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Bryophytes from Western Jammu and Kashmir

Mszaki z zachodniego Jammu i Kaszmiru

Мохообразные из западного Джамму и Кашмира

INTRODUCTION

The bryophytes were collected by the author in October, 1974, during a botanical trip in western Jammu and Kashmir. All the examined material was collected in Gulmarg Pass in three separate localities in the Valley of Kashmir. Previously, flower plants and bryophytes had been collected by J. F. Duthie and E. T. Atkinson in this region and in the western Himalayas. The collection made by Duthie is known to have been determined by Brotherus (2). This famous bryologist published also another contribution to the moss flora of Kashmir (3). Bryophytes were also collected by J. F. Borelli, a member of a scientific expedition to the central Himalayas directed by M. Piacenza (6). An interesting collection of mosses containing four new species from high altitudes in Punjab and Kashmir (kept in the Michigan Univ. Herbarium), was made by Walter Koelz in 1933 (1). Kashyap and Chopra (11) gave four interesting hepatics from western Kashmir: *Marchantia nepalensis*, *Preissia quadrata* and *Targionia hypophylla*, but erroneously *Porella (Madotheca) platyphylla* from Gulmarg Pass. The specimens of this species belong to *Porella chinensis*. Some widely distributed mosses were noted in short contributions in the last few years (12, 17). However, other authors published some papers with valuable floristic and bryogeographical data from the neighbouring mountainous territories of Pakistan (16), Hindukush (10) and Himalayas (4, 13).

COLLECTION STANDS

The examined collection comes from four stands of western Jammu and Kashmir:

1. Most bryophytes (25 mosses and 12 hepatics) were collected in Gulmarg Pass W from Srinagar, on NW slopes of Pir Panjal Range, ca. 1550—1700 m a.s.l. This area is situated in a considerably moist zone of the upper boundary of coniferous forests. They cover the south slopes of the surrounding of the western Himalayas. At a high altitude thick layers of Paleozoic formations are exposed (23). The slopes and elevations along the road from Srinagar to Gulmarg Pass are dry in summer. At lower altitudes forests with *Pinus gerardiana* and *P. halepensis* and *Quercus coccifera* occur. Above this zone thin high mountainous coniferous forests occur, consisting of *Picea morinda*, *Pinus excelsa* and *Abies pindrow* (18). On the slopes of higher elevations, the western distribution range of two coniferous trees — *Pinus excelsa* and *Cedrus deodora* are found. The epiphytic flora of bryophytes and lichens is poorly developed. Gently sloping depressions and valleys are covered with low-grass mountainous meadows in which numerous springs and small streams with hydrophilic mosses are explored.

2. Moghul Gardens-Chesma Shahi, Nishat and Shalimar. They are well-planned and beautifully laid out with old trees of *Platanus orientalis*. The mosses: *Amblystegium serpens*, *Gymnostomum calcareum*, *Orthotrichum anomalum* and *Tortella tortuosa* have been found mainly on sandstones. Three moss species: *Amblystegium serpens*, *Bryoerythrophyllum wallichii* and *Fissidens bryoides* are found only on grass slopes.

3. The third stand is situated on a rocky elevation in Srinagar near "Caffee". Mosses grow numerously but only in crevices of sandstone rocks. They are xerophytic mosses: *Barbula confertifolia*, *Bryum argenteum* var. *lanatum*, *Grimmia laevigata*, *G. pulvinata*, *Leucodon sciuroides* and *Tortula ruralis*.

4. The fourth stand is a large area of smaller and bigger lakes and ponds in the deep Valley of Kashmir, near Srinagar. In the lakes widely distributed three aquatic bryophytes, such as *Fontinalis antipyretica*, *Riccia fluitans* and *Ricciocarpus natans* were found. A list of hepatics from the Valley of Kashmir was published by Srivastava (20).

