. They are unique in their habits in having the tendency to grow in rosettes (a unique feature of the genus).

The earliest record of *Riccia* from India is found in the posthumous memoirs of William Griffith [1,2] who has given an illustrated account of a species of *Riccia* from Assam, which is referable to *R. frostii* Austin. Mitten [3] perhaps was the pioneer researcher who dealt comprehensively with Indian *Riccia*'s and reported five species viz *R. ciliata* Hoffm. *R. crystallina*, *R. discolor* Lehm. & Lindenb., *R. fluitans* L. and *R. squamata* Nees from different part of India. Later, Stephani [4,5] in his world hepatics census reported *R. discolor*, *R. bulbifera* Steph. (= *R. billardieri* Mont. & Nees), *R. microspora* Steph. (= *R. frostii*) and *R. gollani* Steph. (= *R. discolor*) from India.

Kashyap [6] instituted five species viz., *R. pathankotensis* Kashyap, *R. robusta* Kashyap (= *R. cavernosa* Hoffm.), *R.*

cruciata Kashyap, *R. sanguinea* Kashyap (= *R. frostii*) and *R. himalayensis* Kashyap (= *R. discolor* Lehm. & Lindenb.) mainly from Western Himalyas. Later, he [7] described *R. melanospora* Kashyap from Hoshiarpur and reported *R. fluitans* and *Ricciocarpus natans* (L.) Corda from Western Himalaya. Ahmad [8] instituted *R. gangetica* Ahmad, *R. mangalorica* Ahmad, and *R. orientalis* Ahmad (= *R. hirta* (Austin) Underw.) from Lucknow, Mangalore and Kumaon respectively. Pande and Ahmad [9] reported *R. curtisii* (James ex Austin) Austin from Lucknow. Kachroo [10] instituted *R. kashyapii* Kachroo (= *R. huebeneriana* Lindenb.) from Guwahati and reported *R. glauca* L. from there.

The studies on the genus *Riccia* in India was in fact accelerated by the Department of Botany, Lucknow University, where Prof. S.K.Pande and Prof. Ram Udar contributed predominantly on the genus of the country and published a series of papers. Udar [11,12] reported *R. sorocarpa* Bisch. and *R. huebeneriana* from Sikkim Himalayas and *R. crozalsii* Lev., *R. warnstorffii* Limpr. from Ootacamund, South India. Three species, *R. aravalliensis* Pande & Udar, *R. tuberculata* Pande & Udar (= *R. grollei* Udar) and *R. attenuata* Pande were Instituted from Mount Abu, Nilgiris and Kamakhya Hill respectively by Pande and Udar [13,14,15]. Udar [16,17] instituted *R. pandei* Udar and *R. reticulatula* Udar from Pauri-Garhwal and Pilani, Rajasthan respectively.

Kachroo [18] established a new species, *R. pimodii* Kachroo (= *R. billardieri*) from Burdwan, West Bengal. Bapna [19] described *R. jodhpurensis* Bapna from Jodhpur. Subsequently, Bapna [20] instituted one more species *R. abuensis* Bapna from

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Mount Abu. These records and many other regional ones were reviewed well by Srivastava [21], who accepted occurrence of 29 species of the genus in the country. He provided the detailed account of 18 species and distribution all 29 earlier reported species. In recent years eight species viz., *R. udarii* Kanwal, *R. indica* Udar & A.Gupta, *R. lucknowensis* A.Gupta & Udar, *R. indiragandhii* Dabhade & Akhtar Hasan '*indira-gandhiensis*', *R. nagalandensis* D.D.Pant & Bhowmik ex S.K.Chaturv. & S.Chaturv., *R. poihaiana* A.E.D.Daniels & P.Daniel, *R. velimalaiana* A.E.D.Daniels & P.Daniel, *R. coracina* Jovet-Ast were instituted from different part of the country [22, 23,24,25,26,27,28] and three species viz., *R. perssonii* Khan, *R. stricta* (Gottsche, Lindenb. & Nees) Perold and *R. haskarliana* Steph. [29,30,31] recorded as new to India. A number of regional reports are also published in different journals and books; they are annotated in the distribution of the species in parenthesis. In this study, a total of 36 species are accepted from India. The bryo-geographically they are distributed as below:

Western Himalaya (18): *R. aravalliensis*, *R. beyrichiana*, *R. billardieri*, *R. cavernosa*, *R. cruciata*, *R. crystallina*, *R. curtisii*, *R. discolor*, *R. fluitans*, *R. frostii*, *R. gangetica*, *R. hirta*, *R. indica*, *R. melanospora*, *R. pandei*, *R. Pathankotensis*, *R. sorocarpa*, *R. udarii*.

