Taxonomic analysis of Pomir's bryoflora

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Abstract. The bryoflora of the Pamirs includes 209 species of bryophytes: 12 marshans, 2 sphagnum and 195 true mosses and 12 varieties, which are representatives of 89 genera, 38 families, 18 orders, 6 classes, 2 divisions - Marshantiophyta and Bryophyta. For the first time, 78 species are given for the bryoflora of the Pamirs, for Tajikistan - 17 species, of which 13 are new for the bryoflora of Central Asia.The leading families in terms of the number of species are Pottiaceae -57, Bryaceae -36, Amblystegiaceae - 26, Grimmiaceae - 12, Brachytheciaceae - 8, Mniaceae - 6, Dicranaceae, Encalyptaceae 5 species each, Fissidentaceae and Funariaceae 4 species each. The ten leading families contain 163 species, which is 78.0% of the bryoflora of the Pamirs.

The Pamir is an orthographically closed arid highland country located ($36^0$16'-$39^0$29'c and $70^0$4'-$75^0$44') at a considerable distance from the oceans and large bodies of water and lying in the area of convergence of the largest mountain uplifts in Asia - Kuenlun, Karakorum, Hindu Kush, Pamir - Alay and Tien Shan. The western and southwestern border is a natural boundary - the Pyanj River, Zorkul Lake, and the Pamir River; in the north, the border runs along the Zaalayskiy and Yazgulemskiy ridges; the eastern boundary of the Pamirs is usually drawn along the Sarykol ridge, the ridge of which coincides with the Tajik-Chinese state border. Meanwhile, to the east of the Sarykol ridge, between it and the ridge of the Kashkar ridge, there is a mountainous country, which is naturally difficult to separate from the Pamirs [18]. Since the beginning of the last century, following the efforts of the Tajik-Pamir expedition (1932-1936), this region is commonly divided into two main areas based on geomorphologic principles: the Western Pamir - with a high-mountainous, highly dissected erosional relief and the Eastern Pamir - with a high-mountain accumulative-glacial relief.

Low temperatures are observed in January, when the average monthly values range from -7.9^0 to -17.9^0 C, high temperatures in July - August: from $+12.4^0$ to $+22.8^0$ C, and on the lake Bulunkul temperature reaches - 49^0 C, there is no frost-free period. Annual precipitation ranges from 92 to 260 mm.

The dryness of the climate and the presence of significant areas occupied by talus, rocks and stony outcrops give the vegetation cover of the region a xerophilic appearance. Deserts predominate geographically, which are replaced to the north by steppe and tragacanth groups.

The Pamir is one of the richest regions of Tajikistan in terms of floristry. According to O.E. Agakhanyants [1], more than 1535 plant species grow in the Pamirs. S.S. Ikonnikov

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[2, 3] lists 1567 species for the Western Pamirs (Badakhshan), and 636 species of vascular plants for the Eastern Pamirs. The vegetation cover of the Pamirs is dominated by herbal vegetation – desert, steppe, mountain-meadow and tragacanth groups and semi-savannas, while arboreal and shrub vegetation is found locally on fine-earth mountain slopes, as well as in river floodplains.

The first information about the bryophytes of the Pamirs is found in the works of botanists at the end of the 19th century, among them the data of A. Fedchenko (1859), V.F. Brotherus (1888, 1889) and G. Filibert (1890, 1899, 1900), who give 40 species of mosses for the Pamirs and give descriptions of new species for science (Bryum pamirense, B. leptoglyphodon, etc.). Of the works of this period, the publication of a desiccate of mosses of Turkestan (Musci turkestanica) (Brotherus, 1898), in which mosses collected by V.F. Brotherus in Central Asia. Two issues of desiccate include materials on more than 100 species of mosses. VF Brotherus in 1898 took part in a botanical expedition to explore Central Asia, where he collected a large collection of mosses (about 300 leaves). Based on the materials of the expedition of V.F. Brotherus and G. Philibert described more than 30 species of mosses new to science (Tortula grandiretis, T. thianschanica, etc.) [4-9].

In the works of Fedchenko B.A., Fedchenko O.A. (1903, 1905), Brotherus V.F. (1906, 1931), Visloukh S.M., Yelenkin A.A. (1908), Lazarenko A.S. (1938) Muzafarova A.M. (1958, 1965), Abramova A.L., Abramova I.I. (1970), Mamatkulova U.K. (1966, 1974, 1989) Mamatkulova U.K., Boboradzhabova B. (1973, 1974) Zerova D.K., Mamatkulova U.K., Boborajabova B. (1972) and others, a list of 78 species of mosses from 14 families is given. All this information about bryophytes from various points of the study area was the main point for our in-depth generalized bryological studies of the Pamirs [10-17].

The bryoflora of the Pamirs is represented by 209 species and 12 varieties belonging to 89 genera and 38 families. The discovered species are representatives of two divisions of the superdepartment Bryobionta: Marchantiophyta and Bryophyta. The division Marchantiophyta includes two classes: Marchantiopsida and Jungermanniopsida. The Marchantiopsida class contains 7 species belonging to 6 genera, 4 families. The Jungermanniopsida class contains 5 species, 5 genera and 5 families, and the families of the Jungermanniopsida class include one species each.