A LIST OF SPECIES AND LOCALITIES

Abbreviations: G. P. = Gulmarg Pass, M. G. = Moghul Gardens, V. K. = Valley of Kashmir in the vicinity of Srinagar; „Caffee" = rocky elevation in Srinagar.

Hepaticopsida

Reboulia hemisphaerica (L.) Raddi — G. P., on limestone slopes in *Abies* forest, sterile, no. 2.

Conocephalum conicum (L.) Lindb. — G. P., on wet stones in forest stream, sterile, no. 17.

Preissia quadrata (Scop.) Nees — G. P., on sandstone rocks, c. sp., no. 3; V. K., on stones near park, sterile, no. 1.

Marchantia polymorpha L. emend. Burgeff — G. P., in stream and meadow, with *antheridia*, no. 16.

Ricciocarpus natans (L.) Corda — V. K., in smal shallow lakes, southern Moghul Gardens, sterile, no. 1.

Riccia fluitans L. emend. Lorber — Within previous aquatic hepatic and on loam, sterile, no. 1.

Metzgeria conjugata Lindb. — G. P., on sandstones in *Abies* forest, sterile, no. 2. 19. Very seldom on oak roots.

Pellia epiphylla (L.) Corda — G. P., on loam in deep forest stream, sterile, nos. 17, 19.

Lophozia (Subgen. *Massula*) *incisa* (Schrad.) Dum. — G. P., on moist soil in coniferous forest, no. 9a.

Jungermannia gracillima Sm. — G. P., on loam in valley of deep forest stream, sterile, no. 21.

Plagiochila porelloides (Torrey ex Nees) Lindenb. — G. P., on soils and rocks in *Abies-Picea*-forest, sterile, nos. 8, 21.

Lophocolea bidentata (L.) Dum. — G. P., in valley of forest stream, sterile, large plants with gemmae!, no. 32.

The plants examined of this species are distinguished from *L. minor* by large stem leaves normally developed.

Chiloscyphus polyanthus (L.) Corda — G. P., on bank streams, in water, no. 32.

Porella chinensis (Steph.) Hatt. var. *decurrens* (Steph.) Hatt. — G. P., on sandstone rocks and roots of *Abies* in valley of forest stream, sterile, no. 19.

Porella chinensis is a variable species in habit and has a wide geographical distribution in Central and East Asia. The largest number of localities is very distinctly limited to the continental part of Asia (7, 8). Var. *decurrens* previously treated as a separate species is endemic in NW-Himalayas. *P. chinensis* was described earlier by Massalongo and Stephani (21, 22) under different names. A complete set of synonyms of some *Porella* species and the earlier genus *Madotheca* was given by Hattori (8). In a list of the Himalayan liverworts (9) this species was referred erroneously to the European taxon — *Madotheca platyphylla*

(L.) Dum. (=*Porella platyphylla* (L.) Pfeiff.). Similarly, *P. chinensis* specimens from Simla Pass (16), Hindukush and Afganistan (West-Nuristan, Sandel Pass, Aschkun region), have also been identified (10). The investigated plants collected from Gulmarg Pass have been identified on the basis of comparative materials. Young and green specimens always demonstrate a negative IKJ reaction, thus typical for. *P. chinensis*. However, the extract from young plants of *P. platyphylla* always gives a pink reaction.

Bryopsida

Polytrichum alpinum Hedw. var. *alpinum* — G. P., on sandstones and soil in forest, sterile, no. 7.

Atrichum undulatum (Hedw.) P. Beauv. — G. P., on wet montane meadows and sandy soils, locally frequent, with setae and mature capsules, no. 7.

Anisothecium molliculum (Mitt.) Broth. — G. P., in loose cushions on wet sandy soil near stream in the margin of montane meadow; stem often with mature and young capsules, no. 1a.

