Arctoa (2011) **20**: *43-64*

UPPER JURASSIC MOSSES FROM BAIGUL (TRANSBAIKALIA, SOUTH SIBERIA)

МХИ ИЗ ВЕРХНЕЮРСКИХ ОТЛОЖЕНИЙ БАЙГУЛА (ЗАБАЙКАЛЬЕ, ЮЖНАЯ СИБИРЬ)

MICHEAL S. IGNATOV[1], EUGENY V. KARASEV[2] & SOFIA M. SINITSA[3]

МИХАИЛ С. ИГНАТОВ[1], ЕВГЕНИЙ В. КАРАСЕВ[2], СОФЬЯ М. СИНИЦА[3]

Abstract

A collection of Upper Jurassic fossils from the Baigul, Transbaikal Area of South Siberia, includes numerous specimens of mosses *Bryokhutuliinia ingodensis* (Srebrodolskaya) Ignatov and *Baigulia complanta* gen. et sp. nov. Leafy shoots, leaf characters and leaf cell structure are seen in both species. These two genera belong likely to pleurocarpous mosses, but without obvious affinity to any modern family. The third genus, *Baiguliella*, represented by six small shoots is compared with acrocarpous mosses of the Dicranaceae, Ditrichaceae, Archidiaceae, Meesiaceae.

Резюме

В коллекции мхов из верхнеюрских отложений Байгула (Забайкалье) богато представлены остатки двух видов, *Bryokhutuliinia ingodensis* (Srebrodolskaya) Ignatov и *Baigulia complanata* gen. et sp. nov. Благодаря сохранности материала с фрагментами побегов с листьями хорошо видна структура клеточной сети. *Bryokhutuliinia* и *Baigulia*, вероятно, являлись бокоплодными мхами, но родство с каким-либо из современных семейств установить невозможно. Третий род, *Baiguliella*, представленный шестью мелкими побегами, сравнивается с верхоплодными мхами из семейств Dicranaceae, Ditrichaceae, Archidiaceae и Meesiaceae.

KEYWORDS: mosses, fossil, Upper Jurassic, Transbaikalia, Baigul

INTRODUCTION

Mesozoic mosses of the pre-Cretaceous time are poorly known, as their findings are few in number. There are only five Jurassic collections in the world: *Bryokhutuliinia jurassica* (Ignatov, 1992), *Muscites samchakianus* (Srebrodolskaya, 1980), *Stachybryolites zhoui* and *Mnioites brachyphylloides* (Wu et al., 2000), *Tricostium papillosum* and *Muscites fontinaloides* (Krassilov, 1973), *Palaeodichelyma sinitzae* (Ignatov & Shcherbakov, 2007).

In the course of paleofloristic study at the Baigul locality by two latter authors a number of well preserved specimens were found.

LOCALITY, AGE, MATERIAL

Specimens were collected in South Siberia, Zabaikalsky Territory, Baigul Creek, 52°14'N – 116°51'E, coll S.M. Sinitsa, 2009, deposited in Borissiak Paleontological Museum of Russian Academy of Sciences (PIN) in Moscow.

Baigul is an isolated locality. The presence of a number of index-species (Crustacea: *Prolepidurus schewija* (Notostraca) and *Chirocephalus ras-*

[1] – Main Botanical Garden, Russian Academy of Sciences, Botanicheskaya 4, Moscow 127276 Russia, e-mail: misha_ignatov@list.ru

[2] – Borissiak Paleontological Institute, Russian Academy of Sciences, Profsoyuznaya 123, Moscow 117997 Russia, e-mail: karasev@paleo.ru

[3] – Institute of Natural Resourses, Ecology and Cryology of Siberian Branch of Russian Academy of Sciences, Butina, 26, Chita, 672090 Russia

nitsyni (Anostraca); insects: *Proameletus caudatus* (Ephemeroptera) and Isophlebiidae (Odonata), and also *Equisetum undense*) indicates the same age as for Glushkovo formation of Unda-Daya series of the Unda and Daya Depression and the Lower subseries of Ukureika series in the Novo-Berezovo and Olov Depression (near Kulinda Settlement). The Glushkovo Formation in South Siberia has been dated back to Late Jurassic by Sinitsa (1993), Sinitsa & Starukhina (1986), Rasnitsyn (1990) and some others, albeit late Early Cretaceous by Zherikhin (1978), and now seems most probable to be terminal Jurassic, or maybe basal Cretaceous (Rasnitsyn & Quicke, 2002).