Western Ghats (18): *R. billardieri*, *R. coracina*, *R. crozalsii*, *R. cruciata*, *R. crystallina*, *R. discolor*, *R. fluitans*, *R. frostii*, *R. gangetica*, *R. grollei*, *R. huebeneriana*, *R. indiragandhii*, *R. mangalorica*, *R. melanospora*, *R. sorocarpa*, *R. stricta*, *R. velimalaiana*, *R. warnstorffii*.

Eastern Himalaya (16): *R. attenuata*, *R. beyrichiana*, *R. billardieri*, *R. cavernosa*, *R. ciliata*, *R. crispata*, *R. cruciata*, *R. discolor*, *R. fluitans*, *R. frostii*, *R. gangetica*, *R. glauca*, *R. haskarliana*, *R. huebeneriana*, *R. sorocarpa*, *R. stricta*.

Punjab and West Rajasthan (17): *R. abuensis*, *R. aravalliensis*, *R. billardieri*, *R. cavernosa*, *R. cruciata*, *R. crystallina*, *R. discolor*, *R. fluitans*, *R. frostii*, *R. gangetica*, *R. grollei*, *R. jodhpurensis*, *R. mangalorica*, *R. melanospora*, *R. pathankotensis*, *R. reticulata*, *R. warnstorffii*.

Gangetic plains (14): *R. billardieri*, *R. cavernosa*, *R. cruciata*, *R. crystallina*, *R. curtisii*, *R. discolor*, *R. fluitans*, *R. frostii*, *R. gangetica*, *R. hirta*, *R. huebeneriana*, *R. melanospora*, *R. perssonii*, *R. sorocarpa*

Central India (11): *R. billardieri*, *R. cavernosa*, *R. crystallina*, *R. discolor*, *R. fluitans*, *R. frostii*, *R. gangetica*, *R. grollei*, *R. huebeneriana*, *R. melanospora*, *R. stricta*.

Eastern Ghat & Deccan Peninsula (7): *R. billardieri*, *R. ciliata*, *R. coracina*, *R. crispata*, *R. fluitans*, *R. glauca*, *R. pathankotensis*.

Andaman & Nicobar Islands (1): *R. billardieri*.

2. Systematic treatment

Riccia abuensis Bapna, Trans. Brit. Bryol. Soc. 4: 249. 1962. *Distrib.*: Rajasthan [20]; endemic.

Riccia aravalliensis Pande & Udar, J. Indian Bot. Soc. 36: 249. 1957. *Distrib.*: Rajasthan, Uttarakhand [13]; endemic.

Riccia attenuata Pande in Pande & Udar in Proc. Natl. Inst. Sci. India 25 B: 92. 1959. *Distrib.*: Assam [15], Sri Lanka [32].

Riccia beyrichiana Hampe in Lehmann, Nov. Stirp. Pug. 7: 1. 1838. *Distrib.*: Himachal Pradesh [33,34], Meghalaya [21,35], Macronesia [36], Pakistan [37], Russia [38], Africa [39], Europe [40], North America [41,42].

Riccia billardieri Mont. & Nees in Gottsche, Lindenberg & Nees, Syn. Hepat. 4: 602. 1846. *R. bulbifera* Steph., Sp. Hepat. 1: 24. 1900. *R. bengalensis* Khan in Bryologist 60: 28. 1957. *R. pimodii* Kachroo in J. Indian Bot. Soc. 38: 216. 1959. *R. himalayensis* auct. non Kashyap 1916 sensu Kashyap, Liverw.

W. Himal. 1 (Suppl.): 7. 1932. *Riccia poihaiana* A.E.D.Daniels & P.Daniel, Bull. Bot. Surv. India 44: 135. 2002. **syn. nov.** *Distrib.*: Andaman [43], Assam [15], Gujarat [44], Himachal Pradesh [45], Jharkhand [4], Karnataka [14,21], Kerala [30], Madhya Pradesh [46, 21], Maharashtra [21], Manipur [47], Rajasthan [48], Sikkim [31], Tamil Nadu [21, 26], Uttar Pradesh [21,49,50], Uttarakhand [16,21], West Bengal [4,10, 21,51,52,53], Bangladesh [54], Indonesia [55], Nepal [56], Philippines [57], Sri Lanka [32], Thailand [58], Australia [59].

