

THE EPIPHYTIC MOSSES IN THE NORTHERN BURYATIA  
(EASTERN SIBERIA)

ЭПИФИТНЫЕ МХИ НА СЕВЕРЕ БУРЯТИИ  
(ВОСТОЧНАЯ СИБИРЬ)

DOLGOR YA. TUBANOVA<sup>1</sup> & OLEG A. ANENKHONOV<sup>1</sup>

ДОЛГОР Я. ТУБАНОВА<sup>1</sup>, ОЛЕГ А. АНЕНХОНОВ<sup>1</sup>

Abstract

The epiphytic mosses in Buryatia occur mostly on bases of tree trunks, up to 10-20 cm above ground only. Despite of the severe climate and very low winter temperatures, however, some epiphytic mosses at places are reaching up to 8-10 m, mostly on trunks of deciduous trees in proximity of hot springs. *Orthotrichum speciosum* grows on twigs of *Picea obovata* up to 3 m above ground. The most widespread epiphytic moss within studied area is *Pylaisia polyantha*.

Резюме

Эпифитные мхи в лесах Бурятии встречаются преимущественно на основаниях стволов деревьев, поднимаясь на высоту от поверхности почвы на 10-20 см. Несмотря на суровый континентальный климат, низкие температуры, не большой снежный покров в зимнее время, на трех участках (в окрестностях горячих источников Мегдельгун, Умхей и в долине реки Ковыли) мхи по стволам деревьев поднимаются на высоту до 8-10 м. На ветвях ели *Orthotrichum speciosum* отмечен на высоте до 3 м. Наиболее распространенным эпифитным мхом является *Pylaisia polyantha*.

INTRODUCTION

Epiphytic mosses are usually more numerous in places with the high air humidity (Bardunov, 1961, 1974, 1978; Rykovskij, 1989; Frahm, 1995). These conditions are characteristic in oceanic climates, or otherwise in sites with locally heightened air moisture (near waterfalls, hot springs, river valleys, etc.). In highly continental climate of Eastern Siberia, where air moisture in generally low, places suitable for epiphytes are rare and quite separated one from another. These conditions favors some species which are usually considered in other regions as more or less strictly epilithic to growth on trees (Bardunov, 1974, 1978).

STUDY AREA

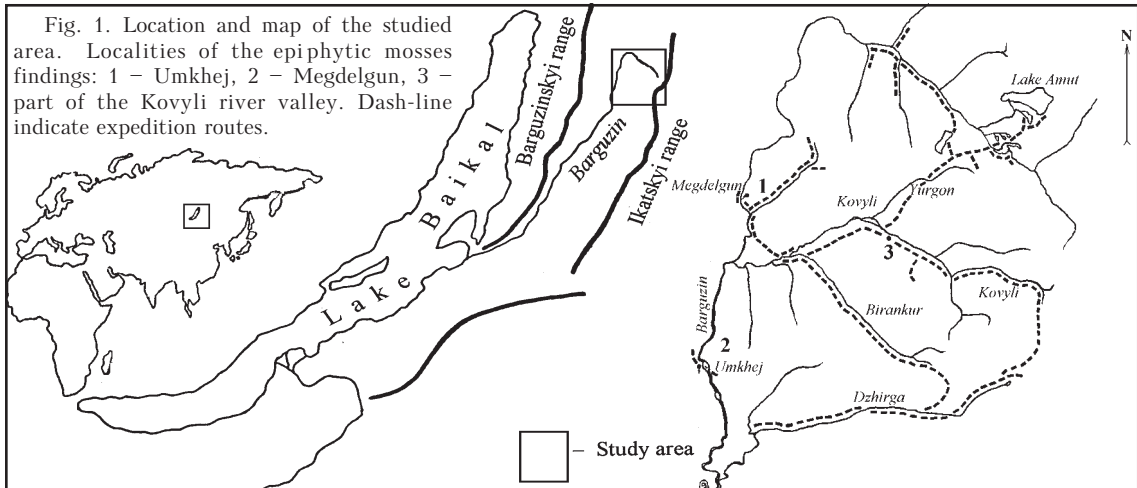
Collecting localities are shown in Fig 1. Most of collections were made within the territory of the Dzherginskyi State Nature Reserve, in the area at 54°–55° N, 111°–112° E, 570 to 2574 m elev.

