

HEPATIC FLORA OF THE UPPER BUREYA RIVER
(RUSSIAN FAR EAST)

ФЛОРА ПЕЧЕНОЧНИКОВ ВЕРХНЕГО ТЕЧЕНИЯ РЕКИ БУРЕЯ
(РОССИЙСКИЙ ДАЛЬНИЙ ВОСТОК)

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Abstract

Hepatic flora of the Upper Bureya River includes 69 species and 2 varieties. Annotated list is given and supplemented by a brief discussion on hepatic diversity pattern. In contrast to mosses, there is almost no East Asian phytogeographic elements among hepatics in this area. Among rare species are *Tetralophozia filiformis*, *Anastrophyllum assimile*, *Scapania rufidula*, *Herbertus sakurai*, *Marsupella commutata*, etc.

Резюме

Флора печеночников верхнего течения р. Бурея включает 69 видов и 2 разновидности. Приводится их аннотированный список и краткое обсуждение фитогеографических особенностей. В отличие от мхов, среди печеночников региона практически нет видов с восточноазиатским типом распространения. Среди редких видов *Tetralophozia filiformis*, *Anastrophyllum assimile*, *Scapania rufidula*, *Herbertus sakurai*, *Marsupella commutata* и др.

In the preliminary list of bryophytes of the Bureya State reserve (Ignatov & al., 1990), 35 species of hepatics were published, basing on collections of geobotanists from the Moscow State University, who explored vegetation of the reserve in 1980s. During the field trip to this area in 1997, Ignatov, Iwatsuki and Tan concentrated mostly on mosses, but collected also hepatics, which were subsequently identified by Konstantinova, Bakalin (*Lophozia*) and Potemkin (*Scapania*), and most of them were checked also by M. Mizutani. This increases the number of species in this area almost twice, up to 65 species, which are reported here, using the style of the paper on mosses (Ignatov & al., 2000): after species name are [altitudes], brief habitat characteristics [numbers of localities (cf. Fig. 1) / enumeration of few voucher specimens]. For

the environmental condition and supplementary information of the area see Ignatov & al. (2000). Voucher specimens are in MHA if otherwise is not indicated.

LIST OF SPECIES

- Anastrophyllum assimile* (Mitt.) Steph. – [950-1600 m] wet cliff on S-facing slope [1-2/Ignatov 97-1050a, 1038, 1040; 1050; 1056K; 1064].
A. michauxii (Web.) Buch – [1400-1450 m] rotten log in *Picea* forest, with *Blepharostoma trichophyllum*, *Cephalozia bicuspidata*, *Lepidozia reptans*, *Mylia taylori*, *Schistochilopsis incisa*, *Tritomaria exsecta* [1, 18 / Ignatov 97-1046].
Aneura pinguis (L.) Dum. – [1550 m] on soil among rocks in alpine belt [1/1070]
Anthelia juratzkana (Limpr.) Trev. – [1600-1900 m] wet cliff and rocks at lake shore, with *Blepharostoma trichophyllum*, *Cephalozia ambigua*, *Diplo-*

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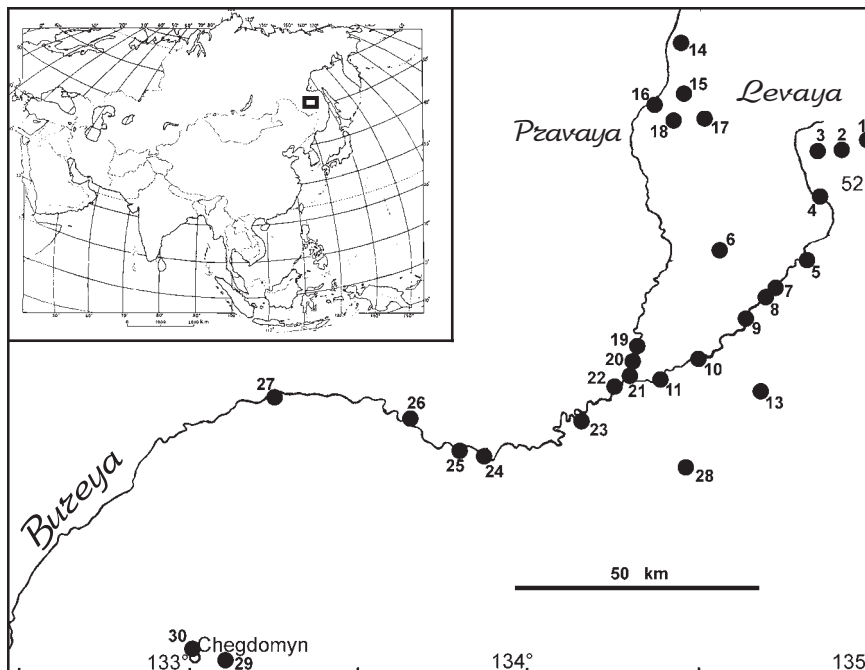


