
A revision of Campylopodioideae (Musci, Dicranaceae) from India

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Abstract: The 70 names of Campylopodioideae listed in checklists from India are critically revised and belong to 20 species.

Checklists are the most important tools for the calculation of biodiversity. They offer an excellent possibility to see which species have been found in an area and which not. On the occasion of a trip to India, I consulted the Indian checklists. The book of Lal (2005) lists 1576 species of mosses. The most recent checklist by Dandotiya et al. (2011) lists even 1986 species. Also the famous moss flora by Gangulee (1969-72) can be consulted, which seems to be the backbone of the younger checklists. Another “database” was provided by Daniels et al. (2004), who listed only 423 species.

A close look at these checklists, however, reveal that these list all species ever recorded from India and are uncritical. They make no difference between accepted names and synonyms, since they do not consider any taxonomic revisions or monographs. Therefore the high number of 2489 bryophyte species (Dandotiya et al. 2011) suggests an enormous biodiversity, which is not justified since all synonyms and dubious species are included. For example, *Microcampylous khasianus* is listed under five different names in two different genera.

To clarify the species of Campylopodioideae in India, a list of all species found in Gangulee (1969-72), Lal (2005), Daniels (2004) and Dandotiya (2011) was compiled and checked against revisions and monographs published by me and my students during the past thirty years. Especially helpful are the catalogues of species (Frahm 1994, 1999), of which the latter is available free in the internet.

For India, 70 species of Campylopodioideae were listed in the checklists. A critical revision of all names provided reveal only 20 accepted names, all other names are synonyms, nomina nuda and dubia, misspelled names or combinations, which do not exist. This is a reduction of 71,5%. This group of Dicranaceae is regarded as difficult and the reduction rate within this subfamily might be especially high, but it can be estimated from these numbers that the actual number of Indian mosses is about 50%. that means below thousand species.

List of Species

Accepted taxa are in boldface.

Abbreviations: L= Lal (2005), D= Daniels et al. (2004), Da= Dandotiya et al. (2011), G= Gangulee (1969-72).

Atractylocarpus

The genus *Atractylocarpus* was monographed by Padberg & Frahm (1985). Nomenclatural and taxonomic additions were presented by Frahm (2000). An updated list of worldwide species was presented by Frahm (1994).

A. alpinus (Schimp.ex Milde) Lindb.

A. erectifolius Mitt. ex Dix. (L, G) = *Campylopodiella himalayana* (Broth.) Frahm cf. Frahm (1994).

A. sinensis (Broth. Herz.) (D, Da, L, G) = *Atractylocarpus alpinus* (Schimp. ex Milde) Lindb. cf. Padberg & Frahm (1985).

Brothera

The species of this genus were treated by Frahm (1994).

B. capillifolia (Da, L) = *Dicranodontium asperulum* (Mitt.) Broth. fide Frahm (1997)

B. himalayana (Da; L, G) = *Campylopodiella himalayana* (Broth.) Frahm cf. Frahm (1984)

B. leana (Da, D, L, G)

Campylopodiella

A review of the species was given by Frahm (1984).

C. ditrichoides Nog. (Da, L, G) = *Campylopodiella himalayana* (Broth.) Frahm cf. Frahm (1984).

C. himalayana (Broth.) J.-P. Frahm

C. tenella (Da, L, G) = *Campylopodiella himalayana* (Broth.) Frahm cf. Frahm (1984).

Campylopodium

The genera *Campylopodium* and *Microcampylopus* were monographed by Giese & Frahm (1985a, b). *Campylopodium* differs by the presence of stomata in the capsules and coarsely warty spores. The genus does not occur in India, all records belong to *Microcampylopus* or *Dicranella*.

C. griffithii (Mitt.) Broth. (D, L, G) = *Dicranella griffithii* (Mitt.) Jaeg. cf. Giese & Frahm (1985a).

The combination *Dicranella griffithii* (Mitt.) Giese & Frahm cited by Daniels (2004) does not exist.

C. khasianum (Griff.) Par. (D, L, G) = *Microcampylopus khasianus* (Griff.) Giese & Frahm cf. Giese & Frahm (1985b).

C. phascoides (C. Müll.) Par. (D, Da, L) A type could not be located. Therefore the identity of this species, which was also placed in *Aongstroemia* and *Dicranella*, remains doubtful.

Campylopus

A revised list of the *Campylopus* species of the World was published by Frahm (1999), upon which this list is based.

C. albescens (C. Müll.) Jaeg. (Da, L, G) = *C. fragilis* (Brid.) B.S.G. ssp. *goughii* (Mitt.) J.-P. Frahm, Trop. Bryol. 61, 1991.

