

***Boreoplaca ultrafrigida* (Umbilicariales),
the correct name for *Rhizoplacopsis weichingii***

EVGENY A. DAVYDOV¹* & JIANG-CHUN WEI²

*eadavydov@yandex.ru

¹Altai State University, Lenin ave. 61
Barnaul, 656049, Russia

²Institute of Microbiology Chinese Academy of Sciences
Beijing 100080, China

Abstract — The type of *Boreoplaca ultrafrigida* is shown to be identical with *Rhizoplacopsis weichingii*. Consequently, the latter name is reduced to synonymy with *B. ultrafrigida*, and *Rhizoplacopsis* is reduced to synonymy with *Boreoplaca*. Systematical position of the genus is discussed on the basis of literature sources. The known distribution of *B. ultrafrigida* in Russia and China is summarized.

Key words — lichen, new synonym, *Ophioparmaceae*, *Rhizoplacopsidaceae*, biogeography, Asia

A new genus and species *Rhizoplacopsis weichingii*, the only representatives of a new family *Rhizoplacopsidaceae* J.C. Wei & Q.M. Zhou, were recently described from northeast China (Zhou & Wei 2006). Based on the similarity of the ascus apex structure with species of the family *Umbilicariaceae*, supported by ITS, SSU and LSU nrDNA phylogenetic analyses, Zhou & Wei (2007) placed *Rhizoplacopsidaceae* in the order *Umbilicariales* J.C. Wei & Q.M. Zhou.

After a careful examination of the holotype of *Rhizoplacopsis weichingii*, the present authors concluded that it is a synonym of *Boreoplaca ultrafrigida* Timdal, a species found in a few localities in East Siberia and Far East (Russia). Furthermore, the morphological descriptions and data on secondary metabolites of the genus and species in Timdal (1994) and Zhou & Wei (2006) are in close agreement, and coincident parts of nrDNA LSU sequences obtained from authentic material from both Yakutia (*Boreoplaca ultrafrigida*, holotype, Genbank Acc. No. AY853360; paratype, DQ986797) and Jilin (*Rhizoplacopsis weichingii*, holotype, AY530886, submitted as *Rhizoplaca orientalis*) differs in only one base (excluding gaps). Thus, the nomenclature of the genus and species should be treated as follows:

Boreoplaca Timdal, Mycotaxon 51: 503 (1994)

Type: *Boreoplaca ultrafrigida* Timdal

=*Rhizoplacopsis* J.C. Wei & Q.M. Zhou, in Zhou & Wei, Mycosystema 25(3): 381 (2006)

Type: *Rhizoplacopsis weichingii* J.C. Wei & Q.M. Zhou.

Boreoplaca ultrafrigida Timdal, Mycotaxon 51: 503 (1994)

Type: RUSSIA. YAKUTIA: Ojmyakonskii Region: CA. 7 KM WSW OF UST'-NERA (64°32'N, 143°08'E) — 500–600 m alt., on boulder in open *Larix* forest, 10.VII.1992, Haugan, R. & Timdal, E. YAK03/39 (HOLOTYPE σ L127!).

=*Rhizoplacopsis weichingii* J.C. Wei & Q.M. Zhou, in Zhou & Wei, Mycosystema 25(3): 381 (2006)

Type — CHINA. JILIN: Wangqing Co. (43°21'N, 129°46'E), on stone, 8 June 1996, Wei Jiang-chun, Jiang Yu-mei & Wang You-zhi no 45 (HOLOTYPE HMAS-L 4918!); SAME LOCALITY, on rock, 9.VI.1996, Wei J. C., Jiang Y. M. & Wang Y. Z. no 140 (PARATYPE HMAS-L 84923!).