Mosses were collected in two ravines 260 m apart from each other in a finely laminated tuffaceous mudstones, associated, in addition to the above mentioned, with the seeds of *Pityospermum sp., Ferganiella sp., Carpolithes sp.* Detailed geological description of the locality can be received from the authors upon request.

Preservation. Specimens were seen on rock faces, allowing observation of laminal cell structure, at least at places, even in dry state. Photographs were taken using Leica M 165 and Olympus SZX16 stereomicroscopes. Usually 3-8 pictures were taken and subsequently assembled with Helicon Focus 4.50 (Kozub et al., 2008).

TAXONOMY

Genus **Bryokhutuliinia** Ignatov, J. Hattori Bot. Lab. 92: 379. 1992.

Description: Plants robust. Stem pinnately branched at an angle of (25-)50-70°. Leaves patent to reflexed, ovate to ovate-lanceolate, acute to broadly rounded at apex; margin entire, bordered; costa absent; laminal cells rectangular, with transversal cell walls more or less perpendicular to leaf length, alar cells shorter and broader than central basal cells.

Type species: *Bryokhutuliinia jurassica* Ignatov, Upper Jurassic, Mongolia.

The genus includes three species from Upper Jurassic to Lower Cretaceous of South Siberia and Mongolia.

Bryokhutuliinia ingodensis (Srebrodolskaya) Ignatov, J. Hattori Bot. Lab. 92: 385. 1992. – *Muscites ingodensis* Srebrodolskaya, Trudy Vses. Geol. Inst. 204: 27, tabl. 2, fig. 2. 1980.