C. alpigena Broth. var. *lamellatus* Broth. (Da, L, G) = *C. schimperi* Milde cf. Frahm, Cryptogamie Bryol. Lich. 3(1):63 (1982).

C. andreanus Card. & P. Varde (Da, D) This species is a nomen nudum, since no type could be located.

C. aureus Bosch & Lac. (Da, L) = *C. schmidii* (C. Müll.) Jaeg. cf. Frahm, Bryol. Beitr. 7:15 (1987). The species was described from Java but has been described earlier from India as *Campylopus schmidii*.

C. atrovirens De Not.(G). This species was reported by Gangulee (1969-72) from Nepal, which has to be verified since it is the only record from the Himalayas. His illustration is based on a specimen from Europe.

C. aureus Bosch & Lac.(G) = *C. schmidii* (C. Müll.) Jaeg. cf. Frahm, Bryol. Beitr. 7:15 (1987)

C. comosus (Schwaeg.) Bosch & Lac. (Da, D) A species described from Java which needs to be confirmed for India. The reference is unknown to me.

C. durellii Broth. ex Gang. (G, G, L) This is an invalid species according to the authors of the Index Muscorum (Wijk et al. 1959 ff.). It was compared by the author with *C. ericoides* (= *C. involutus*), and is presumably an epilose form of the latter.

C. eberhardtii Par.(Da) This species has been described from China (Tonkin) and revealed to be a synonym of *C. japonicus*. The origin of this record is not known to me and the occurrence in India remains dubious until it is verified.

C. ericoides (Griff.) Jaeg. (Da, L, D, G)

C. flagelliferus C. Müll.) Jaeg. (Da, D)

C. flexuosus (Hedw.) Brid. (Da, L, G) This species lacks in SE-Asia, where it is replaced by the vicariant *C. flagelliferus*. The latter differs by ventral stereids instead of hyalocysts in the transverse section of the leaf. The illustration in Gangulee (1969-72) shows a specimen from Sweden.

C. fragilis (Brid.) B.S.G. var. *pyriformis* (Schultz) Agst. (Da, G) This taxon is better known as *C. pyriformis*, which occurs in the austral regions of the southern hemisphere, in western Europe and rarely in North America. It is reported by Gangulee (1969-72) from Darjeeling and Khasia hills, and in additions by Dandotiya et al. (2011) from W. Himalaya, Kumaon and Kashmir. The records need to be verified since a confusion with *C. fragilis* ssp. *goughii* is possible.

C. fragilis (Brid.) B.S.G. ssp. *goughii* (Mitt.) J.-P. Frahm

C. goughii (Mitt.) Jaeg. (Da, L, G) = *C. fragilis* (Brid.) B.S.G. ssp. *goughii* (Mitt.) Frahm cf. Frahm, Trop. Bryol. 4: 61, 1991.

C. gracilis (Mitt.) Jaeg. (Da, L, D, G)

C. introflexus (Hedw.) Brid. (Da, L, D, G) *Campylopus introflexus* is a subantarctic species, introduced along the west coast of North America and in Europe. The name had been applied for *Campylopus pilifer* before and misapplied in India, where it does not occur. The illustration in Gangulee (1969-72) shows a plant with erect hairpoints, whereas *C. introflexus* has reflexed ones. Due to the lack of an illustration of the transverse section of the costa it cannot be decided whether Gangulee's figure belongs to *C. pilifer* or more probable to *C. schmidii*.

C. involutus (C. Müll.) Jaeg. (Da, L, D, G) = *C. ericoides* (Griff.) Jaeg. cf. Frahm, J. Hattori Bot. Lab. 71: 140, 1992.

C. laetus (Mitt.) Jaeg. (Da, L, G) = *C. savannarum* (C. Müll.) Mitt. cf. Frahm, J. Bryol. 13:179 (1984).

C. latinervis (Mitt.) Jaeg. (Da, L, G) = *C. gracilis* cf. Frahm, J. Bryol. 13:176 (1984).

C. milleri Ren. & Card. (Da;G, L) This species is only known from the type locality and needs to be revised.

C. nivalis (Brid.) Brid. (Da, D) This is a tropical alpine species from the Neotropics and Africa. It is reported from Tamil Nadu but it is most unlikely that this species occurs there. It is probably a misidentification of *C. fragilis* ssp. *goughii*, which is similar.

C. pilifer Brid. (Da; D) The range of *Campylopus pilifer* includes the Neotropics and Africa, from where it extends to North America and Europe. The occurrence in the Western Ghats is therefore unlikely and a confusion with *Campylopus schmidii*, which is very similar in appearance but differs by the lack of ventral lamellae along the costa.

C. recurvus (Mitt.) Jaeg.

C. richardii Brid. (Da; L, D, G) The range of this species is neotropical. The name was often misapplied to specimens from SE-Asia, since it is superficially very similar to *C. umbellatus*.