Notes: *Riccia poihaiana* was described from Poihai reservoir, Kanyakumari, Tamil Nadu by Daniels and Daniel [26]. A study of type (P. Daniel 01!) deposited at Herbarium of Botanical Survey of India, Southern Regional Centre, Coimbatore (MH) reveals it is not different than the *Riccia billardieri*. Hence, *R. poihaiana* is proposed to synonym de novo of *Riccia billardieri* here.

Riccia cavernosa Hoffm., Deutschl. Fl. 2: 95.1796 emend. Raddi, Opusc. Sci. (Bologna) 12: 351. 1818. *R. robusta* Kashyap, J. Bombay Nat. Hist. Soc. 24: 348. 1916. *Distrib.*: Himachal Pradesh [7], Madhya Pradesh [60], Nagaland [28], Uttar Pradesh [7,61], Rajasthan [48], Bangladesh [62], Iran [63], Macronesia [36] Nepal [56], Pakistan [6], Russia [38], Africa [64], Australia [59], Europe [40], North America [42] South America [65].

Riccia ciliata Hoffm., Deutschl. Fl. 2 (Cryptog.): 95. "1795" 1796. *Riccia trichocarpa* M.Howe Bull. Torrey Bot. Club 25: 184. 1898.

Distrib.: Odisha [66] Sikkim [21], West Bengal [3], Iran [63], Macronesia [36], New Zealand [67] Russia [38], Turkey [68], Africa [64], Europe [40], North America [42] South America [65].

Riccia coracina Jovet-Ast, Cryptog. Bryol. 24: 212. 2003. *Distrib.*: Tamil Nadu [27], endemic.

Riccia crispata Mitt., Proc. J. Linn. Soc., Bot. 5: 127. 1861. *Distrib.*: Odisha (69), West Bengal [70], Sri Lanka [32].

Riccia crozalsii Lev. in Rev. Bryol. 29: 73. 1902. *Distrib.*: Tamil Nadu [12], Iran [63], Macronesia [36], New Zealand [67], Turkey [68], Africa [64], Australia [59], Europe [40].

Riccia cruciata Kashyap, J. Bombay Nat. Hist. Soc. 24: 349. 1916. *Distrib.*: Kerala [21], Maharashtra [71], Nagaland [28], Punjab [6,7], Uttarakhand [72,73,33], Uttar Pradesh [21,49], West Bengal [74], Indonesia [27], Pakistan [6,7].

Riccia crystallina L. Sp. Pl.: 1138. 1753 emend. Raddi, Opusc. Sci. (Bologna) 12: 353. 1818. *Riccia plana* Taylor, London J. Bot. 5: 414. 1846. *Distrib.*: Jammu & Kashmir [75], Karnataka [14], Kerala [30], Maharashtra [71], Madhya Pradesh [61,77], Punjab [78], Uttar Pradesh [49]; Rajasthan [48,79], West Bengal (Singh et al., as *R. plana*) [74], Bangladesh [62], China [80] Macronesia



Fig. 1: A. *R. beyrichiana*, B. *R. billardieri*, C. *R. cruciata*, D. *R. cavernosa*, E. *R. crystallina*, F. *R. fluitans*.