Fig. 1. Collecting localities of bryophytes in Upper Bureya River (from Ignatov & al., 2000, the name of localities see in that publication).

phyllum albicans, *Gymnomitrium concinnatum*, *Lophozia sudetica*, *Marsupella boeckii*, *M. tubulosa*, *Pleurocladula albescens* [1, 28 / Ignatov 97-1057]. *Apometzgeria pubescens* (Schrank) Kuwah. – [430–840 m] on dry rocks, *Picea* trunks, rotten logs, base of *Populus* [4, 7, 20, 22, 29 / Ignatov 97-1075]. *Barbilophozia barbata* (Schmid. ex Schreb.) Loeske – [470–1460 m] dry rock, base of *Populus*, rotten log [7, 10, 18, 19, 20, 22, 23, 24 / Ignatov 97-1053, 1004a, 1008, 1047, 1053]. *Bazzania tricrenata* (Wahlenb.) Lindb. – [1600 m] wet cliff on S-facing slope, with *Anastrophyllum assimile*, *Mylia taylora*, *Scapania microdonta*, *Radula prolifera* [1 / Ignatov 97-1050a]. *Blasia pusilla* L. – [430 m] one collection on old road [26 / Ignatov 97-1199]. *Blepharostoma trichophyllum* (L.) Dum. – [700–1900 m] on rocks and rotten logs [1–2, 4, 7, 18, 28 / Ignatov 97-1056, 1031, 1103, 1023, 1047]. *Calycularia crispula* Mitt. s.l. – [580–1600 m] wet cliffs, with *Cephalozia bicuspidata*, *Diplophyllum albicans*, *D. taxifolium*, *Lophozia sudetica*, *Marsupella tubulosa*, *Tritomaria quinquedentata*, *Scapania nemorea* ssp. *crassiretis* [1, 18, 19 / Ignatov 97-1010 (fem.), 1043, 1061]. Our specimens have no male plants, which are important for differentiation of *C. crispula* and *C. laxa* Lindb. et H. Arnell. According to the width of the uniseriate margin, to 12–15(–18) cells, and flat plants with crispate margin, our specimens fit better *C. crispula*. However the

relationship of these two taxa needs further studies (cf. Schuster & Konstantinova, 1996).

Calypogeia integristipula Steph. – [590–1000 m] base of *Populus*, soil bank, rocks, with *Cephalozia lunulifolia* [2, 4, 10, 11 / Ignatov 97-1041, 1013, 1096]. *Cephalozia ambigua* C. Mass. – [1600 m] rocks near lake shore with *Anthelia juratzkana*, *Blepharostoma trichophyllum*, *Lophozia sudetica*, *Marsupella boeckii*, *Pleurocladula albescens* [1 / Ignatov 97-1106]. *C. bicuspidata* (L.) Dum. – [610–1600 m] soil bank to small creek, rocks, rotten log in *Picea* forest [1, 2, 4, 10 / Ignatov 97-1059, 1051, 1026, 1074]. *C. lunulifolia* (Dum.) Dum. – [590–1450 m] rotten log in *Picea* and *Larix* forest [1, 2, 4, 11, 18 / Ignatov 97-1007, 1108, 1018]. *Cephaloziella divaricata* (Sm.) Schiffn. – [580–1000 m] on dry rock outcrops and loamy-sandy slope to gravelly bar of creek, with *Scapania mucronata*, *Cephalozia bicuspidata*, *Lophozia excisa*, *Pleurocladula albescens*, *Scapania nemorea* ssp. *crassiretis*, *S. rufidula* [2 / Ignatov 97-1095, 1111]. *Chiloscyphus polyanthos* (L.) Corda – [430 m] rotten log in flood valley of Bureya [26 / Ignatov 97-1065]. *C. profundus* (Nees) Engel et Schust. (= *Lophocolea heterophylla* (Schrad.) Dum.) – [610–840 m] rotten log in flood valley of Levaya Bureya [4, 7, 10 / Ignatov 97-1110, 1018]. *Conocephalum conicum* (L.) Dum. – [590 m] on soil in spruce forest [11 / Khasanov 89-M-109].