C. savannarum (C. Müll.) Mitt. (Da;D)

C. schmidii (C. Müll.) Jaeg. (Da, D) See also notes under *C. introflexus* and *C. pilifer*.

C. schimperi A holarctic species, which is found in the Rocky Mountains of North America, in Europe and the Himalaya (east to Yunnan) . The occurrence in the Nilghiris is unlikely, however not in the Himalayas, from where it was reported as *C. alpigena*.

C. schwarzii Schimp. (Da, L, G) = *C. gracilis* (Mitt.) Jaeg. cf. Frahm, Nova Hedwigia 59: 152 (1994).

C. sedgwickii Dix. (Da) A species described from Sri Lanka. A revision of the type proved the identity with *C. recurvus*. The occurrence in Kashmir and W. Himalaya is unlikely and probably based on misidentifications.

C. sinensis (C. Müll.) J.-P. Frahm (Da) A species described and reported from China and reported in India from Kodaikanal, which should be confirmed.

C. subfragilis Ren. & Card. (Da, L, D, G) This species was synonymized with *C. fragilis* (Brid.) B.S.G. cf. Frahm, Bryol. Beitr. 7: 95 (1987). The Indian records from Darjeeling, Palni hills, Shembaganur probably belong to *C. fragilis* ssp. *goughii*, which replaces *C. fragilis* ssp. *fragilis* in this area.

C. subgracilis Ren. & Card. ex Gang (Da, L, G) = *C. fragilis* (Brid.) B.S.G. ssp. *goughii* (Mitt.) J.-P. Frahm, Trop. Bryol. 4: 61, 1991.

C. subluteus (Mitt.) Jaeg. (D, La, G) A species described from Birma and reported from Eastern India.

***C. umbellatus* (Arn.) Par. (Da, D)**

C. zollingerianus (C. Müll.) Bosch. & Lac. (Da, D) = *C. fragilis* (Brid.) B.S.G. ssp. *zollingerianus* (C. Müll.) J.-P. Frahm, Trop. Bryol. 4: 61, 1991. This taxon differs from *C. fragilis* ssp. *goughii* by rectangular instead of oval or oblique upper laminal cells and replaces the latter in Indonesia. It has to be confirmed that it occurs in India and is not confused with *C. fragilis* ssp. *goughii*.

Dicranodontium

The genus has been revised by Frahm (1997)

D. asperulum (Mitt.) Broth. (Da, G, L)

D. aspermum (Da) Such a species does not exist, it is probably a typographic error.

D. attenuatum Mitt. (Da, G, L) = *D. didymodon* (Griff.) Par. fide Frahm (1987).

D. caespitosum Mitt. (Da, G, L) = *D. didymodon* (Griff.) Par. fide Frahm (1987).

D. capillifolium (Dix.) Takaki (G, L) = *D. asperulum* fide Frahm (1997)

D. decipiens Mitt. (Da, G, L) = *D. didymodon* (Griff.) Par. fide Frahm (1987).

***D. denudatum* (Brid.) Britt. (Da, G, L, D)**

D. didymodon (Griff.) Par. (Da, G, L)

D. didictyon (Mitt.) Jaeg. (Da, G, L)

D. dimorphum Mitt. in Ren. & Card. (Da, G, L) = *D. didictyon* (Mitt.) Jaeg. fide Frahm (1997).

D. fleischerianum Schultze-Motel (Da, G, L) = *D. uncinatum* fide Frahm (1997).

D. flexifolium (Da) Such a species does not exist (Wijk et al. 1959 ff.)

D. macroalare (Da) Such a species does not exist (Wijk et al. 1959 ff.)

D. perviride Dix. & P. Varde (Da, L) = *D. denudatum* fide Frahm (1997).

D. sordidum (Mitt.) Gangulee (G, L) = *Blindia sordida* (Mitt.) C. Müll. cf. Wijk et al. (1959 ff.)

D. uncinatum (Harv.) Jaeg. (Da, G, L, D)

Microcampylopus

See remarks under *Campylopodium*.

***M. khasianus* (Griff.) Giese & Frahm (Da)**

M. subnanus (Da, L) = *Microcampylopus khasianus* cf. Giese & Frahm (1985a)

Paraleucobryum

P. nerve (Thed.) Loeske (Da, L)

P. himalayanum Dix. (Da, L) Such a combination seems not to exist. It is most probably *Campylopodia himalayana*.

Thysanomitrium

Thysanomitrium is a subgenus of *Campylopus*.

T. leioneuron Thér. & P. d. Varde (Da) *C. involutus* (C. Müll.) Jaeg. cf. Frahm, Nova Hedwigia 39: 593 (1984).

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