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## Liverworts Flora of Parson's valley, Nilgiri hills (Western Ghats), South India

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**Abstract.** Parson's valley is an area explored for the first time in Indian Bryology; it is situated in Nilgiri hills (Western Ghats). The region is very conducive for the growth of liverworts and it is evident by the present study of recent collections from this area in which 27 taxa (under 12 genera and 5 families) of liverworts have been recorded, of which few are new to Nilgiri hills as well as south India.

### Introduction

The present work is the result of an investigation of liverworts collected from the Parson's valley (Nilgiri hills), an area explored for the first time in Indian Bryology. Parson's valley is situated at cardinals 11°23'29"N 76°31'38"E in the eastern part of Nilgiri hill ranges at an altitude of about 2200m and is about 22 km from Ootacamund. The flora of the area is significant as it lacks tea and coffee plantations, commonly occurring on slopes of the Nilgiris and provides a natural cover of dense forest as it encircled by Mukurthy National Park. The temperature, humidity, rainfall and elevation provide a favorably conducive environment for the luxuriance of liverwort flora, which remained neglected so far. In a recent collection from the area 26 taxa (under 11 genera and 5 families) of liverworts have been recorded, of which few are new to Nilgiri hills as well as south India. These include *Plagiochila subtropica* St. and *Plagiochila gracilis* Lindenb. & Gott. Both of these were earlier restricted to eastern Himalayas. *Plagiochila beddomei* St., generally regarded as extremely rare, has been recollected after a long void since its inception from Dodabetta. *Frullania inflexa* Mitt., though earlier known from south India, is now a welcome addition to Nilgiri hills. The extensive collection of liverworts of the area are *Metzgeria coorgens*, *M. nilgiriensis*,

*Plagiochila subtropica*, *P. nepalensis*, *P. beddomei*, *Lopholejeunea sikkimensis*, *L. subfusca*, *Frullania arecae*, *F. campanulata*, *F. neurota*, *F. tamarisci* subsp. *obscura* (Verd.) Hatt., *F. acutiloba*, *F. ericoides*, *F. inflexa*, *Ptycanthus sriatus*, *Spruceanthus semirepandus*, *Lejeunea wightii*, *L. flava*, *L. kashyapii*, *L. discreta*, *Cheilolejeunea imbricata*, *C. laviscula*, *Taxilejeunea eckloniana*, *Microlejeunea ulicina*, *Radula nilgiriensis* and *R. madagascarensis*.

The following checklist is based on critical examination of recent collections from the Parson's Valley and the specimens deposited in the Lucknow University Hepatic Herbarium, Bryology Unit, Department of Botany, Lucknow University (LWU).

## ENUMERATION OF TAXA

### ORDER METZGERIALES SCHUST. EX SCHLJAK.

#### Family- Metzgeriaceae Klinggr.

#### *Metzgeria* Raddi

##### 1. *Metzgeria nilgiriensis* Srivastava et Udar

**Type locality:** Tamil Nadu: Ootacamund – Govt. Botanical Garden (Srivastava and Udar, 1975a).

**Range:** Endemic to India

**Distribution in India:** South India: Tamil Nadu – Nilgiri hills [Coonoor (Ketabettu, Law's fall, Lamb's rock, Sims park, Singara tea estate), Kotagiri (Kilkotagiri, Kodnad view point, Quinsholai), Gudalur (Anumapuram, Naduvattam reserve forest), Mukuruthy National Park (Governorsholai, on way to Mukuruthy lake Parson's valley), Ootacamund (Dodabetta, Ebanadu, Govt. Botanical Garden, Kamraj Sagar reserve forest, on way to Iduhatty, on way to Pykara lake, Thallakunda), Upper Bhavani (Avalanche)]; Palni hills – Kodaikanal (Perumalmalai, Shembaganur, Silver cascade) (see also Srivastava and Udar, 1975a).

**Ecology:** *M. nilgiriensis* is one of the most abundantly growing species in Nilgiri hills, forming corticolous as well as foliicolous population as thallose mats on twigs of several angiospermic as well as gymnospermic trees.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills – Parson's valley; ca. 2200 m.; 08.04.2002; P. K. Verma, A. Alam and N. Sahu; 15257/2002, 15258/2002, 15265/2002, 15266/2002, 15272/2002, 15298/2002, 15300/2002, 15309/2000 (LWU).

##### 2. *Metzgeria coorgens* Srivastava et Srivastava

**Type locality:** Ootacamund (Nilgiri hills) (Srivastava et Srivastava, 2004).

**Range:** Endemic to India

**Distribution in India:** South India: Tamil Nadu – Nilgiri hills: Mukuruthy National Park (Governorsholai, Mukuruthy lake, Parsons valley) Ootacamund (Dodabetta).

**Ecology:** Plants closely creeping, mostly growing in thallose mats on tea plantations also, where the species forms pure green cover, also on other angiospermic trees.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills – Parson's valley; ca. 2200 m.; 09.04.2002; P. K. Verma, A. Alam and N. Sahu; 15267/2002, 15268/2002, 15295/2002 (LWU).

**ORDER JUNGERMANNIALES LIMPR.**

Family Plagiochilaceae (Joerg.) Müll.

*Plagiochila* (Dum.) Dum.

*Plagiochila* sect. *Subtropicae* Carl

**3. *Plagiochila subtropica* St.**

**Type locality:** Assam – Khasia hills (So, 2001a)

**Range:** Oriental region: Asia- Bhutan, China, INDIA, Nepal, Thailand ( So, 2001a).

**Distribution in India:** Eastern Himalayas: Arunachal Pradesh – Tawang; Sikkim (Nathu La); West Bengal – Darjeeling (Himalayan Mountaineering Institute, Llyod Botanical Garden, Mirik, Senchal, Siliguri road, Tiger hill, Tongloo). South India: Tamil Nadu - Nilgiri hills [Upper Bhavani (Avalanche), Mukuruthy National Park - Parson's valley].

**Ecology:** Plants growing in rough mats on angiospermic trees as an epiphytic population mainly in diffused or in loose segregated patches.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills – Mukuruthy National Park (Parson's valley); ca. 2200 m.; 08.04.2002; P.K. Verma, A. Alam and N. Sahu; 15261/20002 (LWU).