Dzherginskyi Reserve is located in the upper course of Barguzin River (Buryatian Republic, Transbaikal Area of South Siberia). Most part of reserve is mountain area, while its southern part is situated within the Barguzin depression.

The main features of climate of the studied area are determined by the geographical position close to the epicentre of Siberian-Mongolian anticyclon. The average annual values of temperature in depression vary from -2.6°C up to -5.3°C. The amplitude of the mean month temperatures during year is 46–51°C. The amplitude of extreme values of temperature in the northern part of the Barguzin depression is 85–95°C (Zhukov, 1960). Duration of the frostless period is 68–113 days, but only July is free from the ground frost (Vizenko & al., 1986).

The level of climate humidity within the Barguzin depression is one of the lowest in Baikal area (200-300 mm of precipitation per year). The

<sup>1</sup> – Institute of General and Experimental Biology of Siberian Branch of Russian Academy of Sciences, Sahjanovoy str., 6, Ulan-Ude, 670047, RUSSIA – Россия, 670047, г. Улан-Удэ, ул. Сахьяновой, 6, Институт общей и экспериментальной биологии СО РАН



upper part of the Barguzin valley is more humid (300-400 mm). During summer the air moisture vary from 40% in May up to 70% in August (Vizenko & al., 1986). The snow cover in Barguzin depression usually does not exceeds 10 cm, while in the mountains in upper course of the Barguzin River it is much more developed, 50-80 cm.

Within the studied territory the permafrost with minimal temperatures  $-4.4^{\circ}$  –  $-4.8^{\circ}\text{C}$  is widespread. Its deepness exceeds at places 600 m.

There are two hot springs within the studied area: “Megdelgun” and “Umkhej”. The temperature of Megdelgun water is  $+34.5^{\circ}\text{C}$ . This hot spring is situated in the Barguzin River valley and is usually flooded after snow melting and also after heavy rains. Similarly, Umkhej hot springs are situated in Barguzin River valley, on river island and river banks. Temperature of its water reaches  $+50^{\circ}\text{C}$  (Borissenko, Zamana, 1978).

The vegetation of the Dzherginskyi Nature Reserve is represented by various types of plant communities. Above 1700 m elev. mountain tundras and shrubs formed by *Pinus pumila* (Pall) Regel prevail. In the forest belt cryophilous larch forests (*Larix gmelinii* (Rupr.) Rupr.) are most widespread. Only in the southern part of the reserve *Pinus sylvestris* L. is rather common. *Abies sibirica* Ledeb. and *Picea obovata* Ledeb. are represented by comparatively small patches in the southern part of the reserve. In the south-western part of the reserve forest-steppe communities occur. River banks are occupied at places by *Populus suaveolens* Fischer. The successions after forest fire pass the stages with *Betula pendula* Roth and *Populus tremula* L. There are also small

«island patches» of an aspen on the southern prominent rocky slopes. Within bottom of comparatively wide valleys the typical for the Eastern Siberia cryophilous shrub vegetation dominated by *Betula fruticosa* Pall. and *B. exilis* Sukach. (“yernik”) occur. *Larix* forests and yerniks indicate the presence of permafrost; they often totally cover shallow valleys of rivers and creeks. Steppe communities are developed in the most xeric and warm habitats which occur at the lower part of the steep southern slopes; however, those habitats are quite rare.

Surrounding of hot springs have no permafrost, microclimate is much milder, and thermophilous communities are developed here, namely species-rich birch-spruce stands (*Picea obovata* and *Betula pendula*) – around the “Megdelgun” hot spring, and pine (*Pinus sylvestris*) – around “Umkhei” hot spring. These communities are rich in rare species of vascular plants (Anenkhonov, 1999).

#### MATERIALS AND METHODS

The bryological studies have been carried out in the course of routes, which crossed all of ecotopes (main types of plant communities, rocks and outcrops) of the Dzherginskyi Reserve. Mosses were considered as epiphytes if they raise up along the trunk even somewhat above the forest floor moss carpet, starting usually from about 15 cm above ground.

#### RESULTS AND DISCUSSION

Most part of the reserve is covered by *Larix* taiga. *Larix* never has epiphytes, probably both because of specific larch bark and inhabiting

Table 1. Distribution of epiphytic mosses in Dzerginsky Reserve: + - 10-50 cm above ground, ++ - more than 50 cm above ground.

