

Mosses of Pakistan collected by Dr. T. Nakaike in 1992

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Abstract Forty one species of mosses in 35 genera and 17 families are recognized based on the collections by Dr. T. Nakaike from Pakistan in 1992. Among them three species, *Atrichum subseratum*, *Platydictya jungermannioides* and *Tortula obtusifolia*, are newly recorded from Pakistan.

Key words: bryophytes, mosses, Pakistan

Three hundred and thirty four moss species in 122 genera and 32 families have been reported for Pakistan (Nishimura & Higuchi 1993, 1994). The moss flora of southern and southwestern Pakistan (Sindh and Balochistan) is almost unknown. The present paper deals with the mosses collected by Dr. T. Nakaike, a leader of the Botanical Expedition to the Western Himalaya organized by the National Science Museum, Tokyo, during his trips in Pakistan from August to October in 1992 (Nakaike & Malik, 1995). He visited Baltistan, N. W. Frontier Province, Punjab, Balochistan and Sindh, and collected 112 specimens of mosses. They comprise 17 families, 35 genera and 41 species. Among them three species are newly recorded from Pakistan.

We are indebted to Dr. T. Nakaike of Natural History Museum and Institute, Chiba, for kindly providing the interesting collection, the curator of the Hattori Botanical Laboratory for the loan of some specimens that Noguchi (1956, 1959) reported and Dr. W. R. Buck of the New York Botanical Garden for collecting the English text.

In the following enumeration the vouchers are deposited in the herbarium of the National Science Museum, Tokyo (TNS). An asterisk (*) preceding a species indicates “new to Pakistan.” For each species, collection localities, specimen numbers and distribution are provided.

Enumeration of the species

* *Atrichum subseratum* (Harv.) Mitt., J. Proc. Linn. Soc. Bot. Suppl. 1: 150.



Fig. 1. Map showing the areas investigated.

1859. (Polytrichaceae).

N. W. Frontier Prov.: Dir, Jogray Khoad (between Dir and Lowari Pass), 2260 m, 23 Sep 1992, *Nakaike 1957, 1960*.

Distribution: Pakistan, western Himalaya, India, eastern Nepal and China (Xizang and Yunnan).

This species is characterized by dioicous plants, leaves bluntly acute and not undulate, costa not reaching the leaf apex and small marginal teeth on the leaves (cf. Lou & Koponen 1986).

Barbula indica (Hook.) Spreng. in Steud., Nomencl. Bot. 2: 72. 1824. (Pottiaceae).

Baltistan: Skardu, upper Kachura Lake, 2260 m, 15 Sep 1992, *Nakaike 1922, 1925, 1927, 1931, 1935*.

Distribution: widely distributed in tropical and warm temperate regions in the world.

Brachymenium exile (Dozy & Molk.) Bosch & Sande Lac., Bryol. Jav. 1: 139. 1860. (Bryaceae).

Baltistan: Skardu, upper Kachura Lake, 2260 m, 15 Sep 1992, *Nakaike 1938*.

Distribution: Africa, southern & southeastern Asia, Japan, Hawaii, Mexico, Guatemala and South America.

Brachythecium buchananii (Hook.) A.Jaeger, Bell. S. Gall. Naturw. Ges. 1876–77: 341. 1878. (Brachytheciaceae).

N. W. Frontier Prov.: Abbottabad, Changla Gali, 2430 m, 1 Oct 1992, *Nakaike 1986*.

Distribution: Pakistan, Nepal, Bhutan, Assam, southern India, Burma, Indochina, Philippines, China, Korea and Japan.

Brachythecium garovaglioides Müll.Hall., Nuovo Giorn. Bot. Ital. n. ser. 4: 270. 1897. (Brachytheciaceae).

N. W. Frontier Prov.: Dir, Miyan Khoad (between Dir and Lowari Pass), 2160 m, 23 Sep 1992, *Nakaike 1953, 1955*.

Distribution: Pakistan, Nepal, China (Yunnan) and Japan.

Recently Wang et al. (2000) referred *Brachythecium wichurae* (Broth.) Paris to the synonymy of *B. garovaglioides* Müll.Hall.