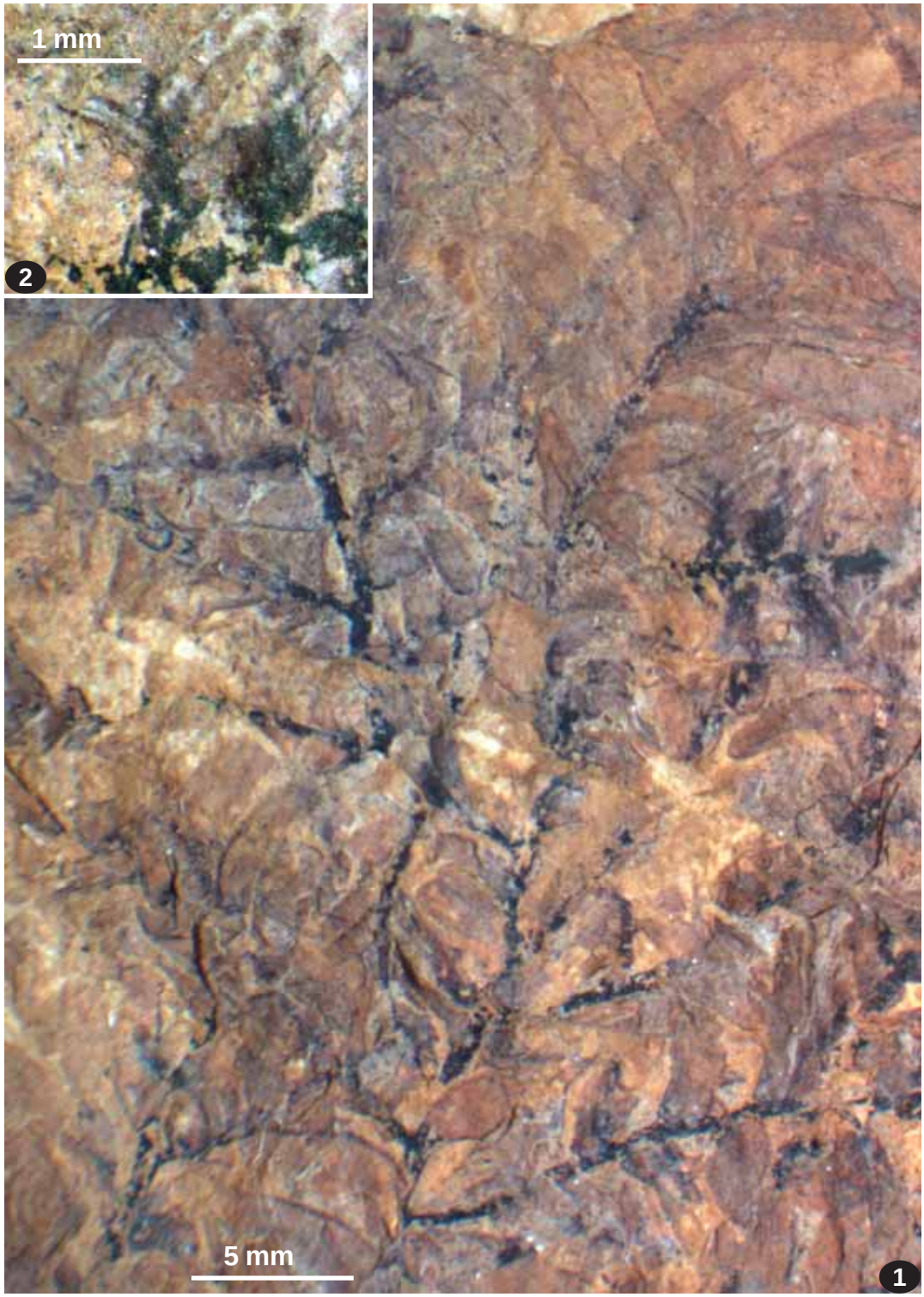
Figs. 1-18.

Description: Plants in loose wefts. Stem straight, more than 2 cm long, 0.32-0.40 mm wide, surface cells ca. 25 μm wide, short rectangular, 1.5-2:1, remotely spirally foliate (4-7 leaves per 5 mm in middle part of stem, i.e., not close to apical zone), pinnately branched (distance between branches ca. 2 mm). Branches sitting in leaf axils, but at a distance ca. 1 mm above leaf, straight, forming broad angle (70-80°) with stem, to at least 9 mm long, more densely and subcomplanately foliate (20-25 leaves per 5 mm), in proximal part with smaller leaves. Stem leaves deviating from stem at a broad angle (55-80°), patent to gradually reflexed or sometimes reflexed from their bases, to 4.0-4.7×1.0-1.3 mm, ovate-elongate, gradually tapered and at apex blunt, toward base slightly tapered, somewhat concave (line of insertion V-shaped, with the angle ca. 140°); margin entire, bordered throughout, border dark, ca. 50 μm wide. Branch leaves from 1.2×0.4 mm in proximal part to 3.5×1.2 mm distally, narrower than stem leaves, sitting at an angle 45-60°. Laminal cells 60-105×18-23 μm, in alar region hexagonal-rectangular, broader, to 80×35 μm. Small shoots 0.7-1.0 mm long occurring in leaf axils, terminating with small acute leaves to 0.6 mm long, and likely bearing gametangia.

Material: Shoots of *B. ingodensis* are found in 9 rock slabs, in pure wefts (e.g. Fig. 1), as individual shoots (Figs. 3, 5, 10, 16) or intermixed with *Baigulia complanata* (Fig. 19), and in one specimen leaves of *B. ingodensis* were also with small shoots of *Baiguliella minuta*. In addition to a general similarity, our identification relies on the presence of a peculiar dark border all around leaf, including its apical part (cf. Fig. 9). This border is a characteristic of the genus. Cell structure is seen at places in many leaves, but in one specimen of especially fine-grained rock (Figs. 10-15) cells were well contrasted by white argillite, so the areolation is clear almost throughout leaves.