*Plagiochila* sect. *Firmae* Carl

**4. *Plagiochila gracilis* Lindenb et Gott.**

**Type locality:** Indonesia –Java (So, 2001a).

**Range:** Nearctic region: North America – Canada. Oriental region: Asia – Bhutan, China, INDIA, Indonesia (Java), Philippines, Thailand, Sri Lanka. Palearctic region: Asia – Japan, Korea (So, 2001a).

**Distribution in India:** Eastern Himalayas: Meghalaya – Khasia; Sikkim – Lachen, Tongsa; West Bengal – Darjeeling (Lebong road, Llyod Botanical Garden, Tiger hill, Tongloo). Western Himalayas: Himachal Pradesh – Simla. South India: Tamil Nadu - Nilgiri hills [Ootacamund (Parson's valley)].

**Ecology:** This species is very rare, growing in rough mats and found only in some small patches as epiphytic populations on angiospermic trees.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills – Mukuruthy National Park (Parson's valley); ca. 2250 m.; 08-04-2002; P.K. Verma, A. Alam and N. Sahu; 15278/2002 (LWU).

*Plagiochila* sect. *Contiguae* Carl

**5. *Plagiochila beddomei* St.**

**Type locality:** India: Tamil Nadu - Nilgiri hills (So, 2001a).

**Range:** Oriental region: Asia – China, INDIA and Thailand (So, 2001a).

**Distribution in India:** Eastern Himalayas: West Bengal: Darjeeling (Lebong road); Sikkim. South India: Tamil Nadu – Nilgiri hills [Mukuruthy National Park (Parson's valley), Ootacamund (Dodabetta)] (Stephani, 1903; Hattori, 1966).

**Ecology:** Plants growing in rough mats as epiphytic population on angiospermic trees.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills – Mukuruthy National Park (Parsons Valley); ca. 2200 m.; 08-04-2002; P.K. Verma, A. Alam and N.Sahu; 15308/2002 (LWU).

**6. *Plagiochila nepalensis* Lindenb.**

**Type locality:** Nepal (So, 2001a).

**Range:** Oriental region: Asia – Bhutan, China, INDIA, Indonesia (Java), Malaysia, Myanmar, Philippines Thailand, and Vietnam. Palearctic region: Asia: Japan (see Inoue, 1967; So, 2001a).

**Distribution in India:** Eastern Himalayas: Assam – Khasia hills; Sikkim. Western Himalayas: Himachal Pradesh – Simla; Uttaranchal – Mussoorie, Nainital. South India: Kerala – Vagavurrai; Tamil Nadu - Nilgiri hills [Ootacamund (Dodabetta), Upper Bhavani (Avalanche)] (Dixit, 1995; Srivastava and Dixit, 1996b; Stephani, 1903, 1921; So, 2001a).

**Ecology:** Plants growing in rough mats as epiphytic population on angiospermic trees.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills – Mukuruthy National Park (Parsons Valley); ca. 2200 m.; 08-04-2002; P.K. Verma, A. Alam and N.Sahu; 15358/2002 (LWU).

Family-Lejeuneaceae Cavers

Subfamily- Lejeuneoideae Herz.

*Cheilolejeunea* (Spruce) Schiffn.

**7. *Cheilolejeunea laeviuscula* (Mitt.) St.**

**Type locality:** Sikkim (Mitten, 1861).

**Range:** Oriental region: Asia – INDIA, Nepal.

**Distribution in India:** Eastern Himalayas: Sikkim; West Bengal – Darjeeling (Mungpoo). South India: Karnataka – Mercara; Tamil Nadu - Nilgiri hills [Mukuruthy National Park (Parson's valley), Ootacamund (Dodabetta)] (Asthana *et al.*, 1995).

**Ecology:** Plants growing in smooth mats as epiphytic population on angiospermic trees.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills – Mukuruthy National Park (on way to Mukuruthy lake); ca. 2200 m.; 29.11.2001; P.K. Verma and A. Alam; 14554/2001 (LWU). Mukuruthy National Park (Parson's valley); ca. 2250 m.; P.K. Verma and A. Alam; 15240/2002, 15258/2002, 15261/2002, 15266/2002 (LWU).

#### 8. *Cheilolejeunea imbricata* (Nees) Hatt.

**Type locality:** Indonesia-Java (Mizutani, 1961).

**Range:** Australian region: Bonin Isl., Papua New Guinea. Oriental region: Asia – INDIA, Indonesia (Java, Sumatra, Borneo), Philippines, Taiwan, Thailand. Palearctic region: Asia –Japan (Kjusyu, Shikoku, Honshu, Ryukyu), Korea (see also Asthana *et al.*, 1995; Hong, 2003)

**Distribution in India:** Eastern Himalayas: Assam (Khasia Mts.); Meghalaya – Shillong (Elephant falls). South India: Karnataka – Agumbe; Kerala – Lakkidi; Tamil Nadu - Nilgiri hills [Coonoor (Singara Tea Estate), Gudalur (Anumapuram, Devala, Naduvattam Reserve Forest, Naduvattam – on way to Wilson plantation from frog hill view point, Pandalur- on way to Cherambadi), Kotagiri (Denad, Kilkotagiri, on way to Kodnad view point, Shollarmattum), Mukuruthy national Park (Governorsholai, on way to Mukuruthy National Park, on way to Mukuruthy lake, Parson's valley) Ootacamund (Atheval, Dodabetta, Emerald, Glenmorgan, Government Botanical Garden, Kamraj Sagar Reserve Forest, Kendurai, Love Dale, on way to Iduhatty, on way to Pykara lake, Pykara water fall, Sholur), Upper Bhawani (Avalanche)]; Palni hills -Kodaikanal (Kodai lake side, Perumalmalai) (see also Asthana *et al.*, 1995; Srivastava and Verma, 2004; Stephani, 1923).

**Ecology:** Plants growing in smooth mats as epiphytic population on angiospermic tree and very frequent in occurrence.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills – Mukuruthy National Park (Mukuruthy lake); ca. 2100 m.; 29.11.2001; P.K. Verma and A. Alam; 14535/2001, 14539/2001 (LWU). Mukuruthy National Park (Parson's valley); ca.2250 m; 08.04.2002; P.K. Verma, A. Alam and N. Sahu; 15312/2002, 15473/02 (LWU).