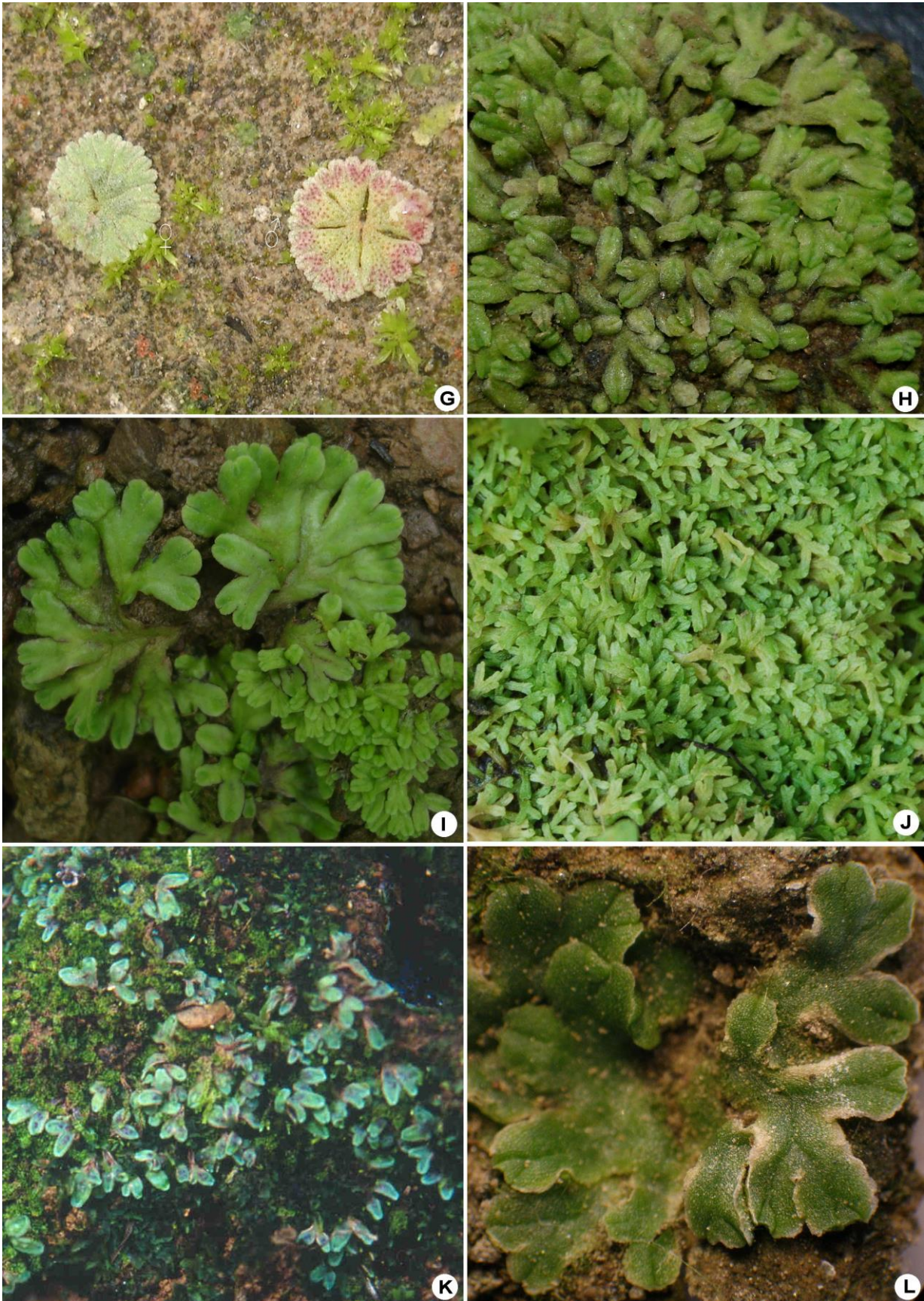


Fig. 2: G. *R. frostii*, H. *R. gangetica*, I. *R. glauca*, J. *R. huebeneriana*, K. *R. pathankotensis*, L. *R. sorocarpa*.

[36], New Zealand [67], Turkey [68], Africa [64], Australia [59], Europe [40], North America [42], South America [65].

Riccia curtisii (James ex Austin) Austin, Bull. Torrey Bot. Club 6: 305. 1879. *Cryptocarpus curtisii* James ex Austin, Proc. Acad. Natl. Sci. Philadelphia 21: 231. 1870.

Distrib.: Uttarakhand [81], Uttar Pradesh [21], Africa [64], North America [42], South America [65].

Riccia discolor Lehm. & Lindenb. in Lehmann, Nov. Stirp. Pug. 4: 1. 1832. *R. himalayensis* Kashyap, J. Bombay Nat. Hist. Soc. 24: 349. 1916. *R. gollanii* Lev. ex Steph., Sp. Hepat. 6: 2. 1924.