- Diplophyllum albicans* (L.) Dum. – [1550-1920 m] wet cliffs, cliff crevices, under cliff overhangs [1, 28 / Ignatov 97-1050, 1056, 1057].
- D. obtusatum* (Schust.) Schust. – [700 m] on rocks; plants autoicous, with perianthia [7 / Ignatov 97-1115].
- D. taxifolium* (Wahlenb.) Dum. – [580-1600 m] on rocks and cliffs [1, 2, 7, 19 / Ignatov 97-1021, 1113, 1061]. (Two specimens cited as *D. taxifolium* in Ignatov & al., 1990 reidentified as *D. albicans*).
- Fossombronina wondraczeckii* (Corda) Lindb. – [430 m] one collection on old road [26 / Ignatov 97-1080a (specimen in NICH)].
- Frullania bolanderi* Aust. – [590-1000 m] spruce trunks in flood-valley forest [2, 10, 11, 16, / Ignatov 97-1045].
- F. davurica* Hampe – [560-580 m] on cliffs in forest [19-21 / Ignatov 97-1014, 1062].
- Gymnomitrium concinnatum* (Lightf.) Corda – [1450-1920 m] cliff crevices, under cliff overhangs [1, 28 / Ignatov 97-1006, 1050, 1056].
- Herbertus sakurai* (Warnst.) Hatt. – [1450-1600 m] on cliffs in subalpine and alpine zones, often forming extensive mats [1 / Ignatov 97-1022].
- Jungermannia borealis* Damsh. et Vana – [950 m] in water near waterfall [2 / Ignatov 97-1012].
- Leiocolea heterocolpos* (Thed. ex Hartm.) Buch – [1600 m] soil on rock outcrop [1 / Ignatov 97-1084].
- L. collaris* (Nees) Schljak. – [1450 m] in cliff crevice with *Preissia* and *Blepharostoma* [1 / Ignatov 97-1023].
- Lepidozia reptans* (L.) Dum. – [610-1450 m] rotten log in *Picea* forest [1, 2, 10, 18 / Ignatov 97-1046, 1007].
- Lophozia excisa* (Dicks.) Dum. – [1000 m] soil bank to small creek [2 / Ignatov 97-1111].
- L. longidens* (Lindb.) Macoun – [700 m] base of spruce trunk [7 / Ignatov 97-1076].
- L. sudetica* (Nees) Grolle – [1000-1600 m] wet cliff, rocks near lake shore, soil bank to small creek, rotten log [1, 2, 18 / Ignatov 97-1011, 1106].
- L. ventricosa* (Dicks.) Dum. (incl. var. *confusa* Schust.) – [1450-1600 m] rotten stump and rocks [1 / Ignatov 97-1029, 1087].
- L. ventricosa* var. *guttulata* (Lindb. et H. Arnell) Bakalin – [1410-1600 m] rotten log and wet rocks [1, 18 / Petelin 17-7-94; Ignatov 97-1073].
- L. ventricosa* var. *longiflora* (Nees) Macoun – [550-1450 m] soil banks, cliffs, near springs and on rotten logs [1, 2, 7, 22 / Ignatov 97-1001, 1037a].
- Marchantia alpestris* (Nees) Burgeff – [1600 m] cliff crevice in alpine zone [1 / Ignatov 97-1105].
- Marsupella boeckii* (Aust.) Lindb. ex Kaal. – [1600 m] rocks near lake shore, with *Anthelia juratzkana*, *Blepharostoma trichophyllum*, *Cephalozia ambigua*, *Lophozia sudetica*, *Pleurocladula albescens* [1 / Ignatov 97-1106].