*Taxilejeunea* (Spruce) Schiffn. emend Schust.,

#### 9. *Taxilejeunea eckloniana* (Lindenb.) Agarwal (MS).

**Type locality:** South Africa (Jones, 1974).

**Range:** Ethiopian region: Africa – Angola, Cape Verde Isl., Cameroon, Congo, Ghana, Kenya, Nigeria, Reunion, Malawi, Sierra Leon, South Africa, Tanzania, Uganda, Zambia, Mauritius and Tenerife. Oriental region: Asia – INDIA (Verma and Srivastava, 2007).

**Distribution in India:** Eastern Himalaya: Meghalaya – Kanchipur; Sikkim – Nathu La Road. South India: Karnataka – Agumbe, Mercara; Kerala –Devicolam, Lakkidi, Munnar, Peermade; Tamil Nadu - Nilgiri hills [Kotagiri (St. Catherine water fall), Gudulur (Pandalur- on way to Cherambadi), Mukuruthy National Park (on way to Mukuruthy lake), Ootacamund (Emerald, Ebanadu)].

**Ecology:** Plants growing in smooth patches as epiphytic population on very extreme conditions (as xeromorphic), on very hard bark and mainly near the base or subdividing branches towards the earth.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills –Mukuruthy National Park (on way to Mukuruthy lake, Parson’s valley); ca. 2200 m.; 29.11.2001; P.K. Verma and A. Alam; 14552/01 (LWU).

*Lejeunea* Libert

#### 10. *Lejeunea flava* (Sw.) Nees

**Type locality:** Jamaica - Antilles (Mizutani, 1961).

**Range:** Australian region: Australia, New Zealand, New Caledonia, Papua New Guinea, Samoa. Ethiopian region: Africa – Central African Republic, Congo, Ethiopia, Ghana, Kenya, Madagascar, Rwanda, South Africa, Sierra Leon, Tanzania, Uganda, Zaire, Zambia. Oriental region: Asia –INDIA, Indonesia (Borneo, Java, Sumatra), Malaysia, Nepal, Sri Lanka, Southern China, Thailand, Palearctic region: Asia – Japan, Korea, Mongolia, Northern China; Europe, Azores and Madeira. Neotropical region: Central America – Bahamas, Bermuda, Cuba, Guadalupe, Guatemala, Honduras, Jamaica, Panama Puerto Rico, Virgin Isl., Trinidad; South America – Venezuela. Nearctic region: North America – U.S.A. (Zhu and So, 2001).

**Distribution in India:** Western Himalayas: Himachal Pradesh; Uttaranchal – Nainital. South India: Kerala – Lakkidi, Munnar, Peermade, Silent valley, Vagavurrai; Karnataka – Agumbe, Jog falls, Kudremukh; Tamil Nadu - Nilgiri hills [Coonoor (Singara Tea Estate, Sim’s park, Lamb’s rock, Low’s falls), Gudulur (Anumapuram, Cherambadi, Naduvattam Reserve Forest, Nellakotta, Pandalur), Kotagiri (Elada, Honhatty, Kengarai, Kilkotagiri, on way to Muduthorai, Shollarmattum), Mukuruthy National Park (Governorsholai, on way to Mukuruthy lake, Parson’s valley), Ootacamund (Atheval, Dodabetta, Emerald, Glenmorgan, Government Botanical Garden, Kamraj Sagar Reserve Forest, Kokal, Krutukuli, Love Dale, Melkahatty, on way to Pykara lake, on way to Pykara water fall, Sholur, Taneri, Thallakunda, Theetkul), Upper Bhavani (Avalanche)]; Palni hills – Kodaikanal (Kodai lake side, Perumalmalai, Shembaganur, Silver Cascade) (Srivastava and Sharma, 2000).

**Ecology:** The plants are growing in smooth mats on variety of habitats mainly as epiphytic population, occasionally as terrestrial population.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills –Mukuruthy National Park (on way to Parson's Valley); ca. 2250 m.; 29.11.2001; P.K. Verma and A. Alam; 14533/2001, 14534/2001, 14545/2001, 14554/2001 (LWU).

**11. *Lejeunea discreta* Lindenb.**

**Type locality:** Indonesia – Java (Mizutani, 1971).

**Range:** Australian region: Norfolk Isl., New Caledonia, Papua New Guinea. Palearctic region: Asia – Japan, Korea. Oriental region: Asia – Bhutan, Cambodia, China, INDIA, Indonesia (Borneo, Java, North Sabah, Sumatra), Malaysia, Moluccas, Nepal, Sri Lanka, Taiwan (see Grolle, 1982; Mizutani, 1971; Piippo, 1990; Yamada and Choe, 1997; Zhu and So, 2001).

**Distribution in India:** Eastern Himalayas: Sikkim – Gangtok; West Bengal – Darjeeling (Rimbic). Western Himalayas: Uttaranchal – Nainital (Chaubatia). South India: Tamil Nadu - Nilgiri hills [Coonoor (Rly. Track), Kotagiri (Kilkotagiri, on way to Kodnad view point, Sholarmattam), Mukuruthy National Park, Ootacamund (Atheval, Dodabetta, Emerald, Government Botanical Garden, Melkahatty, on way to Iduhatty, Theetkul)]; Palni hills-Kodaikanal (Kodai lake side) (see Srivastava and Verma, 2004a).

**Ecology:** Plants growing in smooth mats as epiphytic population on base of the trunk of angiospermic trees.

**Specimens examined:** South India (Tamil Nadu): Nilgiri Hills- Mukuruthy National Park (Parson's valley); ca. 2250 m; 05.04.2003, P. K. Verma and A. Alam 17141/2003, 17142/2003, 17143/2003, 17145/2003 (LWU).