ADDITIONAL SPECIMENS EXAMINED — RUSSIA. REPUBLIC SAKHA-YAKUTIA: Ojmakonskii region, CA. 9 KM SW OF UST'-NERA (64°30'N, 143°10'E) alt. 600–800 m, 11.VII.1992, M. P. Zhurbenko 92164 (LE L61), 92159 & 92160 (LE); SAME REGION, CA. 8 KM SW OF UST'-NERA, (64°31'N, 143°08'E), alt. 600–700 m, 23.VII.1992, M. P. Zhurbenko 92164 (LE); SAME REPUBLIC, VERKHAYANSKIE MTS. OPPOSITE MOUTH OF VILYUI RIVER, (ca. 127°N 64°30'E), on stone, 1901, P. V. Olenin (LE). — REPUBLIC BURYATIA: KHAMAR-DABAN RANGE, BAIKAL STATE RESERVE, HEADWATERS OF THE MISHIKHA RIVER, GLADKY RANGE, (51°20'N, 105°28'E) alt. ca. 2000 m, on boulders, 13.VII.1998, I. N. Urbanavichene (LE); SAME REPUBLIC, EASTERN SLOPE OF KHAMBIN RANGE, 8 KM NE OF GUSINOE LAKE, MT. ULABORTOI (51°20'N, 106°25'E) alt. 800–900 m, on open rocks among taiga forest, 31.VII.1993, M. P. Zhurbenko 9317 (LE L2404). — MAGADANSKAYA OBLAST': Khacynskii region, CA. 26 KM S OF MYAKIT, AT THE TOP OF THE PASS ON THE ROAD TO TALAYA (61°11'N, 152°06'E) alt. 1050–1100 m, 27.VII.1992, M. P. Zhurbenko 92158 (LE). — FAR EAST, PRIMORSKII KRAY: Lazo region, LAZOVSKII STATE RESERVE, SUKHOI LOG (43°02'N, 133°36'E) alt. 700 m, small ridge with open rock outcrops among taiga forest, on stone, 28.IX.1991, M. P. Zhurbenko 914 (LE, M).

The placement of *Boreoplaca ultrafrigida* in a monotypic family *Rhizoplacopsidaceae* requires further discussion. When discussing affinities of *B. ultrafrigida*, Timdal (1994) mentioned that it was difficult to find a family for the new genus. While the thallus morphology is close to species of traditional *Lecidea* sect. *Psora*, the ascus type resembles that of the *Hypocenomyce friesii*-complex, and the anatomy of the apothecium and the thallus chemistry resemble that of the *H. scalaris*-complex.

The close relationship of *Boreoplaca* to *Ophioparma* and *Hypocenomyce scalaris* was supported by molecular phylogenetic analyses based on mtSSU/nLSU rDNA (Wedin et al. 2005) and on the multilocus dataset (Miadlikowska et al. 2006). As mentioned by Wedin et al. (2005), *Boreoplaca*, *Ophioparma* and *H. scalaris* have similar asci. The amyloid reaction pattern of the ascus tips is a valuable taxonomic marker often correlating with molecular data within *Lecanoromycetes* (Peršoh et al. 2004). The presence of amyloid asci with a tholus

exhibiting a strongly amyloid dome in a monophyletic group, supported by the results of the molecular phylogenetic analyses, was used to suggest the extension of the family *Ophioparmaceae* R.W. Rogers & Hafellner (Miadlikowska et al. 2006). Nevertheless, the *Ophioparmaceae* needs additional investigation, since according to the cladograms presented in the above-cited publications, it may include *Ophioparma* and *Hypocenomyce scalaris*, *Ophioparma* and *Boreoplaca*, or all three taxa, the genera of which are clustered within the *Fuscideaceae-Umbilicariaceae* clade (Miadlikowska et al. 2006). However, some taxa related to *Umbilicariaceae* were not included in this study. *Elixia* forms a sister group to *Umbilicariaceae* in Bayesian analyses of nuclear and mitochondrial DNA (Lumbsch et al. 2004). Moreover, *Hypocenomyce friesii*, which has an ascus type similar to *Boreoplaca*, clusters with high support in *Umbilicariaceae* sequences (Wedin et al. 2005), but was not included to the data set by Miadlikowska et al. (2006). Consequently, the relation of *Ophioparmaceae* with *Elixia* and the *Hypocenomyce friesii*-complex remains unclear.