Brachythecium rivulare Schimp., Bryol. Eur. 6: 17, f. 546. 1853. (Brachytheciaceae).

Baltistan: Skardu, Deosai–Sapara, 2900–3670 m, 10 Sep 1992, *Nakaike 1896, 1909*; Kachura Nara, 2400 m, 13 Sep 1992, *Nakaike 1919*.

Distribution: Europe, central & eastern Asia, North America, West Indies.

Bryoerythrophyllum recurvirostre (Hedw.) P.C.Chen var. *robustum* K.Saito, J. Hattori Bot. Lab. 39: 474, f. 39. 1975. (Pottiaceae).

N. W. Frontier Prov.: Chitral, upper Shahananda, 2300–2370 m, 25 Sep 1992, *Nakaike 1975*.

Distribution: widely distributed in the Northern Hemisphere.

Bryum argenteum Hedw., Sp. Musc. 181. 1801. (Bryaceae).

Baltistan: Skardu, upper Kachura Lake, 2260 m, 15 Sep 1992, *Nakaike 1926*.

Distribution: Cosmopolitan.

Bryum pseudotriquetrum (Hedw.) P.Gaertn., E. Mey. et Schreb., Oek. Techn. Fl. Wetterau 3: 102. 1802. (Bryaceae).

Baltistan: Skardu, Deosai–Sapara, 2900–3670 m, 10 Sep 1992, *Nakaike 1898, 1899, 1902, 1907, 1909, 1926*; Kachura Nara, 2400 m, 13 Sep 1992, *Nakaike 1920*.

Distribution: widely distributed in the Northern and Southern Hemispheres, except for tropical and subtropical lowlands.

Campylium sommerfeltii (Myr.) J.Lange, Nomencl. Fl. Dan. 210. 1887. (Amblystegiaceae).

N. W. Frontier Prov.: Chitral, upper Shahananda, 1350 m, 24 Sep 1992, *Nakaike 1890*.

Distribution: Europe, Pakistan, China, Japan, Siberia, North America and Mexico.

Claopodium pellucinerve (Mitt.) Best, Bryologist 3: 19. 1900. (Thuidiaceae).

N. W. Frontier Prov.: Abbottabad, Dunga Gali, 2280 m, 1 Oct 1992, *Nakaike 1988*.

Punjab: Rawalpindi, Bari (near Murree), 1920 m, 1 Oct 1992, *Nakaike 1984*.

Distribution: Pakistan, India, Kashmir, Himalayas, China, Korea, Japan, Siberia, Alaska and Mexico.

Cratoneuron filicinum (Hedw.) Spruce, Cat. Musc. Amaz. And. 21. 1904. (Amblystegiaceae).

N. W. Frontier Prov.: Dir, Darokhal, 2900 m, 22 Sep 1992, *Nakaike 1948*; Dir, Korandi (between Dir and Lawari Pass), 1930 m, 22 Sep 1992, *Nakaike 1952*; Chitral, Karakal (Kalash), 2110 m, 24 Sep 1992, *Nakaike 1963, 1964, 1965, 1966, 1968, 1969*; Chitral, upper Shahananda, 2300–2370 m, 25 Sep 1992, *Nakaike 1979, 1982*.

Baltistan: Skardu, Deosai–Sapara, 2900–3670 m, 10 Sep 1992, *Nakaike 1894, 1899, 1902, 1903, 1904, 1907*; Kachura Nara, 2400 m, 13 Sep 1992, *Nakaike 1915*.

Distribution: Europe, North Africa, Caucasus, Afganistan, Pakistan, Kashmir, Tibet, Nepal, Bhutan, China, Japan, Siberia, North, Central & South America, Greenland and New Zealand.

Desmatodon latifolius (Hedw.) Brid. var. *muticus* (Brid.) Brid., Bryol. Univ. 1: 525. 1826. (Pottiaceae).

Baltistan: Skardu, Kachura Nara, 2400 m, 13 Sep 1992, *Nakaike 1916*.

Distribution: Europe, Caucasus, central and eastern Asia, eastern Siberia, Kamtschatka, North America, Greenland.