**12. *Lejeunea kashyapii* Agarwal (MS)**

**Type locality:** Kerala – Munnar (Agarwal, 1986).

**Range:** Endemic to India.

**Distribution in India:** South India: Kerala – Munnar, Lakkidi, Abbi falls, Devicolam; Karnataka –Agumbe, Mercara; Tamil Nadu - Nilgiri hills [Ootacamund (Emerald, Glenmorgan, on way to Pykara lake, on way to Pykara water falls), Gudulur (Anumapuram, Naduvattam), Mukuruthy National Park (Governorsholai, on way to Mukuruthy lake, Parson's valley)].

**Ecology:** The plants are growing in smooth mats as epiphytic population on tree trunk as well as twigs of angiospermic trees.

**Specimens examined:** South India–Tamil Nadu: Nilgiri hills – Mukuruthy National Park (Parson's Valley, on way to Mukuruthy lake); ca. 2200 m.; 29.11.2001; P.K. Verma and A. Alam; 14536/2001, 14538/2001, 14539/2001, 14541/2001, 14544/2001 (LWU).

**13. *Lejeunea wightii* Lindenb.**

**Type locality:** India Orientalis

**Range:** Endemic to India (Oriental region).

**Distribution in India:** Eastern Himalayas: Manipur; West Bengal – Darjeeling (Kalimpong). Western Himalayas: Uttaranchal – Nainital (Chaubatia). South India: Karnataka – Mercara, Agumbe; Kerala – Lakkidi, Vagavurrai, Devicolam, Peermade, Nyamakad, Periavuarrai, Periyakulam. Tamil Nadu – Nilgiri hills [Coonoor (Ketty valley, Singara Tea Estate, Law's fall, Kulakambay), Gudulur (Cherambadi, Naduvattam Reserve Forest, Nellakotta, Pandalur, on way to Yellamalai), Kotagiri (Shollarmattum), Mukuruthy National Park (Governorsholai, Parson's valley, Mukuruthy lake), Ootacamund (Dodabetta, Glenmorgan, Government Botanical Garden, Kamraj Sagar Reserve Forest, Love Dale, on way to Iduhatty, on way to Pykara lake, Taneri), Upper Bhavani (Avalanche)]; Palni hills, Madura (Agarwal, 1986).

**Ecology:** The plants are growing in smooth mats as epiphytic population on main tree trunk as well as on primary and secondary branches of tree, on shrubs, occasionally as terrestrial vegetation.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills – Mukuruthy National Park (Parson's valley); ca. 2250 m.; 08.04.2002; P.K. Verma, A. Alam and N. Sahu; 15235/2002, 12258/2002 (LWU). Mukuruthy National Park (Governorsholai); ca. 2250 m.; 05.04.2003; P.K. Verma and A. Alam; 17126/2003, 17128/2003 (LWU).

*Microlejeunea* (Spruce) Jack and St.

#### 14. *Microlejeunea ulicina* (Tayl.) Evans

**Type locality:** Ireland: Kerry county – Kenmore (Schuster, 1980)

**Range:** Ethiopian region: Africa- Ivory Coast. Nearctic region: U.S.A., Canada. Neotropical region: South America- Brazil, Chili. Palearctic region: Asia- Japan; Europe – Azores, Britain, France, Italy, Luxembourg, Madeira, Canary Isl. Oriental region: Asia –INDIA (So and Zhu, 2001).

**Distribution in India:** Eastern Himalayas: Meghalaya – Kanchipur, Vishnupur; Sikkim – Nathu La road. South India: Karnataka – Agumbe, Jog falls; Kerala – Lakkidi, Ponmudi, Silent valley; Tamil Nadu - Nilgiri hills [Gudulur (Anumapuram, Cherambadi, Nellakotta, on way to Frog hill point to Wilson plantation, Naduvattam Reserve forest, on way to Yellamalai, Pandalur), Kotagiri (Elada, Kilkotagiri, on way to Kodnad, Nedgula, Quin Sholai, Shollarmattum, St. Catherine water fall), Mukuruthy National Park (Governorsholai, on way to Mukuruthy lake, Parson's valley), Ootacamund (Atheal, Dodabetta, Government Botanical Garden, Kamraj Sagar Reserve Forest, Kendurai, Love Dale, Glenmorgan, Melkahatty, on way to Pykara water fall, Sholur, Theetkul), Upper Bhavani (Avalanche)].

**Ecology:** Plants growing in thread like form as epiphytic population on tree trunks, primary and secondary branches as well as on leaves of angiospermic and gymnospermic trees.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills –Mukuruthy National Park (Parson's valley); ca. 2250 m.; 08.04.2002; P.K. Verma, A. Alam and N. Sahu; 15257/2002, 15309/2002 (LWU).



Subfamily- Ptychanthoideae Mizut. *ex* Schust.

*Lopholejeunea* (Spruce) Schiffn.

**15. *Lopholejeunea sikkimensis* St.**

**Type locality:** Sikkim (Stephani, 1912).

**Range:** Oriental region: Asia – INDIA, Nepal (Mizutani, 1971, Gradstein, 1991).

**Distribution in India:** Eastern Himalayas: Manipur – Imphal (Kanchipur); Sikkim; West Bengal – Darjeeling (Llyod Botanical Garden). Western Himalayas: Uttaranchal. Central India: Madhya Pradesh (Pachmarhi). South India: Karnataka – Agumbe; Kerala – Lakkidi, Munnar; Tamil Nadu - Nilgiri hills [Coonoor (Lamb's rock, Sim's Park), Gudalur – (Anumapuram, Naduvattam Reserve Forest, Pandalur-on way to Cherambadi, T.R. Bazar), Kotagiri (Shollarmattum), Mukuruthy National Park (Governorsholai, on way to Mukuruthy lake, Parson's valley), Ootacamund (Atheal, Dodabetta, Emerald, Glenmorgan, Government Botanical Garden, Kamraj Sagar Reserve Forest, Krutukuli, Love Dale, Melkahatty, on way to Pykara lake, Pykara Water fall, Sholur, Theetkul), Upper Bhavani (Avalanche)]; Palni hills- Kodaikanal (Perumalmalai).