Distrib.: Assam [21], Chattishgarh [82], Gujarat [44], Himachal Pradesh [7], Jammu & Kashmir [75], Karnataka [21], Kerala [83], Maharashtra [71], Meghalaya [21], Madhya Pradesh [21,46,77], Punjab [7,52], Rajasthan [48,79], Sikkim [84], Tamil Nadu [7,21], Uttarakhand [6, 21], Uttar Pradesh [21,49] West Bengal [74], Bangladesh [85], Myanmar [7], Nepal [86], Pakistan [7], Sri Lanka [32] Africa [64], Australia [59].

Riccia fluitans L., Sp. Pl.: 1139. 1753. *Fysonia tenera* Kashyap, Liwerw. W. Himal. 1: 97. 1929. *Riccia media* Klingm., Flora. 146: 616-624. 1958.

Distrib.: Chattishgarh [82], Himachal Pradesh [87], Jammu & Kashmir [7], Maharashtra [52,71], Meghalaya [21], Madhya Pradesh [77], Odisha [66], Rajasthan [48], Sikkim [84], Tamil Nadu [88], Uttarakhand [3,7,73], Uttar Pradesh [49], Afghanistan [89], Bangladesh [62], Bhutan [90], China [80], Hawaii [91], Indonesia [92], Iran [63], Japan [93] Korea [94], Nepal [56], New Zealand [67], Pakistan [7], Russia [38], Thailand [58], Turkey [68], Africa [64], Europe [40], North America [42].

Note: This is a cosmopolitan species of the genus found in aquatic habitat. Very recently, Manju et al. [95] has advocated that plants recorded as *R. fluitans* from various Indian regions are of *R. stricta*. However, it may be annotated here that if we follow the differentiating character used by Manju et al. (*l.c.*) for differentiating *R. fluitans* from *R. stricta* (*Thallus with small air chambers with distinct areolate walls; spore production very rare- R. fluitans*) then the reports, atleast of Kashyap [7], Srivastava [21] and Singh & Singh [73] definitely belong to *Riccia fluitans*. Hence, there is no doubt about the occurrence of *R. fluitans* in Indian region. The reports from Kerala may belong to *R. stricta* as suggested. A further thorough investigation of Indian plants of *R. fluitans* and *R. stricta* are required to clarify more the situation.

Riccia frostii Austin, Bull. Torrey Bot. Club 6: 17. 1875. *R. sanguinea* Kashyap, J. Bombay Nat. Hist. Soc. 24: 349. 1916. *R. microspora* Steph., Sp. Hepat. 1: 43. 1900.

Distrib.: Assam [96] Bihar [97] Delhi [52], Jharkhand (present record); Jammu & Kashmir [97], Kerala [98], Maharashtra [71], Manipur [47], Madhya Pradesh [97], Punjab [78], Rajasthan [48], Sikkim [21], Tamil Nadu [7], Uttarakhand [72, 73], Uttar Pradesh [7,49], West Bengal [99], Bangladesh [62], China [80], Iran [63], Nepal [56], Pakistan [7], Russia [38], Turkey [68], Africa [64], Europe [40], North America [42], South America [65].

Riccia gangetica Ahmad ex L.Söderstr., A.Hagborg et von Konrat, Phytotaxa 65: 57. 2012.

Distrib.: Gujarat [44], Himachal Pradesh [86], Kerala [83], Maharashtra [71], Madhya Pradesh [100,76], Meghalaya (15,21); Rajasthan [48], Uttarakhand [16], Tamil Nadu [88], Uttar Pradesh [8,49], West Bengal [70], Bangladesh [85] Indonesia [92], Australia [59].

Riccia glauca L., Sp. Pl.: 1139. 1753. var. ***glauca***

Distrib.: Assam [53, 101], Odisha [66], China [80], Iran [63], Turkey [68], Taiwan [102], Korea [94], Japan [93], Russia [38], Macronesia [36], New Zealand [67], Africa [64], Europe [40], North America [41].

Riccia grollei Udar, Curr. Sci. 34: 126. 1965. *R. tuberculata* Pande & Udar, Proc. Natl. Inst. Sci. India 24 B: 83. 1958.

Distrib.: Gujarat [44], Madhya Pradesh [76], Rajasthan [103, 79], Tamil Nadu [14,88], endemic.

Riccia haskarliana Steph., Bull. Herb. Boiss. 6: 374. 1898.

Distrib.: Sikkim [31], Indonesia [92,104].

Riccia hirta (Austin) Underw., Bot. Gaz. 19: 274. 1896. *R. orientalis* Ahmad, Curr. Sci. 11: 433. 1942.