- M. commutata* (Limpr.) H. Bern. – [1550-1600 m] wet cliff and cliff crevices [1 / Ignatov 97-1011, 1025].
- M. tubulosa* Steph. (*M. emarginata* (Ehrh.) Dum. subsp. *tubulosa* (Steph.) Kitag.) – [560-1700 m] under cliff in alpine zone, on fresh alluvium of Pravaya Bureya in forest zone (in abundance), soil bank to small creek; cliff crevices; under cliff overhangs; near spring in the valley [1, 2, 4, 18, 19, 20 / Ignatov 97-1006, 1017, 1032, 1034 (ant., per.), 1056 (sporog.) 1057 (per., ant.), 1059(per.), 1078].
- Myliia anomala* (Hook.) S.Gray – [1420 m] bank of brook at about tree-line [18 / Galkina 21.VIII.1987].
- M. taylora* (Hook.) S.Gray – [840-1600 m] rotten log in *Picea* forest; base of *Populus* in forest in flood valley, wet cliff on S-facing slope [1, 4, 18 / Ignatov 97-1046, 1050 1067].
- Nowellia curvifolia* (Dicks.) Mitt. – [840 m] rotten log, with *Blepharostoma trichophyllum*, *Cephalozia bicuspidata*, *C. humulifolia*, *Lophocolea heterophylla*, *Myliia taylora*, *Riccardia palmata*, *Scapania apiculata* [4 / Ignatov 97-1018].
- Orthocaulis kunzeanus* (Hueb.) Buch – [1410 m] boggy valley of small creek [18 / Galkina 21.VIII.1987].
- Pellia neesiana* (Gott.) Limpr. – [370-1420 m] on soil in flood valley of Bureya [11, 18, 27 / Ignatov 97-1058].
- Plagiochila porelloides* (Nees) Lindenb. (incl. *P. satoi* Hatt.) – [370-1700 m] rather common in flood valleys on rocks and rotten and fresh logs, rare in alpine zone among rocks [1, 7, 10, 11, 18, 20, 22, 26, 27 / Ignatov 97-1075a, 1033, 1092, 1084].
- Plectocolea obovata* (Nees) Lindb. var. *minor* (Carring.) Schljak. – [550 m] rocks [22 / Ignatov 97-1088].
- Pleurocladula albescens* (Hook.) Grolle – [1000-1600 m] wet rocks, soil banks [1, 2, 18 / Ignatov 97-1082, 1111].
- Preissia quadrata* (Scop.) Nees – [580-1600 m] on rocks in both alpine and forest zones [1, 19 / Ignatov 97-1084].
- Ptilidium ciliare* (L.) Hampe – [550-1900 m] rotten log in flood valley, on rocks and in mountain tundra [18, 22, 28 / Grigorieva 89-M-253; Khasanov 4.VIII.1989].
- P. pulcherrimum* (Web.) Hampe – [590-610 m] rotten log in flood valley forest [10, 11 / Petelin 23.VIII.1989; Grigorieva 89-M-334].
- Radula complanata* (L.) Dum. – [580 m] cliff in forest and on trunks [10, 18, 19 / Ignatov 97-1014].
- R. prolifera* Arnell – [1600 m] wet cliff on S-facing slope in alpine zone, with *Anastrophyllum assimile*, *Myliia taylora*, *Scapania microdonta*, *Bazzania tricrenata* [1 / Ignatov 97-1050].
- Riccardia multifida* (L.) S.Gray – [590 m] on soil near brook in forest zone [11 / 89-M-89 Khasanov 16.VIII.1989].