The Bryophyta division includes 195 species belonging to 77 genera, 27 families. The department includes representatives of 4 classes: Polytrichopsida is represented by 3 species, 1 genus, Tetraphiopsida - 1 species, 1 genus, Sphagnopsida – 2 species of the genus Sphagnum of the Sphagnacae family, Bryopsida – 189 species, 74 genera and 27 families.

In the flora of real mosses of the Pamirs, the species composition is dominated by the families Pottiaceae – 57, Amblystegiaceae – 26, Bryaceae – 36 species, Grimmiaceae – 12, Brachytheciaceae – 8, ten leading families unite 163 species, which is 78.0% of the bryoflora of the Pamirs. The remaining 27 families: 10 are represented by less than 4 species in each, 17 – one species each. The large species richness of the families Bryaceae, Pottiaceae, Grimmiaceae, Amblystegiaceae testifies to the aridity of the Pamirs, as well as to the wide distribution of mosses along the entire vertical profile of rocks and stony outcrops. It should be noted that such a high degree of participation of species of the families Bryaceae and Pottiaceae shows a pattern typical of arid mountain moss flora. In the Pamirs, 7 large genera of bryophytes were recorded: Bryum (22 species), Tortula (18), Syntrichia (8), Grimmia (8), Brachythecium (7), Mnium (6).

The rest of the genera include no more than 5 species. More than half of the moss genera (50 out of 89) are represented by one species, which is typical for the bryoflora of the entire Holarctic. Twelve species of deciduous mosses, in addition to the basic form, are represented by varieties. A large number of genera are contained in the families: Pottiaceae

– 19, Amblystegiaceae – 14, Bryaceae – 7 (Table 1). As a result of our research, the list of mossy Pamirs has increased by 78 species: 12 species of marshans, 66 deciduous mosses. For the first time for Tajikistan, 17 new species of mosses are presented; 13 of them are new for the bryoflora of Central Asia.

Table 1. Taxonomic composition of biodiversity of the bryoflora of the Pamirs

Family	**Number**		**Genus and number of species in it**
	species	**genus**	
Marchantiaceae	2	2	Preissia (1), Marchantia (1)
Cleveaceae	1	1	Athalamia (1)
Ricciaceae	1	1	Riccia (1)
Grimaldiaceae	3	2	Reboulia (1), Mannia (2)
Pelliaceae	1	1	Pellia (1)
Aneuraceae	1	1	Aneura (1)
Ptilidiaceae	1	1	Ptilidium (1)
Lophoziaceae	1	1	Leiocolea (1)
Scapaniaceae	1	1	Scapania (1)
Sphagnaceae	2	1	Sphagnum (2)
Polytrichaceae	3	1	Polytrichum (3)
Tetraphidaceae	1	1	Tetraphis (1)
Timmiaceae	1	1	Timmia (1)
Encalyptaceae	5	1	Encalypta (5)
Funariaceae	4	2	Entosthodon (1), Funaria (3)
Grimmiaceae	12	4	Coscinodon (1), Schistidium (2), Grimmia (8), Indusiella (1)

Fissidentaceae	4	1	Fissidens (4)
Ditrichaceae	3	2	Ceratodon (1), Distichium (2)
Dicranaceae	5	3	Anisothecium (1), Oncophorus (2), Dicranum (2)
Pottiaceae	57	19	Hennediella (1), Stegonia (2), Pterygoneurum (1), Aloina (1), Crossidium (2), Syntrichia (8), Tortula (19) Weissia (3), Gymnostmum (1), Hymenostylium (1), Eucladium (1), Anoectangium (1), Molendoa (1), Hydrogonium (2), Tortella (1), Bryoerythrophyllum (3), Didymodon (6), Barbula (2), Semibarbula (1),
Splachnaceae	3	2	Tayloria (2), Splachnum (1)
Meesiaceae	1	1	Amblyodon (1)
Orthotrichaceae	2	1	Orthotrichum (2)
Bartramiaceae	4	1	Philonotis (4)
Bryaceae	33	6	Leptobryum (1), Pohlia (5), Mniobryum (2), Plagiobryum (1), Anomobryum (2), Bryum (22),
Mielichhoferiaceae	3	1	Mielichhoferia (3),
Mniaceae	6	2	Mnium (4), Plagiomnium (2)
Cinclidotaceae	1	1	Cinclidotus (1)
Aulacomniaceae	1	1	Aulacomnium (1)
Climaciaceae	1	1	Climacium (1)
Theliaceae	2	1	Myurella (2)
Amblystegiaceae	26	14	Cratoneuron (2), Palustiella (2); Campylium (1), Hygroamblystegium (3), Conardia (1), Amblystegium (2), Serpoleskea (2), Warnstorfia (2), Drepanocladus (3), Sanionia (1), Hygrohypnum (3), Scorpidium (2), Calliergon (1), Pseudocallier gon (1)
Leskeaceae	1	1	Pseudoleskeella (1)

Thuidiaceae	1	1	Helodium (1)
Brachytheciaceae	8	2	Brachythecium (7), Rhynchostegium (1)
Hypnaceae	3	2	Ptillidium (1), Hypnum (2)
Hylocomiaceae	1	1	Pleurosium (1),
Plagiotheciaceae	3	3	Platydyctia (1), Orthothecium (1), Isopterygiopsis (1)
Total:	209	89	

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