Although cell structure had been seen quite clearly, we still failed to understand fully the structure of the leaf border, where cell outlines are usually impossible to trace. Only in a few places, (e.g., in Fig. 15, arrowed), some cell outlines indicate border cells to be about the same in width as laminal cells. It seems also that cells are no longer if not shorter than laminal cells, although an obvi-

(continued in page 53).



Figs. 1-2. *Bryokhutuliinia ingodensis* (Baigul PIN 5424/13). 1 – habit; 2 – part of the same specimens, showing short branches, possibly perigonia or perichaetia.

Figs. 3-4. *Bryokhutuliinia ingodensis* (Baigul PIN 5424/4): 3 – habit; 4 – same specimen, showing branch bases with small proximal leaves.

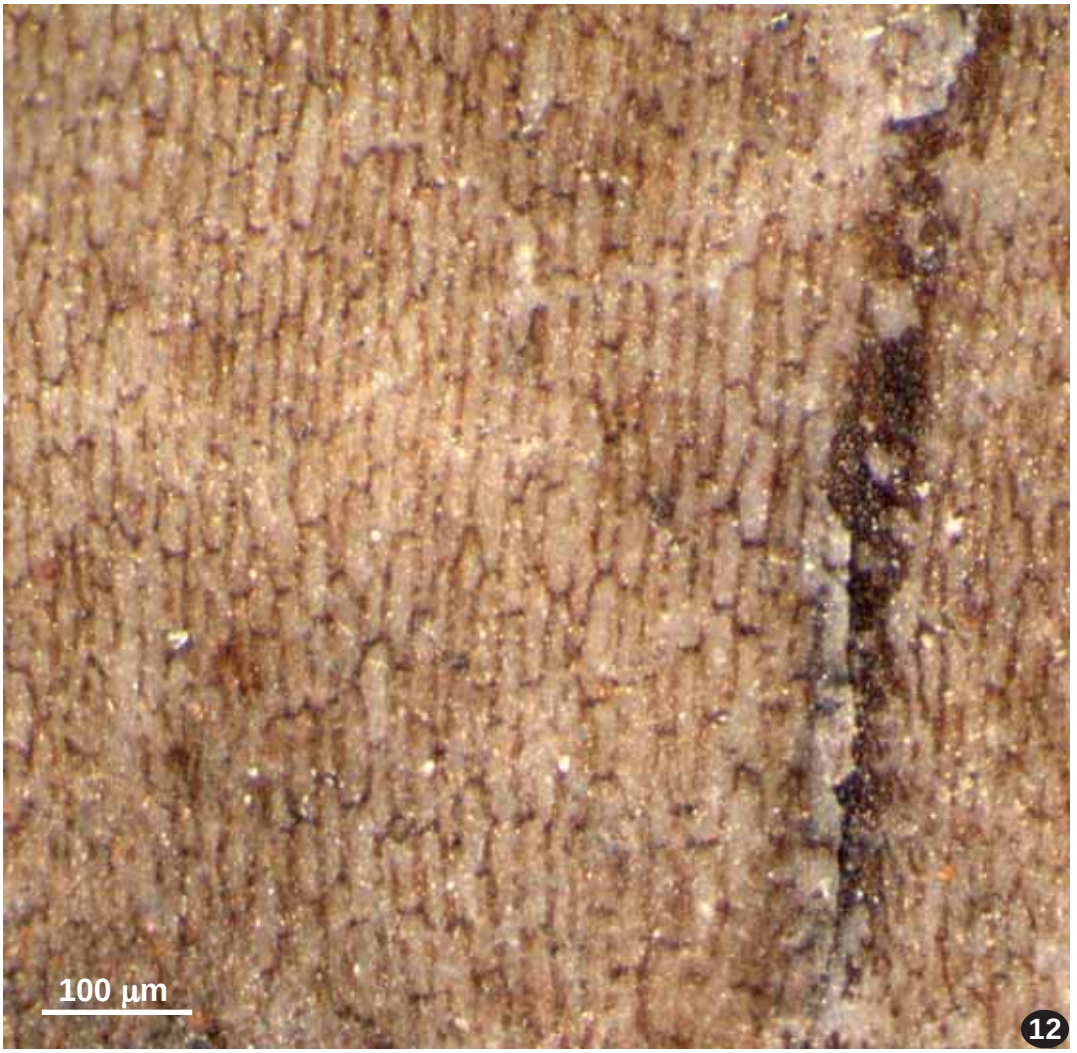
Figs. 5-7. *Bryokhutuliinia ingodensis* (Baigul, 5: PIN 5424/4; 6-7: PIN 5424/13). 5, 7 – habit; 6 – stem with young branch.