**Ecology:** Plants growing in smooth mats as epiphytic population on main trunks, branches of angiospermic trees.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills – Mukuruthy National Park (Parson's valley); ca. 2200 m.; 08.04.2002; P.K. Verma, A. Alam and N. Sahu; 15239/2002, 15242/2002, 15245/2002, 15246/2002, 15249/2002, 15250/2002, 15253/2002, 15255/2002, 15257/2002, 15258/2002, 15260/2002, 15261/2002, 15266/2002, 15270/2002, 15271/2002, 15272/2002, 15275/2002, 15281/2002, 15289/2002, 15290/2002, 15292/2002, 15293/2002, 15294/2002, 15295//2002, 15297/2002, 15302/2002, 15304/2002, 15305/2002, 15312/2002, 15313/ (LWU).

**16. *Lopholejeunea subfusca* (Nees) St.**

**Type locality:** Indonesia – Java (Mizutani, 1961).

**Range:** Australian region: Australia, Carolina Island, New Caledonia, Papua New Guinea. Ethiopian region: Africa –Angola, Annoban, Bioko, Cameroon, Central African Republic, Gambia, Guinea, Ivory Coast, Kenya, Madagascar, Nigeria, Rwanda, South Africa, Sierra Leon, Tanzania, Togo, Zaire. Nearctic region: North America (U.S.A.). Neotropical region: South America – Brazil, Bolivia, Chile, South Bahamas; Central America –Cuba, Mexico, Puerto Rico, Santa Lucia, Trinidad, Santo Pomingo. Oriental region: Asia – Bhutan, China, INDIA, Indonesia (Java, Sumatra, Borneo), Malaysia, Nepal, Philippines, Sri Lanka, Tahiti, Taiwan, Thailand, Vietnam. Palearctic region: Korea (Ryukyu Isl.), Japan (Awasthi *et al*, 2000).

**Distribution in India:** Eastern Himalayas: Sikkim – Gangtok; West Bengal. South India: Karnataka – Mercara; Kerala – Devicolam, Lakkidi, Ponmudi, Vagavurrai; Tamil Nadu - Nilgiri

hills [Kotagiri (Kengarai, Shollarmattum), Mukuruthy National Park (on way to Mukuruthy National Park), Ootacamund (Emerald, Glenmorgan)] (Awasthi *et al*, 2000).

**Ecology:** Plants growing in smooth mats on main trunk as well as primary and secondary branches of angiospermic trees as epiphytic population; occasionally as terricolous populations.

**Specimen examined:** South India (Tamil Nadu): Nilgiri hills – Mukuruthy National Park (on way to Mukuruthy National Park, Parson's Valley); ca. 2100 -2250m.; 01.10.2002; P.K. Verma and A. Alam; 16227/2002, 16260/2002 (LWU). Kotagiri (Shollarmattum);ca,1800 m.; 05.10.2002; 16434/2002, 16443/2002. Ootacamund (Emerald); ca. 2000 m.; 03.04.2003; P.K. Verma and A. Alam; 17006/2003 (LWU).

*Spruceanthus* Verd.

### 17. *Spruceanthus semirepandus* (Nees) Verd.

**Type locality:** Indonesia – Java (Mizutani, 1961).

**Range:** Oriental region: Asia – Bhutan, China, INDIA, Indonesia (Java), Nepal, Philippines, Sumatra, Taiwan, Sri Lanka. Palearctic region: Asia – Korea , Japan (Gradstein and Inoue,1980; Tan and Engel,1986).

**Distribution in India:** Eastern Himalayas: Meghalaya –Cherrapunji, Jowai; Sikkim – on way to Nathu La pass; West Bengal – Darjeeling (Llyod Botanical Garden, Senchal, Sukia, Tiger hill), Mungpoo, Tonglloo, Teesta valley. Western Himalayas: Uttaranchal. South India: Karnataka-Kudremukh; Tamil Nadu - Nilgiri hills [Gudulur (Pandalur- on way to Cherambadi), Mukuruthy National Park (Parson's valley), (Ootacamund – Dodabetta, Emerald, Government Botanical Garden, Pykara water fall), Upper Bhavani (on way to Avalanche)].

**Ecology:** Plants growing in fan life as epiphytic population on main tree trunk as well as on secondary branches.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills – Mukuruthy National Park (Parson's valley); ca. 2250 m.; 08.04.2002; P.K. Verma, A. Alam and N. Sahu; 15258/2002, 15269/2002, 15298/2002 (LWU).

*Ptychanthus* Nees

### 18. *Ptychanthus striatus* (Lehm. et Lindenb.) Nees

**Type locality:** India (Mizutani, 1961).

**Range:** Australian region: Australia, Papua New Guinea. Ethiopian region: Africa –Burundi, Cameroon, Kenya, Ethiopia, Malawi, Madagascar, Mozambique, Rwanda, South Africa, Tanzania, Uganda. Oriental region: Asia – Cambodia, China, INDIA, Indonesia (Sumatra, Java, Borneo, Bali), Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Sulawesi, Taiwan, Thailand, Vietnam. Palearctic region: Asia: Korea, Japan (Poc's and Lye, 1999; Wigginton and Grolle, 1996).

**Distribution in India:** Eastern Himalayas: Sikkim – Gangtok, Nathu La pass; Assam; Arunachal Pradesh; Meghalaya – Shillong, Cherrapunji; West Bengal – Darjeeling (Tiger hill, Ghoom, Sukia, Himalayas Mountaineering Institute, Llyod Botanical Garden, Tongloo, Teesta valley, Mungpo). Western Himalayas: Uttarakhand – Garhwal Himalayas, Jamunotri, Nainital, Mussoorie; Jammu and Kashmir; Himachal Pradesh - Kullu, Manali. Central India: Madhya Pradesh – Pachmarhi. South India: Karnataka – Jog falls (Mahatma Gandhi water fall), Agumbe, Bangalore (Nandi hills); Kerala – Munnar, Vagavurrai; Maharashtra – Mahabaleshwar; Tamil Nadu - Nilgiri hills, Mukuruthy National Park (Governorsholai, on way to Mukuruthy lake, Parson's valley), Ootacamund (Dodabetta, Emerald, Kendurai, Glenmorgan, Government Botanical Garden, on way to Pykara lake), Upper Bhavani (Avalanche)]; Palni hills –Kodaikanal (Pariyakulam, Shembaganur) (Awasthi and Srivastava, 1987).