This is a Himalayan species (Fig. 1), which has been known only at lower altitudes of Himalayas and in Sikkim (Darjeeling). It is congeneric species, described earlier by Brotherus and Reimers, according to the opinion of Gangulee (5), does not find support in the large material from the Himalayas. *Anisothecium molliculum* has seven synonymous names, and its basionym was referred by Mitten (14) to the genus *Leptotrichum*.

Fissidens bryoides Hedw. — G. P., on wet loam soil in valley of forest stream, sterile, no. 32; M. G., on loam of grass slopes in old *Platanus* park, c. sp., no. 1.

Fissidens taxifolius Hedw. — G. P., on sandstone rocks in springs, sterile, no. 8.

Gymnostomum calcareum Nees et Hornsch. — M. G., on shaded stones, sterile, no. 1.

Tortula ruralis Hedw. — V. K., on rocky elevation "Caffee" in Srinagar, in crevices of stones, sterile, no. 2.

Barbula unguiculata Hedw. — G. P., on soil and sandstones, frequent with mature capsules, no. 10.

Barbula confertifolia Mitt. — V. K., on rocky elevation "Caffee" in Srinagar, in crevices of stones, sterile, no. 2.

It is a Himalayan moss distributed, according to Gangulee (4), from Simla Pass between Kashmir and Pakistan to East Nepal (Fig. 1).

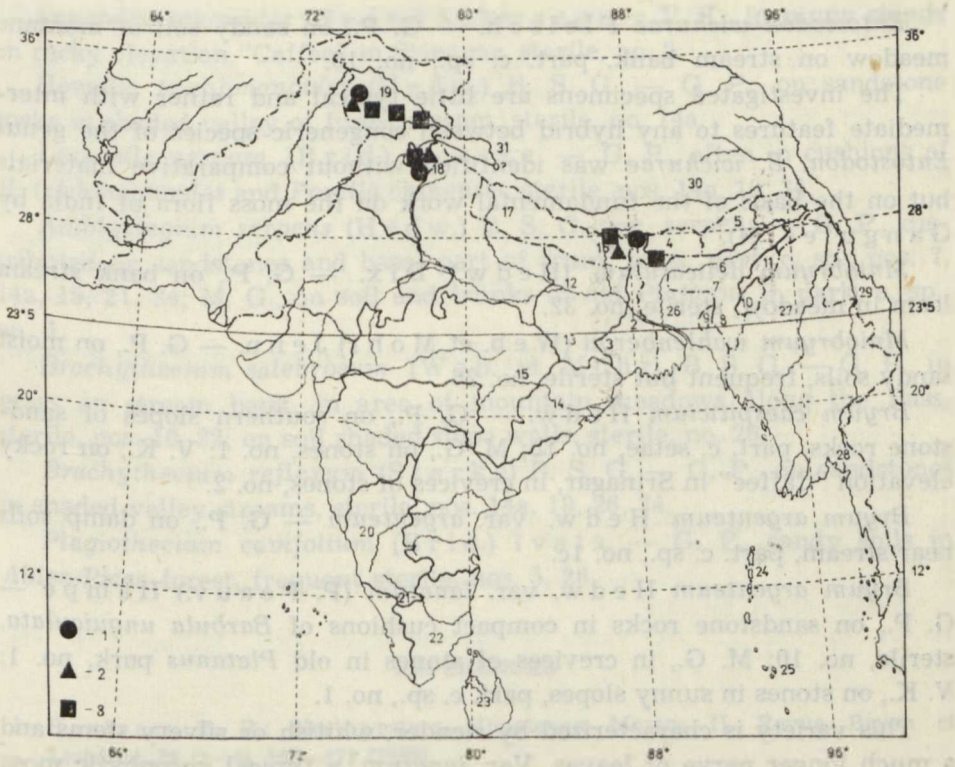

Fig. 1. Distribution of *Anisothecium molliculum* (Mitt.) Broth. (1), *Barbula confertifolia* Mitt. (2) and *Bryoerythrophyllum wallichii* (Mitt.) Chen. (3) in Northern India including Himalayas

The diagnostic features of *B. confertifolia* are very typical and concern mainly the structure of stem leaves. Their leaf tips are rounded, ovate--obtuse. The upper lamina cells are brown coloured with many minute papillae, leaf base cells are rectangular and smooth. However, fruiting plants have not been seen yet.