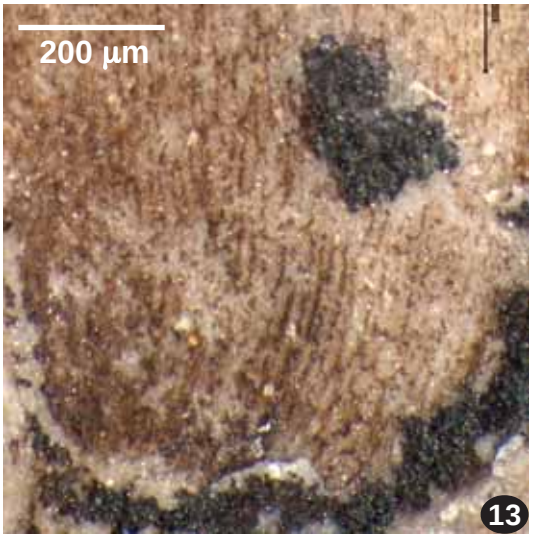
Figs. 8-9. *Bryokhutuliinia ingodensis* (Baigul, PIN 5424/13). 8 – stem with proximal parts of leaves and branches; 9 – leaves, showing border all around leaf including apical part.

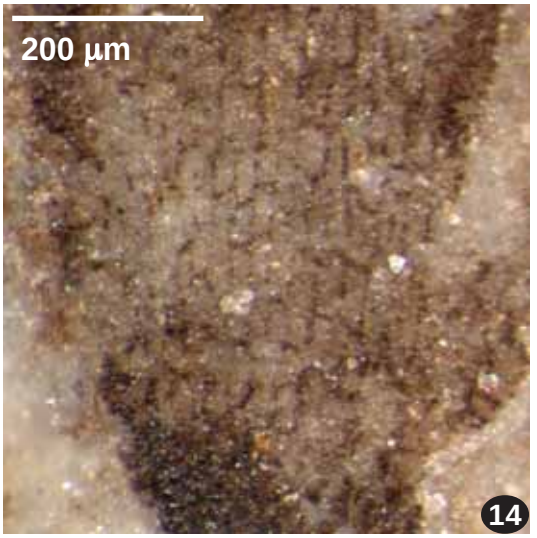
Figs. 10-11 (opposite page). *Bryokhutuliinia ingodensis* (Baigul, PIN 5424/11). 10 – habit; 11 – stem with proximal parts of leaves and branches.