Distrib.: Uttarakhand [16], Uttar Pradesh [49], North America [42].

Riccia huebeneriana Lindenb., Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur. 18: 504d. "1836" 1837. *R. kashyapii* Kachroo, Sci. & Cult. 20: 98. 1954.

Distrib.: Assam [10,21,101], Chattishgarh [82], Karnataka [21], Kerala [30], Madhya Pradesh [11,105], Sikkim [21], Uttar Pradesh [49], West Bengal [11,21,74], China [80], Japan [93] Korea [94], Macronesia [36], Phillipines [57], Russia [38], Europe [40], Africa [64], North America [42].

Riccia indica Udar & A.Gupta, Proc. V. Indian Geophytol. Conf., Lucknow (1983), Spl. Publ. 307. 1984.

Distrib.: Uttarakhand [23], endemic.

Riccia indiragandhii Dabhade & Akhtar Hasan, J. Bombay Nat. Hist. Soc. 83: 398. 1986. '*indira-gandhiensis*'

Distrib.: Maharashtra [25], endemic.

Riccia jodhpurensis Bapna, Bot. Not. 114: 181. 1961.

Distrib.: Rajasthan [19], endemic.

Riccia mangalorica Ahmad ex Jovet-Ast, Cryptog. Bryol. 24: 223. 2003.

Distrib.: Karnataka [8], Rajasthan [27], Indonesia [27].

Riccia melanospora Kashyap, Liwerw. W. Himal. 1: 94. 1929.

Distrib.: Jammu & Kashmir (21,52); Maharashtra [71], Madhya Pradesh [76], Punjab [7], Rajasthan [79,103], Tamil Nadu [14,21], Uttarakhand [21], Uttar Pradesh [21,49], West Bengal [70], Bangladesh [62], Pakistan [106].

Riccia pandei Udar, J. Indian Bot. Soc. 38: 149. 1959.

Distrib.: Uttarakhand [16,72], endemic.

Riccia pathankotensis Kashyap, J. Bombay Nat. Hist. Soc. 24: 349. 1916

Distrib.: Himachal Pradesh [7,107], Odisha [66], Punjab [52], Uttarakhand [21,72], Nepal [56], Pakistan [7].

Riccia perssonii Khan, Svensk Bot. Tidskr. 49: 433. 1955.

Distrib.: Uttar Pradesh [29], West Bengal [74], Bangladesh [62], Africa [64].

Riccia reticulatula Udar, Bull. Bot. Soc. Univ. Saugar. 13: 49. 1961.

Distrib.: Rajasthan [17], endemic.

Riccia sorocarpa Bisch., Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur. 17: 1053. 1835. var. ***sorocarpa***

Distrib.: Himachal Pradesh [11], Uttarakhand [33], Tamil Nadu [88], West Bengal [11,74], Bangladesh [85], China [80], Hawaii [91], Iran [63], Japan [93], Korea [94], Macronesia [36], New Zealand [67], Russia [38], Turkey [68], Africa [64],

Australia [59], Europe [39], North America [41], South America [65].

Riccia stricta (Gottsche, Lindenb. & Nees) Perold, *Bothalia* 20: 197. 1990. *R. fluitans* var. *stricta* Gottsche, Lindenb. & Nees, Syn. Hapat. 610.1846

Distrib.: Kerala [30], Madhya Pradesh [60], Sikkim [31], Tamil Nadu [95], West Bengal [74], Africa [64].

Riccia udarii Kanwal, J. Indian Bot. Soc. 58: 282. 1979.

Distrib.: Uttarakhand [22], endemic.

Note: This species approaches *Riccia fluitans* in its aquatic habitat and thallus structure. A study of type material may concatenate the two species.

Riccia velimalaiana A.E.D.Daniels & P.Daniel, Bull. Bot. Surv. India 44: 139. 2002.

Distrib.: Tamil Nadu [26], endemic.

Notes: *Riccia velimalaiana* was described from Velimalai, Kanyakumari, Tamil Nadu by Daniels and Daniel [26]. A study of type (A.E.D. Daniels 921!) deposited at Herbarium of Botanical Survey of India, Southern Regional Centre, Coimbatore (MH) reveals it is similar to *Riccia grollei* Udar. The features used by authors to differentiate it from *R. grollei* falls in range of variations except a typical feature of *R. grollei* thallus which assimilatory filaments of cell walls bears tuberculate thickening (not noticed by the authors). A further study of type of *Riccia grollei* may lead to interesting findings.