**Ecology:** Plants growing in fan like life form on different habitats, varying from decaying logs to angiospermic trees as epiphytic population as well as on wet rocks.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills – Mukuruthy National Park (on way to Mukuruthy lake); ca. 2200 m.; 29.11.2001; P.K. Verma and A. Alam; 14545/2001, 14546/2001, 14549/2001, 14552/2001, 14555/2001, 14557/2001 (LWU). Mukuruthy National Park (Parson's valley); ca. 2250 m.; 06.04.2002; P.K. Verma, A. Alam and N. Sahu; 15236/2002, 15241/2002, 15244/2002, 15245/2002, 15246/2002, 15247/2002, 15248/2002, 15250/2002, 15296/2002, 15305/2002, 15307/2002, 15317/2002 (LWU).

Family Jubulaceae Klinggr. *ex* Massal.

*Frullania* Raddi

*Frullania* subgen. *Chonantheia* Spruce

### 19. *Frullania (Chonantheia) neurota* Tayl.

**Type locality:** Nepal (Taylor, 1846)

**Range:** Ethiopian region: Africa. Neotropical region: Central America- Hawaii, Jamaica; Mexico; South America- Brazil, Colombia, Surinam. Oriental region: Asia - Bhutan, China, INDIA, Indonesia (Java, Borneo), Nepal, Sri Lanka, Southern China, Thailand, Vietnam (see Hattori, 1972a, 1979; Hattori and Lin, 1985; Taylor, 1846; Yuzawa, 1991; Yuzawa and Koike, 1994).

**Distribution in India:** Eastern Himalayas: Meghalaya – Khasia, Jaintia, Shillong (Circuit house); Sikkim; West Bengal – Darjeeling, Teesta valley, Tongloo. Western Himalayas: Uttarakhand. South India: Karnataka – Agumbe, Mercara, Coorg; Kerala – Lakkidi, Wyanad, Silent valley, Vagavurrai; Tamil Nadu – Nilgiri hills [Coonoor (Hidden forest, Law's fall), Kotagiri (On way to Kodnad view point, Kengarai, Kilkotagiri, Shollarmattum), Masangudi Reserve Forest (Kalahatty slope reserve forest), Mukuruthy National Park (Parson's valley, Governorsholai, On way to Mukuruthy lake), Ootacamund (Atheval, Dodabetta, Ebanadu, Emerald, Glenmorgan, Good's Shepherd school, Government Botanical Garden, Kamraj Sagar R. forest, Melkahatty Pykara lake, Pykara water fall, on way to Iduhatty, Sholur, Theetkul), Gudulur (Naduvattam, On way to Wilson plantation, Anumapuram, Nellakotta), Upper Bhavani (Avalanche)]; Palni hills-Kodaikanal (Kodai

lake, Silver cascade, Perumalmai, Bryant park) (Nath and Asthana, 1998; Srivastava and Alam, 2002).

**Ecology:** Plants mainly growing in smooth mats as an epiphytic population on variety of habitat mainly on tree trunk, primary and secondary branches and even on logs.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills - Mukuruthy National Park (Governorsholai, on way to Parson's valley); ca. 2200 m.; 10.04.2002; P.K. Verma, A. Alam and N. Sahu; 15453/2002, 15458/2002, 15459/2002, 15460/2002, 15461/2002, 15468/2002, 15471/2002, 15473/2002, 15498/2002 (LWU).

## 20. *Frullania (Chonanthelia) arecae* (Spreng.) Gott.

**Type locality:** ?

**Range:** Australian region: Australia, New Guinea, Norfolk islands, Pacific islands. Ethiopian region: Africa – Bioko, Burundi, Cameroon, Ethiopia, Ghana, Mozambique, Madagascar, Reunion, Rwanda. Neotropical region: South America – Brazil, Columbia, Ecuador, Galapagos Isl., Panama, Venezuela. Oriental region: Asia – China, INDIA, Indonesia (Borneo, Java, Sumatra) Malaysia, Nepal, Philippines, Sri Lanka, Thailand (Wigginton and Grolle, 1996).

**Distribution in India:** Eastern Himalayas: Meghalaya – Khasia; Sikkim; West Bengal – Darjeeling. South India: Karnataka – Agumbe; Kerala – Lakkidi, Silent valley, Vagavurrai; Tamil Nadu – Nilgiri hills [Gudulur (Naduvattam R. Forest, Anumapuram), Kotagiri (Muduthorai, Kilkotagiri, Denad Reserve Forest-Elada), Mukuruthy National Park (Governorsholai, Parson's valley, on way to Mukuruthy lake), Ootacamund (Dodabetta, Ebanadu, Emerald, Glenmorgan, Government Botanical Garden, Kamraj Sagar R. forest, on way to Iduhatty, Pykara lake, Pykara water fall, Theetkul), Upper Bhavani (Avalanche)]; Palni hills-Kodaikanal (Silver cascade, Perumalmai, Bryant park). (see also Nath and Asthana, 1998; Srivastava and Alam, 2002).

**Ecology:** Plants growing in smooth mats as an epiphytic population on angiospermic tree as well as saxicolous population.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills – Mukuruthy National Park (Parson's Valley); ca. 2200 m.; 08.04.2002; P.K. Verma, A. Alam and N. Sahu; 15239/2002, 15243/2002, 15249/2002, 15261/2002, 15267/2002, 15268/2002, 15271/2002, 15273/2002, 15274/2002, 15281/2002, 15292/2002, 15294/2002, 15295/2002, 15299/2002, 15302/2002, 15304/2002, 15312/2002 (LWU). Mukuruthy National Park (Governorsholai); ca. 2200 m.; 10.04.2002; P.K. Verma, A. Alam and N. Sahu; 15422/2002, 15452/2002, 15453/2002, 15489/2002 (LWU).