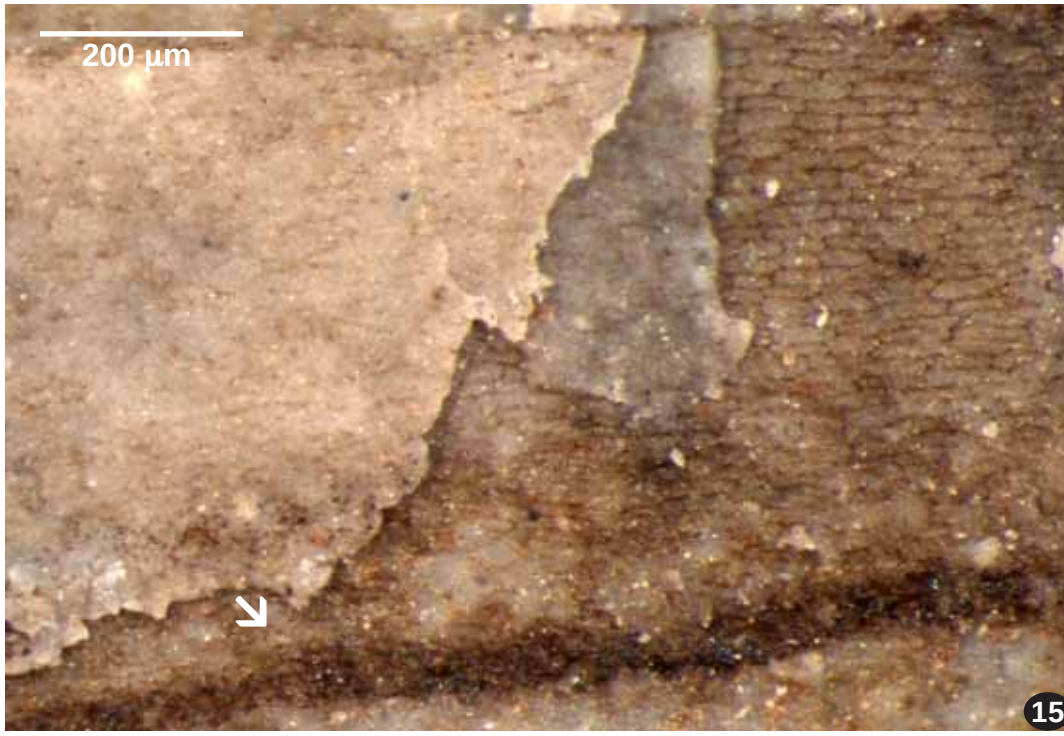

2 mm
10


1 mm
11


100 µm
12

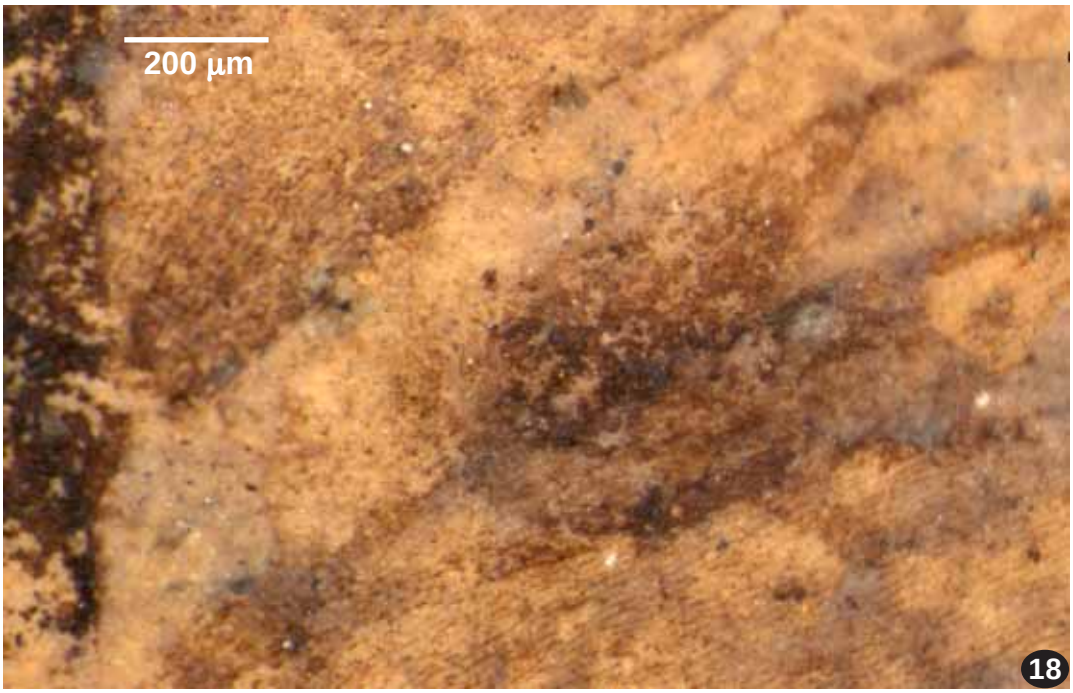

200 µm
13


200 µm
14



Figs. 15-16. *Bryokhutuliinia ingodensis* (Baigul, PIN 5424/11). 15 – cell structure of lamina and of border (partly seen where pointed by arrow); 16 – branched stem.

Figs. 12-14 (opposite page). *Bryokhutuliinia ingodensis* (Baigul, PIN 5424/11). Laminal areolation in: 12 – mid-leaf; 13 – leaf base; 14 – alar part of leaf base.



Figs. 17-18. *Bryokhutuliinia ingodensis* (Baigul, PIN 5424/5). short axillary branches bearing cluster of leaves, likely with gametangia.

ously multistratose area along the margin (either due to a multistratose border, or due to a recurved or revolute margin) does not allow describing them in more detail. The artifact of fossilization is unlikely because of too regular occurrence, including places of leaf overlapping. A regular recurvation or incurvation is also doubtful as it rarely involves the whole leaf margin. Modern mosses with leaf margin incurved throughout, e.g. *Orthotrichum gymnostomum* Bruch ex Brid., have leaves strongly concave; so it would be difficult to imagine how the in- or recurved margin could exist in a rather flat leaf of *Bryokhutuliinia* .

Branching pattern is apparent in many specimens and the small leaves is seen at branch bases, although usually it is difficult to find out if the most proximal of them are sitting at branch base or shortly above (Figs. 3-6).

In one specimen (Figs. 17-18), there are specific structures in axils of two neighboring leaves. One of them, to the left of stem in Fig. 17, has a clear axis, terminated in leaf cluster, although the latter is not clearly seen. In another one, to the right of the stem (Fig. 17), the axis is not clearly seen, but the cluster of minute leaves, ca. 0.6 mm long, is apparent.