- R. palmata* (Hedw.) Carruth. – [840 m] rotten log in flood valley forest [4, 10 / Ignatov 97-1018].
- Riccia huebneriana* Lindenb. – [430 m] one collection on old road [26 / Ignatov 97-1080 (specimen in NICH)].
- Scapania apiculata* Spruce – [840 m] rotten log in flood valley forest [4 / Ignatov 97-1018, 1071].
- S. carinthiaca* Jack ex Lindb. – [700 m] rotten log in flood valley, with *Blepharostoma trichophyllum*, *Chiloscyphus profundus* [7 / Ignatov 97-1110].
- S. microdonta* (Mitt.) Müll. Frib. (= *Macro-diplophyllum microdontum* (Mitt.) H. Perss.) – [1000-1600 m] wet cliff on s-facing slope and among rocks at lake shore [1, 2 / Ignatov 97-1050, 97-1059, 1113].
- S. mucronata* Buch – [1000 m] slope to river bar [2 / Ignatov 97-1095].
- S. nemorea* (L.) Grolle subsp. *crassiretis* (Bryhn) Potemkin – [370-1600 m] soil bank to small creek, rock outcrops in alpine zone on wet cliffs [1-2, 4, 7, 18, 22, 27 / Ignatov 97-1059, 1088].
- S. rufidula* Warnst. – [550-1000 m] soil bank to small creek and rivers [2, 22 / Ignatov 97-1111, 1109].
- S. undulata* (L.) Dum. – [950 m] in water near waterfall [2 / Ignatov 97-1012a].
- Schistochilopsis incisa* (Schrad.) Konst. (= *Lophozia incisa* (Schrad.) Dum.) – [590-1450 m] rotten log in *Picea* forest, soil banks [1-2, 11 / Ignatov 97-1001, 1059, 1046].
- Solenostoma confertissimum* (Nees) Schljak. – [580 m] very common on alluvium, with *Marsupella tubulosa* [19 / Ignatov 97-1017].
- Sphenobolus minutus* (Schreb.) Berggr. – [580-1900 m] rocks, rotten logs, [1, 2, 7, 18, 19, 28 / Ignatov 97-1035, 1102, 1113].
- S. saxicola* (Schrad.) Steph. – [1000-1900 m] on rocks [2, 18, 28 / Ignatov 97-1100, 1072].
- Tetralophozia filiiformis* (Steph.) Urmi – [950 m] dripping cliff near waterfall [1 / Ignatov 97-1077]. New for Russia (see also Konstantinova, 2002).
- T. setiformis* (Ehrh.) Schljak. – [1500-1910 m] rock field and mountain tundra [18, 28 / Galkina 21.VIII.1987; Khasanov 2.VIII.1989].
- Tritomaria exsecta* (Schrad.) Loeske – [550-1650 m] cliff crevices, soil bank, trunk in flood valley, logs, rocks [1-2, 4, 7, 18, 19, 22 / Ignatov 1093, 1027, 1048].
- T. quinquedentata* (Huds.) Buch – [470-1700 m] rocks, soil bank, wet cliff [1-2, 19, 24 / Ignatov 97-1004, 1085, 1054, 1020, 1030].