*Frullania* subgen. *Trachycolea* Spruce

## 21. *Frullania (Trachycolea) acutiloba* Mitt.

**Type locality:** India: Tamil Nadu- Nilgiri Hills (Mitten, 1861).

**Range:** Oriental region: Asia- INDIA, Indonesia (Borneo, Java), Sri Lanka (see also Hattori, 1979; Mitten, 1861).

**Distribution in India:** South India: Kerala – Vagavurrai, Lakkidi, Silent valley; Tamil Nadu – Nilgiri hills [Coonoor (on way to Mettupalayam), Kotagiri (on way to Kodnad view point, Shollarmattum), Gudulur (Anumapuram, Naduvattam), Mukuruthy National Park (Governorsholai, on way to Mukuruthy lake, Parsons valley), Ootacamund (Dodabetta, Emerald Glenmorgan, Government Botanical Garden, Kamraj Sagar R. forest, Pykara water fall, on way to Pykara lake, on way to Iduhatty, Sholur, Theetkul), Upper Bhavani (Avalanche)] (Nath and Asthana, 1998; Srivastava and Alam, 2002).

**Ecology:** Plants growing in smooth mats as an epiphytic population on angiospermic trees especially on branches, tree trunks, bushes, occasionally terrestrial.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills – Mukuruthy National Park (on way to Mukuruthy Lake, Parson's Valley); ca. 2100 m.; 29.11.2001; P.K. Verma and A. Alam; 14542/2001 (LWU). Ootacamund (Glenmorgan); ca. 2050 m.; 01.12.2001; P.K. Verma and A. Alam; 14643/2001, 14649/2001, 14665/2001, 14677/2001 (LWU). Ootacamund (on way to Iduhatty); ca. 2600 m.; 02.12.2001; P.K. Verma and A. Alam; 14717/2001 (LWU).

## 22. *Frullania (Trachycolea) ericoides* (Nees) Mont.

**Type locality:** Brazil (Schuster, 1992a)

**Range:** Australian region: Australia, New Caledonia, Papua New Guinea. Ethiopian region: Asia-Arabian Peninsula; Africa – Angola, Ascension Island, Annobon, Bioko (Fernando Po), Burundi, Cameroon, Central African republic, Congo, Cape Verde Isl., Ethiopia, Gambia, Guinea, Kenya, Madagascar, Malawi, Mozambique, Nigeria, Principe, Reunion, Rwanda, Seychelles, South Africa, Sierra Leone, Scotia, Tanzania, Togo, Uganda, Zaire, Zambia, Zimbabwe. Nearctic region: North America: Canada, United State of America. Neotropical: South America –Brazil, Venezuela, Galapagos Isl.; Central America- Antilles, Caribbean Isl., Mexico. Oriental region: Asia – Bhutan, INDIA, Indonesia (Borneo, Java, Sumatra), Nepal, Philippines, Southern China, Taiwan, Vietnam. Palearctic region: Asia – Northern China, Korea, Japan; Europe (Nath and Asthana, 1998).

**Distribution in India:** Eastern Himalayas: Assam; Sikkim – Gangtok, Yoksam; West Bengal – Darjeeling, Kurseong, Lopchu, Llyod Botanical Garden, Tiger hill; Western Himalayas: Himachal Pradesh – Chamba; Uttaranchal – Garhwal, Mussoorie, Nainital. Central India: Madhya Pradesh – Amarkantak, Pachmarhi. South India: Karnataka – Kudremukh; Tamil Nadu – Nilgiri hills [Coonoor (Droog, Ketabettu, Kulakambay, Laws fall, on way to Mettupalayam, Singara tea Estate, Sims Park, Wellington), Gudulur (Cherambadi, Naduvattam R. Forest, on way to Frog hill view, Nellakotta, Pandalur-on way to Cherambadi, T.R. Bazar), Masangudi Reserve Forest (Kalahatty slope) Mukuruthy National Park (Governorsholai, Parson's valley, on way to Mukuruthy Lake), Kotagiri (Kengarai, Kilkotagiri, on way to Kodnad view point, Nedgula, Shollarmattum), Ootacamund (Atheval, Dodabetta, Ebanadu, Emerald, Government Botanical Garden, Ebanadu, Emerald, Glenmorgan, Government Botanical Garden, Kamraj Sagar R. Forest, Kendurai, Love Dale, on way to Iduhatty, M. Palada, Pykara water fall, on way to Pykara lake, Sholur, Taneri),

Upper Bhavani (Avalanche)]; Palni hills- Kodaikanal (Perumalmalai, Shembaganur), Madura (see also Chopra, 1938a; Nath and Asthana, 1998; Srivastava and Alam, 2002).

**Ecology:** Plants growing in smooth mats as an epiphytic population on angiospermic trees as well as saxicolous populations.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills- Mukuruthy National Park (Parson's Valley; Governorsholai); ca. 2200 m.; 10.04.2002; P.K. Verma, A. Alam and N. Sahu; 15458/2002, 15454/2002, 15475/2002, 15484/2002, 15492/2002 (LWU).

### 23. *Frullania (Trachycolea) campanulata* Sande Lac.,

**Type locality:** Indonesia-Java (Hattori, 1974b).

**Range:** Oriental region: Asia – INDIA, Indonesia (Borneo, Java, Sumatra), Sri Lanka (see Hattori, 1974b).

**Distribution in India:** South India: Karnataka – Agumbe; Kerala – Lakkidi, Silent valley, Vagavurrai, Periyakulam; Tamil Nadu- Nilgiri hills [Coonoor (Lamb's rock, Singara Tea Estate), Gudulur (Cherambadi- Pandalur, Naduvattam, Nellakotta, on way to Anumapuram, Nellakotta), Kotagiri (Kilkotagiri, on way to Kodnad view point, Om Nagar, Nedgula, St. Catherine water fall, Shollarmattum), Mukuruthy National Park (Governorsholai, Parson's valley), Ootacamund (Dodabetta, Ebanadu, Emerald, Kendurai, on way to Pykara lake, Pykara water fall, Glenmorgan, Government Botanical Garden, Kamraj Sagar Reserve forest, Krutukuli, on way to Iduhatty, Taneri), Upper Bhavani (Avalanche) (see also, Nath and Asthana, 1998; Srivastava and Sharma, 2000; Srivastava and Alam, 2002).

**Ecology:** Plants growing in smooth mats as an epiphytic population on angiospermic tree trunk as well as on primary and secondary branches.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills – South India (Tamil Nadu): Nilgiri hills – Mukuruthy National Park (Parson's valley); ca. 2250 m.; 08.0.2002; P.K. Verma, A. Alam and N. Sahu; 15319/2002 (LWU).