Dichodontium pellucidum (Hedw.) Schimp., Coroll. 12. 1856. (Dicranaceae).

Sindh: Mohenjo Daro, 11 Oct 1992, *Nakaike 1892*.

Distribution: widely distributed in the Northern Hemisphere.

Didymodon constrictum (Mitt.) K. Saito, J. Hattori Bot. Lab. 39: 514. 1975. (Pot-tiaceae).

Balochistan: Quetta, Zarghum, 2200 m, 6 Oct 1992, *Nakaike 2002*.

Distribution: Pakistan, Himalayas, China and Japan.

Distichium capillaceum (Hedw.) Bruch & Schimp., Bryol. Eur. 2: 156. 1846. (Ditrichaceae).

Baltistan: Skardu, Deosai-Sapara, 2900–3670 m, 10 Sep 1992, *Nakaike 1895, 1897*.

Distribution: Europe, northern and central Asia, Japan, New Guinea, North & South America, Australia and New Zealand.

Drummondia thomsonii Mitt., J. Proc. Linn. Soc. Bot. Suppl. 1: 46. 1859. (Drummondiaceae).

Baltistan: Skardu, Deosai-Sapara, 2900–3670 m, 10 Sep 1992, *Nakaike 1912*.

N. W. Frontier Prov.: Chitral, Ganbak, 2010 m, 26 Sep 1992, *Nakaike 1983*.

Distribution: Afghanistan, Pakistan, northwestern India, Kashmir and Tibet.

Encalypta vulgaris Hedw., Sp. Musc. 60. 1801. (Encalyptaceae).

Balochistan: Quetta, Hazarganji Chiltan National Park, 2000 m, 7 Oct 1992, *Nakaike 2011*.

Distribution: widely distributed in the Northern Hemisphere and Australia.

Eurhynchium hians (Hedw.) Sande Lac., Ann. Mus. Bot. Lugd. Bat. 2: 299. 1866. (Brachytheciaceae).

N. W. Frontier Prov.: Chitral, Karakal (Kalash), 2110 m, 24 Sep 1992, *Nakaike 1969*.

Distribution: widely distributed in the Northern Hemisphere.

Fissidens grandifrons Brid., Sp. Musc. 1: 170. 1806. (Fissidentaceae).

N. W. Frontier Prov.: Dir, Korandi (between Dir and Lawari Pass), 1930 m, 22 Sep 1992, *Nakaike 1951*.

Baltistan: Skardu, Deosai-Sapara, 2900–3670 m, 10 Sep 1992, *Nakaike 1909*.

Distribution: widely distributed in the Northern Hemisphere.

Fissidens bryoides Hedw. var. *schmidii* (Müll.Hal.) Chopra & Kumar, Mosses West Himalayas Adjacent Plains: 43. 1981. (Fissidentaceae).

N. W. Frontier Prov.: Chitral, upper Shahananda, 2300–2370 m, 25 Sep 1992, *Nakaike 1979*.

Distribution: widely distributed in tropical and subtropical regions of Asia.

Funaria wichurae (M.Fleisch.) Broth. in Engler & Prantl, Nat. Pfl. 1(3): 1204. 1909. (Funariaceae).

Balochistan: Quetta, Zarghum, 2200 m, 6 Oct 1992, *Nakaike 2000*.

Distribution: Pakistan, India, Sri Lanka, Java and Japan.

Grimmia anodon Bruch & Schimp., Bryol. Eur. 3: 110. 1845. (Grimmiaceae).

Balochistan: Ziarat, 2360 m, 5 Oct 1992, *Nakaike 1998*.

Distribution: Europe, Africa, Central Asia, Pakistan, India, China, Siberia, North America and Greenland.

Grimmia pulvinata (Hedw.) Sm., Engl. Bot. 24:1728. 1867. (Grimmiaceae).

Balochistan: Quetta, Zarghum, 2200 m, 6 Oct 1992, *Nakaike 1999*.

Distribution: Europe, Azores, Africa, Turkey, Central Asia, Pakistan, India, China, Hawaii, North America, Australia and New Zealand.