ERRONEOUS AND DUBIOUS RECORDS

The following species were reported by mistake by Ignatov & al. (1990): *Gymnomitrium apiculatum* (Schiffn.) K. Muell., *Gymnocolea inflata* (Huds.) Dum., *Cladopodiella fluitans* (Nees) Buch, *Arnella fennica* (Gott.) Lindb., and *Pellia endiviifolia* (Dicks.) Dum.

Species reported as *Frullaria dilatata* (L.) Dum. is comprised by a poor specimens, which identity is not clear.

DISCUSSION

The above list is obviously not complete, because no one professional hepaticologist worked in the area, while collections gathered by muscologist might omit some specific groups. However, the main patterns of distribution by different geographical elements can be traced from the available data.

The main constituents of hepatic flora are widespread in Holarctic arctoboreomontane species (*Barbilophozia barbata*, *Blepharostoma trichophyllum*, *Cephalozia bicuspidata*, *Diplophyllum taxifolium*, *Lophozia longiflora*, *Ptilidium ciliare*, *Sphenobolus minutus*, *T. quinquedentata*). Most of them have wide distribution in the study area, occurring at all the elevations.

Many circumpolar boreal species grow mostly on decaying wood in this area. Some of them are more or less common (*Chiloscyphus profundus*, *Lophozia ventricosa* var. *longiflora*, *Lepidozia reptans*, *Ptilidium pulcherrimum*), while other were found in a single or very few places (*Riccardia palmata*, *Scapania apiculata*, *S. carinthiaca*).

Another obvious geographic group is arctomontane species with circumpolar distribution (*Cephalozia ambigua*, *Tetralophozia setiformis*, *Anthelia juratzkana*, *Gymnomitrium concinatum*, *Marsupella boeckii*, *Pleurocladula albescens*, etc.). They occur in Upper Bureya mostly above tree-line, 1450 m elev., and some of them have somewhat isolated localities in forest belt, on cliffs close to waterfall. Thus, this group exhibits the same pattern as arctomontane mosses do.

Similarly to mosses, there are some species, occurring only or mostly in alpine zone, which have so-called Beringian type of distribution. They are more widespread along North Pacific coast, but sometimes penetrate quite far along mountain ranges to Siberia and China and Western North America. In Upper Bureya Region this group includes *Radula prolifera*, *Scapania microdonta*, *Calycularia crispula*, *Herbertus sakurai*, *Marsupella tubulosa*.

Among collected species there are a number of rare species with highly disjunctive distribution.

Scapania rufidula is an endemic of Siberia, previously known from a few localities in Sayan Mts., Chukotka and Amur River basin (Potemkin, 1994, Konstantinova, 2000). *Tetralophozia filiformis* was found for the first time in Russia (Konstantinova, 2002); it has in general a more southern distribution. *Anastrophyllum assimile* is an arctomontane species more or less widespread in the Western North America including arctic Alaska and also in the West Greenland but rare in Europe and Asia, where it ranges from Altai to Papua New Guinea (Konstantinova, 2000); in Russia it was found earlier in Altai Mountains only (Vana & Ignatov, 1995). *Marsupella commutata* has predominantly North Pacific distribution, but known also from mountains of central Europe, Iceland and one locality in South Greenland (Konstantinova, 2000). *Scapania carinthiaca* has scattered distribution in North America, but rare in Europe (Red Data Book..., 1995); in Russia it was previously known from one locality in Altai Mountains (Vana & Ignatov, 1995) and also from Khamar-Daban Mountains (Konstantinova, unpubl.). *Diplophyllum obtusatum* is a species with mostly North American distribution, known in Asia just from the single locality in Sayan Mountains (Konstantinova & Vasiljev, 1994). *D. albicans* has montane amphioceanic distribution in Holarctic.

Only two species can be referred to the group of species with more southern (in this sector of Eurasia) distribution: *Nowellia curvifolia* and *Frullania davurica*. The former is a species with rather strict oceanic distribution, the latter is more or less widespread in South Siberia, reaching Altai to the West. In Upper Bureya Region these species do not exceed the limit of 1000 m, which was found to be important for many southern moss species in this area too (cf. Ignatov & al., 2000). Below this elevation of 1000 m, the flood-valley forests with more or less dense canopy of *Picea* and *Populus* occur, while above it are mostly *Larix* forest and mountain

shrubs of *Pinus pumila* (though scattered *Picea* trees reach at places 1400 m).

In contrast to hepatics, the group of South-East Asian temperate mosses is quite rich in Upper Bureya area (Ignatov & al., 2000). What can be the reason for the absent of many temperate hepatic species there? Of course, this can be explained partly by the less professional collecting abilities. However the lack of large and conspicuous species like, for example, *Porella* is probably the real fact. At the same time *Porella* is represented by as much as 7 species in Khinganskij and Bolshekhkzirsij Reserves, situated closer to Amur River (Cherdantseva & Gambaryan, 1986; Gambaryan & Cherdantseva, 1998). The explanation of their absence can probably be linked to the reproductive biology patterns. Most of southern mosses in this area produce sporophytes regularly and in cold period of year. Strong southern wind in this time, when flood-valley forests are leafless, move spores upstream the Bureya River, allowing them colonize trunks and twigs of *Populus* and *Picea*, and sometimes rock outcrops. Contrary to this, southern species of hepatics are mostly dioicous and rarely producing sporophytes. However, this hypothesis needs the checking by experiments on diaspore dissemination.