*Frullania* subgen. *Australes* (Verd.) Hatt.

### 24. *Frullania (Australes) inflexa* Mitt.

**Type locality:?**

**Range:** Oriental region: Asia - Bhutan, China, INDIA. Palearctic region: Asia- Korea, Japan (see Hattori and Lin, 1985).

**Distribution in India:** South India: Tamil Nadu - Nilgiri hills [Gudulur (Cherambadi- Pandalur), Mukuruthy National Park (Parson's valley) and Ootacamund (Emerald)].

**Ecology:** Plants growing in smooth mats as an epiphytic population, mainly in small diffuse patches on middle of tree trunk as well as on secondary branches of angiospermic trees.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills – Mukuruthy National Park (Parson's valley); ca. 2250 m.; 08.0.2002; P.K. Verma, A. Alam and N. Sahu; 15313/2002 (LWU).

*Frullania* subgen. *Frullania* Raddi

**25. *Frullania (Frullania) tamarisci* subsp. *obscura* (Verd.) Hatt.**

**Type Locality:** Japan (Hattori, 1972b)

**Range:** Oriental region: Asia – China, INDIA, Indonesia (Borneo, Java, Sumatra), Philippines, Sri Lanka, Taiwan. Palearctic region: Asia – Asia Minor, East of Russia (Siberia), Japan, Korea, northern China (Hattori and Lin, 1985; Yamada and Choe, 1997).

**Distribution in India:** South India: Tamil Nadu – Nilgiri hills [Coonoor (Hidden forest, Ketty valley), Mukuruthy National Park (on way to Mukuruthy lake, Parson's valley, Governorsholai), Kotagiri (Kilkotagiri, Nedgula), Ootacamund (Atheval, Dodabetta, Emerald, Glenmorgan, Government Botanical Garden, Kamraj Sagar Reserve forest, Kendurai, Love Dale, on way to Pykara lake, Pykara water fall, Sholur), Upper Bhavani (Avalanche)].

**Ecology:** Plants growing in pendulous festoons as an epiphytic population on angiospermic trees.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills – Mukuruthy National Park (Parson's valley); ca. 2200 m.; 08.08.2002; P.K. Verma, A. Alam and N. Sahu; 15241/2002, 15244/2002, 15249/2002, 15250/2002, 15260/2002, 15280/2002, 15282/2002, 15288/2002, 15289/2002, 15291/2002, 15295/2002, 15297/2002, 15307/2002, 15308/2002, 15312/2002, 15318/2002, 15319/2002 (LWU).

Family- Radulaceae (Dum.) K. Müll.

*Radula* Dum.

**26. *Radula madagascariensis* Gott.**

**Type locality:** Madagascar – Ambaranvaranututa (Yamada, 1975).

**Range:** Ethiopian region: Africa – Mauritius, Madagascar, Reunion, Tanzania. Oriental region: Asia – INDIA, Philippines, Nepal, Indonesia (Borneo, Java), Sri Lanka (see Yamada, 1975a, 1975b, 1979; Jones, 1977)

**Distribution in India:** Eastern Himalayas: Meghalaya – Shillong (Elephant falls); West Bengal – Darjeeling (Tongloo, Llyod Botanical Garden, Tiger hill). South India: Tamil Nadu – Nilgiri hills [Ootacamund (Dodabetta), Mukuruthy National Park, (Parson's valley)]; Kanyakumari (Nagarhole) (Srivastava and Verma, 2004)

**Ecology:** Plants growing as smooth mats forming epiphytic population on main tree trunk as well as primary branches of trees.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills –Mukuruthy National Park (Parson's valley); ca. 2250 m.; 08.04.2002; P.K. Verma, A. Alam and N. Sahu; 15278/2002, 15284/2002 (LWU).

**27. *Radula nilgiriensis* Udar et Kumar.**

**Type locality:** Tamil Nadu – Nilgiri hills-Avalanche (Udar and Kumar, 1982).

**Range:** Endemic to India.

**Distribution in India:** South India: Tamil Nadu - Nilgiri hills [Coonoor (Hidden forest, Singara Tea Estate), Kotagiri (Muduthorai, Shollarmattum), Ootacamund (Dodabetta, Ebanadu, Emerald, Love Dale, Government Botanical Garden, Kamraj Sagar Reserve Forest, Kendurai, Glenmorgan, Melkahatty, Pykara water fall, on way to Pykara boat house, on way to Iduhatty, Theetkul), Upper Bhawani (Avalanche)] (Udar and Kumar, Dh. 1982).

**Ecology:** Plants growing in smooth mats as epiphytic population on angiospermic trees.

**Specimens examined:** South India (Tamil Nadu): Nilgiri hills –Mukuruthy National Park (Parson's valley); ca. 2250 m.; 08.04.2002; P.K. Verma, A. Alam and N. Sahu; 15288/2002, 15289/2002 (LWU).

**Discussion**

The liverwort flora of Parson's Valley includes 27 species belonging to 12 genera distributed to 5 families and 2 orders. Order Metzgeriales is limited to family Metzgeriaceae with only a single genus while order Jungermanniales is predominant as it comprises 4 families, of which Lejeuneaceae is most flourished and diversified in the region with 7 genera. In terms of species *Frullania* is most diversified genus in the region with 7 species followed by *Lejeunea* and *Plagiochila* with 4 species each. The present communication provides 27 recognized taxa from parson's valley and revealed its potential in harboring the liverworts and it is certain that further explorations may prove to be highly valuable.

**Acknowledgements**

The authors are grateful to Dr. G. Asthana, P.I. AICOPTAX, Department of Botany, Bryology Unit, University of Lucknow and Prof. S.C. Srivastava, Former Emeritus Professor, N. B. R. I. Lucknow for their help and encouragement. The authors are also thankful to the Vice Chancellor, Banasthali Vidyapith for providing necessary support. The author is also thankful to Department of Environment and Forestry, Govt. of India, New Delhi for financial assistance under AICOPTAX during the this work.

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online Jan. 5, 2012