Species of mosses	<i>Picea obovata</i>	<i>Populus suaveolens</i>	<i>Populus tremula</i>	<i>Salix spp.</i>	<i>Betula platyphylla</i>	<i>Padus avium</i>
<i>Didymodon ferrugineus</i> (Schimp. ex Besch.) M. Hill.				+		
<i>Orthotrichum obtusifolium</i> Brid.	++	+		+		
<i>O. sordidum</i> Sull. et Lesq.	++	++	++	+	++	
<i>O. speciosum</i> Nees	++	++	++	+	++	
<i>Zygodon sibiricus</i> Ignatov et al.		++	++			
<i>Dicranum fuscescens</i> Turn.		+				
<i>Abietinella abietina</i> (Hedw.) Fleisch.	+		+	+		
<i>Thuidium philibertii</i> Limpr.	+		+			
<i>Drepanocladus polygamus</i> (B.S.G.) Hedenaes	+					
<i>Sanionia uncinata</i> (Hedw.) Loeske			+		+	
<i>Brachythecium cf. salebrosum</i> (Web. et Mohr) B.S.G.			+			
<i>Cirriphyllum piliferum</i> (Hedw.) Grout		+	+			
<i>Hypnum cupressiforme</i> Hedw.		+	+			
<i>Platygyrium repens</i> (Brid.) B.S.G.	+		+		+	+
<i>Pylaisia polyantha</i> (Hedw.) B.S.G.	+	++	++	+	++	+
<i>P. selwynii</i> Kindb.			++			
<i>P. steerei</i> (Ando et Higuchi) Ignatov			+			
<i>Hylocomium splendens</i> (Hedw.) B.S.G.	+			+		
<i>Rhytidium rugosum</i> (Hedw.) Kindb.	+	+	+			

very severe climatic conditions. *Populus tremula* and *Betula platyphylla* are moderately rare in reserve, but most of their populations are small and occur in dry environments, thus not suitable for epiphytes.

Epiphytic mosses were found in abundance only in three places (Fig. 1), two - near hot springs, and third - in narrow valley of Kovyli Creek.

In the areas of hot springs mosses are common on bases of tree trunks, but most species are restricted to basal part of trunks only, raising not higher than 10-20 cm above ground.

However species of *Orthotrichum* and *Pylaisia* were observed here up to 8-10 m on trunks of *Populus tremula*, *P. suaveolens*, and *Betula platyphylla*. Especially abundant are *Orthotrichum speciosum* and *Pylaisia polyantha*. *Orthotrichum obtusifolium* was found on bark of *Populus suaveolens* Fischer on height up to 3.5 m. *Orthotrichum* and *Pylaisia* were found up to 2 m above ground also on *Padus avium* and various species of *Salix*.

On trunks of *Picea obovata* epiphytes do not raise up to 10-20 cm above ground, but on its lower thin twigs *Orthotrichum speciosum* and *O. sordidum* are reaching up to 3 m above

ground. There is however a question, if this is correct to call these species as epiphytes, as they were never found of twigs with needles, thus inhabiting dead parts of trees. At the same time this habitat is certainly much more similar by species composition to epiphytic one, rather than to epixylic.

The third place where epiphytes were found was an aspen stand surrounded by larch forests. Though *Populus tremula* is moderately rare in the reserve it grows mostly on xeric slopes and have no epiphytes. Contrary to them, the population of aspen in narrow valley of Kovyli Creek grows in more mesic environments. These conditions are favorable for epiphytes, which on this site rise on the bark of aspen on height up to 10 m. *Orthotrichum speciosum*, *O. sordidum*, *Zygodon sibiricus*, and *Pylaisia polyantha* are common here.

Table 1 illustrates the distribution of epiphytes in these three areas. It shows that *Picea*, *Populus* and *Betula* are more or less equally rich in epiphytes. Among species registered on trunk bases are those which are usually considered as epilithic (*Didymodon*) or epigeic (*Abietinella*, *Rhytidium*, etc.).

Most epiphytes in this area are widespread species. The only rare species found in this study is *Pylaisia steerei*; before it was known from few places in Alaska, Chukotka, Eastern Yakutiya and North-West China (Ignatov & al., 2001; Arikawa, 2004).