Gymnostomum aeruginosum Sm., Fl. Brit. 3: 1163. 1804. (Pottiaceae).

N. W. Frontier Prov.: Abbottabad, Dunga Gali, 2280 m, 1 Oct 1992, *Nakaike 1987*.

Distribution: widely distributed in the Northern Hemisphere and South America.

Homomallium simlaense (Mitt.) Broth. in Engler & Prantl, Nat. Pfl. 1(3): 1027. 1908. (Hypnaceae).

N. W. Frontier Prov.: Abbottabad, Dunga Gali, 2280 m, 1 Oct 1992, *Nakaike 1994*.

Distribution: Pakistan, India, Kashmir and China.

Hymenostylium recurvirostrum (Hedw.) Dixon, Rev. Bryol. Lichenol., 6: 96. 1934. (Pottiaceae).

Baltistan: Skardu, Deosai-Sapara, 2900–3670 m, 10 Sep 1992, *Nakaike 1911*.

Distribution: widely distributed in the Northern Hemisphere and South America.

Leptobryum pyriforme (Hedw.) Wilson, Bryol. Brit. 219. 1855. (Bryaceae).

N. W. Frontier Prov.: Chitral, upper Shahananda, 2300–2370 m, 25 Sep 1992, *Nakaike 1975, 1976*.

Distribution: widely distributed in the Northern and Southern Hemispheres, except for Africa and Australia.

Miyabea nishimurae R. Watanäbe in Nakaike & Malik, Cryptogam. Fl. Pakistan 2: 259. 1993. (Thuidiaceae).

N. W. Frontier Prov.: Abbottabad, Dunga Gali, 2280 m, 1 Oct 1992, *Nakaike 1990, 1994*.

Distribution: Pakistan.

This species was considered to be closely allied to *M. fruticella* when it was described by Watanabe (in Nishimura et al. 1993) based on a sterile specimen from Pakistan. Our examination of the holotype of *M. nishimurae* reveals that it has sparse paraphyllia on the stems. The genus *Miyabea* has three species in the Far East Asia other than *M. nishimurae*, and otherwise no paraphyllia are known for the species. Thus, additional study may be necessary to determine the generic position of *M. nishimurae*.

Mnium lycopodioides (Hook.) Schwägr., Sp. Musc. Suppl. 12: 24, t. 160. 1826. (Mniaceae).

N. W. Frontier Prov.: Dir, Jogray Khoad (between Dir and Lowari Pass), 2260 m, 23 Sep 1992, *Nakaike 1959*; Chitral, upper Shahananda, 2300–2370 m, 25 Sep 1992, *Nakaike 1980*; Abbottabad, Changla Gali, 2430 m, 1 Oct 1992, *Nakaike 1986*.

Baltistan: Skardu, Deosai–Sapara, 2900–3670 m, 10 Sep 1992, *Nakaike 1901, 1913*; upper Kachura Lake, 2260 m, 15 Sep 1992, *Nakaike 1929, 1933*.

Distribution: widely distributed in the Northern Hemisphere.

Molendoa sendtneriana (Bruch & Schimp.) Limpr., Laubm. Deutschl. 1: 248. 1886. (Pottiaceae).

N. W. Frontier Prov.: Abbottabad, Dunga Gali, 2280 m, 1 Oct 1992, *Nakaike 1993*.

Distribution: Pakistan, Himalayas, China, Taiwan, Japan, Alaska and Europe.

Philonotis falcata (Hook.) Mitt., J. Proc. Linn. Soc. Bot. Suppl. 1: 62. 1859. (Bartramiaceae).

N. W. Frontier Prov.: Dir, Darokhal, 2900 m, 22 Sep 1992, *Nakaike 1947*.

Distribution: widely distributed in tropical and subtropical regions of Asia.

Plagiomnium medium (Bruch & Schimp.) T.J.Kop., Ann. Bot. Fenn. 5: 146. 1968. (Mniaceae).

N. W. Frontier Prov.: Chitral, upper Shahananda, 2300–2370 m, 25 Sep 1992, *Nakaike 1974*.

Distribution: widely distributed in the Northern Hemisphere.