Despite the fact that the current family (*Rhizoplacopsidaceae* or *Ophioparmaceae*) for *Boreoplaca* seems uncertain, the placement of the genus within *Umbilicariales* as suggested by Zhou & Wei (2006) and Miadlikowska et al. (2006) and formally described in Zhou & Wei (2007) looks plausible, because phylogenetic analyses based on different genes consistently place *Boreoplaca* in the monophyletic groups sister to *Umbilicariaceae*-clade; furthermore, *Boreoplaca* has asci similar to asci in representatives of *Umbilicariaceae*.

The above work extends our knowledge of the distribution of *Boreoplaca ultrafrigida* (FIG. 1), which was previously known only from Russia: Chersky Range (NE Yakutia) (Timdal 1994), Verkchoyansky Range (LE), Southern (Urbanavichene & Urbanavichus 1999) and Eastern (Budaeva & Kharpukhaeva 2003) Baikal region, Khentei-Chikoi Upland (Urbanavichus & Urbanavichene 2002), Stanovoye Upland (Makryi 2002; Kharpukhaeva et al. 2004), and Sikhote-Alin' Range (Zhurbenko 2003). The locality in China is the most southerly finding of *B. ultrafrigida*.

Acknowledgments

We are most grateful to the curators and staff of the herbaria O and HMAS-L for the provision of type material, to Dr. Mats Wedin and Dr. Mikhail Zhurbenko for their critical and helpful comments, and to Professor Mark Seaward for improving the text. The first author was supported by Grants of the President of the Russian Federation (MK 5671.2006.4) and the National Geographic Society (8204-07).

Literature cited

Budaeva SE, Kharpukhaeva TM. 2003. New records of lichens in Buryatia. *Botanicheskii Zhurnal* [St.-Petersburg] 88 (12): 90–92. (in Russ.).

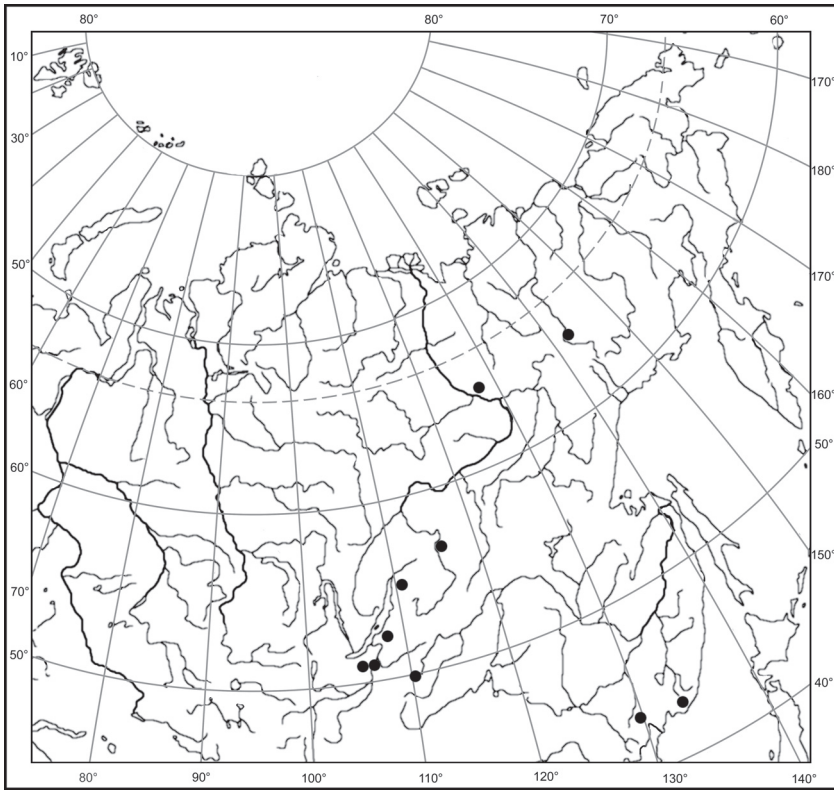


FIGURE 1. Distribution map of *Boreoplaca ultrafrigida* based on investigated specimens and literature data.