Bryoerythrophyllum wallichii (Mitt.) Chen — M. G., on loam and grass slope in the old *Platanus* park, large sterile specimens, no. 1.

This very attractive species is easily determined and distinguished from other Asiatic members of the genus. It is widely distributed from Western Himalayas to East Nepal (Fig. 1).

Tortella tortuosa (Hedw.) Limpr. — G. P., on sandstone rocks and small stones, sterile, no. 1a; M. G., on shaded stones, sterile, no. 1.

Grimmia laevigata (Brid.) Brid. — V. K., on rocky elevation "Caffee" in Srinagar, in crevices of stones, sterile, no. 2.

Grimmia pulvinata (Hedw.) Sm. var. *pulvinata* — V. K., on stand with previous species, abundantly fruiting, no. 2.

Entostodon wichurae Fleisch. — G. P., on sandy soil of montane meadow on stream bank, part. c. sp., no. 10.

The investigated specimens are little typical and rather with intermediate features to any hybrid between congeneric species of the genus *Entostodon*. *E. wichurae* was identified without comparative materials but on the basis of the fundamental work on the moss flora of India by Gangulee (4).

Mniobryum delicatulum (Hedw.) Dix. — G. P., on bank stream loam in meadow, sterile, no. 32.

Mniobryum wahlenbergii (Web. et Mohr) Jenn. — G. P., on moist sandy soils, frequent but sterile, no. 26.

Bryum caespiticium Hedw. — G. P., on southern slopes of sandstone rocks, part. c. setae, no. 1b; M. G., on stones, no. 1; V. K., on rocky elevation "Caffee" in Srinagar, in crevices of stones, no. 2.

Bryum argenteum Hedw. var. *argenteum* — G. P., on damp soils near stream, part. c. sp., no. 1c.

Bryum argenteum Hedw. var. *lanatum* (P. Peauv.) Hampe — G. P., on sandstone rocks in compact cushions of *Barbula unguiculata*, sterile, no. 10; M. G., in crevices of stones in old *Platanus* park, no. 1; V. K., on stones in sunny slopes, part. c. sp., no. 1.

This variety is characterized by slender, whitish or silvery stems and a much longer nerve of leaves. Var. *lanatum*, a typical xerophytic moss may only be a dry ground variant of the *B. argenteum*, but sometimes it grows with the typical variety.

Mnium lycopodioides Schwaegr. — G. P., on partly wet stones in deep valley of forest stream, with capsules and old setae, nos. 5, 9a.

Mnium heterophyllum (Hook.) Schwaegr. — G. P., on shaded sandstones, sterile, no. 7.

Mnium stellare Hedw. — G. P., on shaded sandstone rocks, in moss layers, sterile, nos. 5, 9.

This member of the genus *Mnium* has never been reported from the investigated territory of NW-Kashmir.

Plagiomnium rostratum (Schrad.) Kop. — G. P., some stands on wet sandy soils and decayed wood, sterile, no. 19.

Philonotis fontana (Hedw.) Brid. — G. P., on bank stream, abundantly but sterile, no. 26.

Orthotrichum anomalum Hedw. — G. P., on southern sunny walls of rocks, frequent c. sp., no. 34; M. G., on sandstones, c. sp., no. 1.

Fontinalis antipyretica Hedw. var. *antipyretica* — V. K., W-Srinagar, in clean water of shallow lakes, sterile or seldom with capsules, nos. 1, 44.

Leucodon sciuroides (Hedw.) Schwaegr. — V. K., in sunny stands on rocky elevation "Caffee" in Srinagar, sterile, no. 2.