Riccia warnstorffii Limpr. in Warnstorff, Verh. Bot. Ver. Prov. Brandenb. 27: 85. 1885.

Distrib.: Tamil Nadu [12, 14], Punjab [78], Macronesia [36], Pakistan [37], Africa [64], Europe [40].

2.1. Doubtful Records

Riccia dictyospora M. Howe, Bull. Torrey Bot. Club 28 (3): 163. 1901.

Note: This species was reported by Udar [108] from Lucknow (U.P.) India. This report was published in a form of abstract and no detailed description was provided. Later, it could not be reported from any other locality of the country. However, about a decade later, Udar [17] reviewed the status of *Riccia*'s in Central-India Zone, Gangetic Plains, Punjab and Rajasthan and provided a detailed taxonomic account of the genus *Riccia* growing there but without mention of *R. dictyospora*. Therefore, the report of this species from Lucknow is not tenable and as such the occurrence of this species from Indian regions is treated here doubtful.

Riccia duplex Lorb. & Müll. Friebl., Hedwigia 80: 100. 1941.

Note: This species was recorded from along the margins of Khajjar lake, Dalhousie Himachal Pradesh India. While reporting this species authors annotated that this species is probably terrestrial form of *Riccia fluitans* [87]. Later, this species could not be reported from elsewhere in India. The plants collected from Khajjar lake are apparently destroyed (Prof. S.S. Bir: pers. comm.) and are not available for further study. Hence the occurrence of this species in India is untenable.

Riccia squamata Nees in Mart., Fl. Bras. 1: 302. 1833.

Note: This species is reported by Mitten (1861) without any definite locality in India. Later, it could not be collected from anywhere else in India. Hence in dearth of further collection of it is treated as doubtful record.

2.2. Invalid Species

Riccia nagalandensis D.D.Pant & Bhowmik ex S.K.Chaturv. & S.Chaturv., Bryology in the New Millennium p. 88, 2008, *nom. inval.*

Note: This species was initially published in form of abstract (Pant & Bhowmik, 1997: Abst. p. 4), and presented in a symposium "National Symposium of Biodiversity, Conservation and Evolution of Plants" organized by Department of Botany, Allahabad University, Allahabad. This is an invalid publication as it does not fulfill the requirement for valid publication (Art. 39.1 & 40.1: Melbourne Code). Chaturvedi and Chaturvedi (2008) reported again it from Mokokchung, Nagaland without validating the same.

Riccia lucknowensis A.Gupta & Udar, Bryophyt. Biblioth.29: 51. 1986, *nom. inval.*

Note: This species was instituted on the basis of the collection Mashidha, Malihabad near Lucknow Uttar Pradesh (Gupta & Udar, 1986). The authors had provided only the spore descriptions not the other details. Following the rules of ICBN, this is an invalid publication as it does not fulfill the requirement for valid publication (Art. 39.1 & 40.1: Melbourne Code).

3. Conclusion

Genus *Riccia* is the largest among thallose liverworts in India. A detailed review of *Riccia*'s growing in different geographical location of the country has been made after a long gap of 46 year and 36 valid species are accepted from India. From diversity point of view, the Western Himalaya and Western Ghats are rich with 18 species each. However, the species are also luxuriously growing in low elevated/plain areas of Punjab & West Rajasthan, Gangetic plains and central India. Species are mostly terrestrial in habit. The current data on diversity, distribution and taxonomy is discussed. About 1/3 of the known species (11 species) are endemic to the country. These are: *Riccia abuensis*, *R. aravalliensis*, *R. coracina*, *R. grollei*, *R. indica*, *R. indiragandhii*, *R. jodhpurensis*, *R. pandei*, *R. reticulatula*, *R. udarii*, *R. velimalaiana*. *Riccia poihaiana* A.E.D.Daniels & P.Daniel, a species recently described [26] from Western Ghat shows no remarkable difference from *R. billardieri* Mont. & Nees, hence former synonymised under the latter here. Three species viz., *Riccia squamata*, *R. duplex* and *R. dictyospora* are excluded from Indian bryoflora as their occurrence is doubtful (see notes under mentioned species).

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