## ACKNOWLEDGEMENTS

Authors sincerely acknowledge Drs. L.V. Bardunov and S.G. Kazanovskij for help in determination of some species. Dr. M. Ignatov is cordially thanked for valuable comments.

## LITERATURE CITED

- [ANENKHONOV, O.A.] АНЕНХОНОВ, О.А. 1999. Пути формирования перигидротермальных флор в Байкальском регионе. – [Directions of perihydrothermal flora formation in Baikal region.] В кн.: *Генезис флоры и растительности Байкальской Сибири: мат-лы конф., Иркутск: Изд-во ИГУ* [In: Salaev R.K. (ed) *Genesis of flora and vegetation of the Baikalian Siberia, Irkutsk, The Irkutsk State University Press.*], 43-47.
- ARIKAWA, T. 2004. A taxonomic study of the genus *Pylaisia* (Hypnaceae, Musci). – *J. Hattori Bot. Lab.* **95**: 71-154.
- [BARDUNOV, L.V.] БАРДУНОВ, Л. В. 1961. Листостебельные мхи побережий и гор Северного Байкала [Mosses of the shores and mountains of the Northern Baikal.] М., Наука [Moscow, Nauka], 120 pp.
- [BARDUNOV, L.V.] БАРДУНОВ, Л.В. 1974. Листостебельные мхи Алтая и Саян [Mosses of the Altai and Sayan Mts.] Новосибирск, Наука [Nauka, Novosibirsk], 167 pp.
- [BARDUNOV, L.V.] БАРДУНОВ, Л.В. 1978. Эпифитные мхи Южной Сибири [Epiphytic mosses of the South Siberia]. В кн.: *Флора Прибайкалья* (ред. Л.И. Малышев, Г.А. Пешкова), Новосибирск, Наука [In: L.I. Malyshev, G.A. Peshkova, (eds). *Flora Pribaikalia, Nauka, Novosibirsk*], 4-18.
- [BORISSENKO, I.M. & L.V. ZAMANA] БОРИСЕНКО И.М., Л.В. ЗАМАНА 1978. Минеральные воды Бурятской АССР [Mineral waters of the Buryatia] Улан-Удэ: БКИ [Buryat book press, Ulan-Ude], 162 pp.
- FRAHM, J.-P. 1995. Systematics of the bryophytes. *Progress in Botany* **56**: 354-371.
- IGNATOV, M. S., E. I. IVANOVA, E. A. IGNATOVA & K. K. KRIVOSHAPKIN 2001. On the moss flora of Ust-Maya District (Republic Sakha / Yakutia, East Siberia). – *Arctoa* **10**: 165-184.
- [RYKOVSKIY, G.F.] РЫКОВСКИЙ, Г.Ф. 1989. Эпифитные мхи как экологическая группа экстремальных местообитаний. – [Epiphytic mosses such as ecological group of the extreme habitats] В кн.: *Проблемы бриологии в СССР под ред. И.И. Абрамова, Л.: Наука* [In: I.I. Abramov, ed., *Problems of the bryology in USSR, Nauka, Leningrad*], 90-121.
- [VIZENKO, O.S., V.V. VLASENKO, DROZDOVA V.B., T. V. KOKOEVA, N.P. LADEISHCHIKOV, L.I. LUT, K.N. MIZANDRONZEVA, V.A. OBOLKIN] ВИЗЕНКО, О.С., В.В. ВЛАСЕНКО, В.И. ДРОЗДОВА, Т.В. КОКОЕВА, Н.П. ЛАДЕЙЩИКОВ, Л.И. ЛУТ, К.Н. МИЗАНДРОНЦЕВА, В.А. ОБОЛКИН 1986. Климатические особенности Баргузинской котловины. – [Climatic characteristics of the Barguzin river basin] В кн.: *Озера Баргузинской долины, под ред. Ладейщикова, Новосибирск: Наука* [In A.G. Ladeyshikov ed. *Lakes of the Barguzin river basin. Nauka, Novosibirsk*], 5-15
- [ZHUKOV, V.M.] ЖУКОВ, В.М. 1960. Климат Бурятской АССР. – [Climate of the Buryatia] Улан-Удэ: БКИ [Buryat book press, Ulan-Ude], 187 pp.