Homalia trichomanoides (Hedw.) B. S. G. — G. P., on sandstone rocks in shaded valley of forest stream, sterile, no. 14a.

Leskeella nervosa (Brid.) Loeske — G. P., often in cushions of *H. trichomanoides* and *Porella chinensis*, sterile, nos. 14a, 19, 34.

Amblystegium serpens (Hedw.) B. S. G. var. *serpens* — G. P., distributed on sandstones and basal part of trunk trees, part. c. sp., nos. 7, 14a, 19, 21, 34; M. G., on soil and trunks of old *Platanus* in park, c. sp., no. 1.

Brachythecium salebrosum (Web. et Mohr) B. S. G. — G. P., in grass on stream bank, in area of mountain meadows along the Pass, sterile, nos. 10, 32; on soil shaded slope walls, sterile, no. 26.

Brachythecium reflexum (Starke) B. S. G. — G. P., on sandstones in shaded valley streams, sterile, nos. 14a, 19, 26, 34.

Plagiothecium cavifolium (Brid.) Ivats. — G. P., sandy soils in *Abies-Picea*-forest, frequent sterile, nos. 5, 26.

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STRESZCZENIE

Badania nad florą mszaków Jammu i Kaszmiru rozpoczęto dosyć późno, a dotychczas opublikowano bardzo nieliczne dane o rozmieszczeniu mchów i wątrobowców. Z 47 gatunków i 1 odmiany mszaków wszystkie zebrano na czterech stanowiskach w październiku 1974 r. Najwięcej gatunków (25 mchów i 10 wątrobowców) zebrano w strefie lasów i górskich łąk na przełęczy Gulmarg na wys. 1550—1700 m. n.p.m. Są wśród nich rzadkie gatunki: *Anisothecium molliculum*, *Entostodon wichurae*, *Mnium heterophyllum*, *M. stellare*, *Porella chinensis* i *Reboulia hemisphaerica*. Nieliczne mchy zebrano w parkach Mogołów w Srinagarze, jak: *Bryoerythrophyllum wallichii* i *Tortella turtuosa*. Na wzniesieniu skalnym w Srinagarze stwierdzone zostały kserofityczne mchy, w tym *Barbula convertifolia*, *Grimmia laevigata* i *Leucodon sciuroides*, a na wschodnich zboczach skalistych *Bryum argenteum* var. *lanatum*. Badane stanowisko w rejonie jezior i stawów w Dolinie Kaszmiru obfitowało w wodne gatunki, o których dotychczas brak było danych. Są to: *Fontinalis antipyretica*, *Riccia fluitans*, *Ricciocarpus natans*.

РЕЗЮМЕ

Изучение флоры мохообразных Джамму и Кашмира было начато довольно поздно. До настоящего времени опубликованы немногочисленные данные о размещении мхов и печеночников. Из 47 видов и 1 разновидности мохообразных все были собраны на четырех местообитаниях в октябре 1974 года. Больше всего видов (25 мхов и 10 печеночников) собрано в зоне лесов и горных рек на пере-

вале Гульмарг на высоте 1550—1700 м н.у.м. Среди них встречаются редкие виды: *Anisothecium molliculum, Entostodon wichurae, Mnium heterophyllum, M. stellare, Porella chinensis, Reboulia hemisphaerica.* Немногочисленные мхи найдены в парках Сринагара: *Bryoerythrophyllum wallichii, Tortella tortuosa.* На скалистой возвышенности в Сринагаре были обнаружены ксерофитные мхи, в том числе *Barbula confertifolia, Grimmia laevigata, Leucodon sciuroides,* а на восточном скалистом склоне — *Bryum argenteum* var. *lanatum.* Изучаемое местообитание в районе озер и прудов в долине Кашмира было богато водяными видами, а о которых до настоящего времени ничего не было известно: *Fontinalis antipyretica, Ricca fluitans, Ricciocarpus natans.*