Finally, three species can be considered as a weedy one in Upper Bureya area: *Riccia hueberiana*, *Fossombronina* cf. *wondraczeckii* and *Blasia pusilla* were found just once, on old road, somewhat outside the reserve.

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LITERATURE CITED

- [CHERDANTSEVA, V. YA. & S. K. GAMBARYAN] ЧЕРДАНЦЕВА, В. Я., С. К. ГАМБАРЯН 1986. Мохообразные – [Bryophytes] В кн.: *Флора и растительность Большехецирского заповедника (Хабаровский край)* [In: *Flora i rastitelnost Bolshekhkhtsirskogo zapovednika (Khabarovskij kraj)*]: 79-101.
- [GAMBARYAN, S. K. & V. YA. CHERDANTSEVA] ГАМБАРЯН, С. К., В. Я. ЧЕРДАНЦЕВА 1998. Мохообразные. – [Bryophytes {of the Khingan State Reserve}] В кн.: *Флора и растительность Хинганского заповедника (Амурская область)*, (ред. Васильева, Л. Н.), Владивосток, Дальнаука [In: *Vasil'eva, L. N. (ed.) Flora i rastitelnost Khinganskogo Zapovednika*

- (*Amurskaya Oblast*), *Vladivostok, Dalnauka*]: 70-87.
- [IGNATOV, M. S., E. A. IGNATOVA, D. A. PETELIN & V. F. KHASANOV] ИГНАТОВ, М. С., Е. А. ИГНАТОВА, Д. А. ПЕТЕЛИН, Б. Ф. ХАСАНОВ 1990. Материалы к бриофлоре Буреинского заповедника (Хабаровский край). – [Contributions to the bryoflora of Bureya Reserve (Khabarovsk Territory)] *Бюлл. МОИП. Отд. Биол.* [*Bull. Mosk. Obshch. Isp. Prir. Otd. Biol.*] **95**(6): 86-96.
- IGNATOV, M. S., V. C. TAN, Z. IWATSUKI & E. A. IGNATOVA 2000. Moss flora of the Upper Bureya River (Russian Far East). – *J. Hattori Bot. Lab.* **88**: 147-178.
- [KONSTANTINOVA, N.A.] КОНСТАНТИНОВА, Н.А. 2000. Анализ ареалов печеночников севера Голарктики. – [Distribution patterns of the North Holarctic hepatics] *Arctoa* **9**: 29-94.
- [KONSTANTINOVA, N. A.] КОНСТАНТИНОВА, Н. А. 2002. Род *Tetralophozia* (R.M.Schust.) Schljakov (Lophoziaceae, Hepaticae) в России. – [The genus *Tetralophozia* (R.M.Schust.) Schljakov (Lophoziaceae, Hepaticae) in Russia] *Arctoa* **11**: 45-52.
- KONSTANTINOVA, N. A. & A. N. VASILJEV 1994. On the hepatic flora of Sayan Mountains (South Siberia). – *Arctoa* **3**: 123-132.
- POTEKIN, A. D. 1994. Studies on *Scapania*, Hepaticae. Sectio Ruidulae and sectio Nemorosae. – *J. Hattori Bot. Lab.* **77**: 273-285.
- RED DATA BOOK OF EUROPEAN BRYOPHYTES. 1995. *Trondheim*. 291 pp.
- SCHUSTER, R. M. & N. A. KONSTANTINOVA 1996. Studies on the distribution of critical arctic/subarctic Hepaticae with special reference to taxa found in Russia. – *Lindbergia* **21**(1): 26-48.
- VANA, J. & M. S. IGNATOV 1995. Bryophytes of Altai Mountains. V. Preliminary list of the Altaian hepatics. – *Arctoa* **5**: 1-13.