- Kharpukhaeva TM, Zhurbenko MP, Urbanavichus GP. 2004. Lichens of Dzherginsky Nature Reserve: 6–235, in: Urbanavichus GP, Urbanavichene IN. Lichens of Russia's Nature Reserves. The present-day state of biodiversity within protected areas of Russia. Vol. 3: Lichens and Bryophytes. Moscow.
- Lumbsch HT, Schmitt I, Palice Z, Wiklund E, Ekman S, Wedin M. 2004. Supraordinal phylogenetic relationships of *Lecanoromycetes* based on a Bayesian analysis of combined nuclear and mitochondrial sequences. *Molecular Phylogenetics and Evolution* 31: 822–832.
- Makryi TV. 2002. To the lichen flora of the Stanovoye Nagorye uplands (Baikalian Siberia). I. The epilithic lichens of the Kodar range. *Turczaninowia* 5(1): 47–67. (in Russ.).
- Miadlikowska J, Kauff F, Hofstetter V, Fraker E, Grube M, Hafellner J, Reeb V, Hodgkinson BP, Kukwa M, Lücking R, Hestmark G, Otolara MG, Rauhut A, Büdel B, Scheidegger C, Timdal E, Stenroos S, Brodo I, Perlmutter GB, Ertz D, Diederich P, Lendemer JC, May P, Schoch CL, Arnold AE, Gueidan C, Tripp E, Yahr R, Robertson C, Lutzoni F. 2006. New insights into classification and evolution of the *Lecanoromycetes* (*Pezizomycotina*, *Ascomycota*) from phylogenetic analyses of three ribosomal RNA- and two protein-coding genes. *Mycologia* 98: 1088–1103.

- Peršoh D, Beck A, Rambold G. 2004. The distribution of ascus types and photobiontal selection in *Lecanoromycetes* (*Ascomycota*) against the background of a revised SSU nrDNA phylogeny. *Mycological Progress* 3: 103–121.
- Timdal E. 1994. *Boreoplaca ultrafrigida*, a new lichen genus and species from continental Siberia. *Mycotaxon* 51: 503–508.
- Urbanavichene IN, Urbanavichus GP. 1999. New and rare for Asia and Russia lichens from the Southern Baical region. [St.-Petersburg] 84 (7): 129–133. (in Russ.).
- Urbanavichus GP, Urbanavichene IN. 2002. New and rare lichen species from Sokhondinsky reserve (Chentei-Chikoi upland, Chita region). In: Proceedings of the Conference “Specially protected natural areas in Altai region and adjacent territories. Tactics of biodiversity and gene fund protection”: 191–195. Barnaul. (in Russ.).
- Wedin M, Wiklund E, Crewe A, Döring H, Ekman S, Nyberg Å, Schmitt I, Lumbsch HT. 2005. Phylogenetic relationships of *Lecanoromycetes* (*Ascomycota*) as revealed by analyses of mtSSU and nLSU rDNA sequence data. *Mycological Research* 109: 159–172.
- Zhou QM, Wei JC. 2006. A new genus and species *Rhizoplacopsis weichingii* in a new family *Rhizoplacopsidaceae* (*Ascomycota*). *Mycosystema* 25: 376–385.
- Zhou QM, Wei JC. 2007. A new order *Umbilicariales* J.C. Wei & Q. M. Zhou (*Ascomycota*). *Mycosystema* 26: 40–45.
- Zhurbenko MP. 2003. New and rare lichen species (Lichenes) from Sakha-Yakutiya Republic and Magadan Region. *Botanicheskii Zhurnal* [St.-Petersburg] 88(1): 111–118. (in Russ.).