Plagiomnium rostratum (Schrader) T.J.Kop., Ann. Bot. Fenn. 5: 147. 1968. (Mniaceae).

N. W. Frontier Prov.: Dir, Jogray Khoad (between Dir and Lowari Pass), 2260 m, 23 Sep, 1992, *Nakaike 1958, 1959*.

Baltistan: Skardu, Deosai–Sapara, 2900–3670 m, 10 Sep 1992, *Nakaike 1906, 1908*; Kachura Nara, 2400 m, 13 Sep 1992, *Nakaike 1919*; upper Kachura Lake, 2260 m, 15 Sep 1992, *Nakaike 1940*.

Distribution: Europe, northwestern Africa, Pakistan, Himalayas, China, western Siberia, New Guinea and North America.

* *Platydictya jungermannioides* (Brid.) Crum, Michigan Bot. 3: 60. 1964. (Amblystegiaceae).

Baltistan: Skardu, Deosai–Sapara, 2900–3670 m, 10 Sep 1992, *Nakaike 1895, 1897*.

Distribution: Europe, Pakistan, northern Asia, Japan and North America.

Although the costa of the leaves in the plants reported here (*Nakaike 1895, 1897*) is sometimes single and distinct, other characteristics show that these are best referred to *Platydictya jungermannioides*.

Platyhypnidium riparioides (Hedw.) Dixon, Rev. Bryol. Lichenol. 6: 111. 1934. (Brachytheciaceae).

N. W. Frontier Prov.: Chitral, upper Shahananda, 2300–2370 m, 25 Sep 1992, *Nakaike 1978*.

Distribution: widely distributed in Northern Hemisphere.

Pohlia cruda (Hedw.) Lindb., Musci Scand. 18. 1879. (Bryaceae).

N. W. Frontier Prov.: Dir, upper Lawari Pass, 3150 m, 22 Sep 1992, *Nakaike 1944*.

Distribution: widely distributed in the Northern Hemisphere, and scattered in the Southern Hemisphere.

Taxiphyllum taxirameum (Mitt.) M.Fleisch., Musci Fl. Buitenz. 4: 1435. 1923. (Hypnaceae).

N. W. Frontier Prov.: Abbottabad, Changla Gali, 2430 m, 1 Oct 1992, *Nakaike 1986*.

Distribution: widely distributed in Asia, eastern North America, Central & South America.

Timmia megapolitana Hedw. subsp. *bavarica* (Hessl.) Brassard, Lindbergia 10: 34. 1984. (Timmiaceae).

N. W. Frontier Prov.: Dir, upper Lawari Pass, 3150 m, 22 Sep 1992, *Nakaike 1946*.

Distribution: widely distributed in the Northern Hemisphere.

Timmiella anomala (Bruch & Schimp.) Limpr., Laubm. Deutschl. 1: 590, f. 173. 1888. (Pottiaceae).

N. W. Frontier Prov.: Abbottabad, Dunga Gali, 2280 m, 1 Oct 1992, *Nakaike 1991, 1992*.

Baltistan: Skardu, Kachura Nara, 2400 m, 13 Sep 1992, *Nakaike 1918*; upper Kachura Lake, 2260 m, 15 Sep 1992, *Nakaike 1930, 1931, 1932, 1935, 1936, 1939*.

Distribution: Europe, Pakistan, Himalayas, North & Central America.

* *Tortula obtusifolia* (Schwägr.) Mathieu, Fl. Gen. Belg. 48. 1853. (Pottiaceae).

Balochistan: Ziarat, 2360 m, 5 Oct 1992, *Nakaike 1997*; Quetta, Zarghum, 2200 m, 6 Oct 1992, *Nakaike 2004*; Quetta, Hazarganji Chiltan National Park, 2000 m, 7 Oct 1992, *Nakaike 2009*.

Distribution: Europe, Africa (Algeria), Caucasus, Pakistan, China, Japan, Siberia and North America.

This species is characterized by obtuse or broadly acute leaf apices and small laminal cells (cf. Saito 1973).

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