Fig. 2 illustrates two short and small-leaved branches, sitting on stem among leaves of average size. Their position and overall appearance are similar to perigonia or perichaetia of modern pleurocarpous mosses, although daitals that would be able to proof this hypothesis are unavailable due to poor plant preservation.

Specimen examined: PIN 5424/1, /4, /5, /6, / 8, /11, /12b (mixed with *Baigulia complanata*) /13, / 15 (mixed with *Baiguliella minuta*). Number refers to slab, where sometimes several intermingled shoots are present.

Comparison. The bordered ecostate leaves, rectangular laminal cells and pleurocarp-like habit of plants are the diagnostic features of the genus *Bryokhutuliinia*. The familial placement of the genus is still unclear, its relation to Hookeriales seems to be most likely (cf. Ignatov, 1992; Ignatov & Shcherbakov, 2011). This conclusion was made due to pinnate branching and absence of a costa that exclude its placement in acrocarpous groups, while the rectangular cells (with transversal cell walls clearly perpendicular to the cell length) are not the case of Hypnales, so positing within the group of basal pleurocarps is most likely. However none of the extant genera of Hookeriales has all these features altogether.

The genus includes 3 species: *B. jurassica* Ignatov (type of the genus), *B. ingodensis* and *B. obtusifolia* Ignatov & Shcherbakov (Ignatov & Shcherbakov, 2011, present volume).

The present material is referred to *B. ingodensis* originally described from Ingoda in Zabaikalsky Territory (ca. 52°11'N – 113°04'E), ca. 200 km from Baigul. The original description of this species lacks description of cell structure and type material also does not allow to see it. At the same time, the dense subcomplanate foliage of branches, size of plants and leaves, and characteristic leaf border are similar enough to refer the present material to this species.

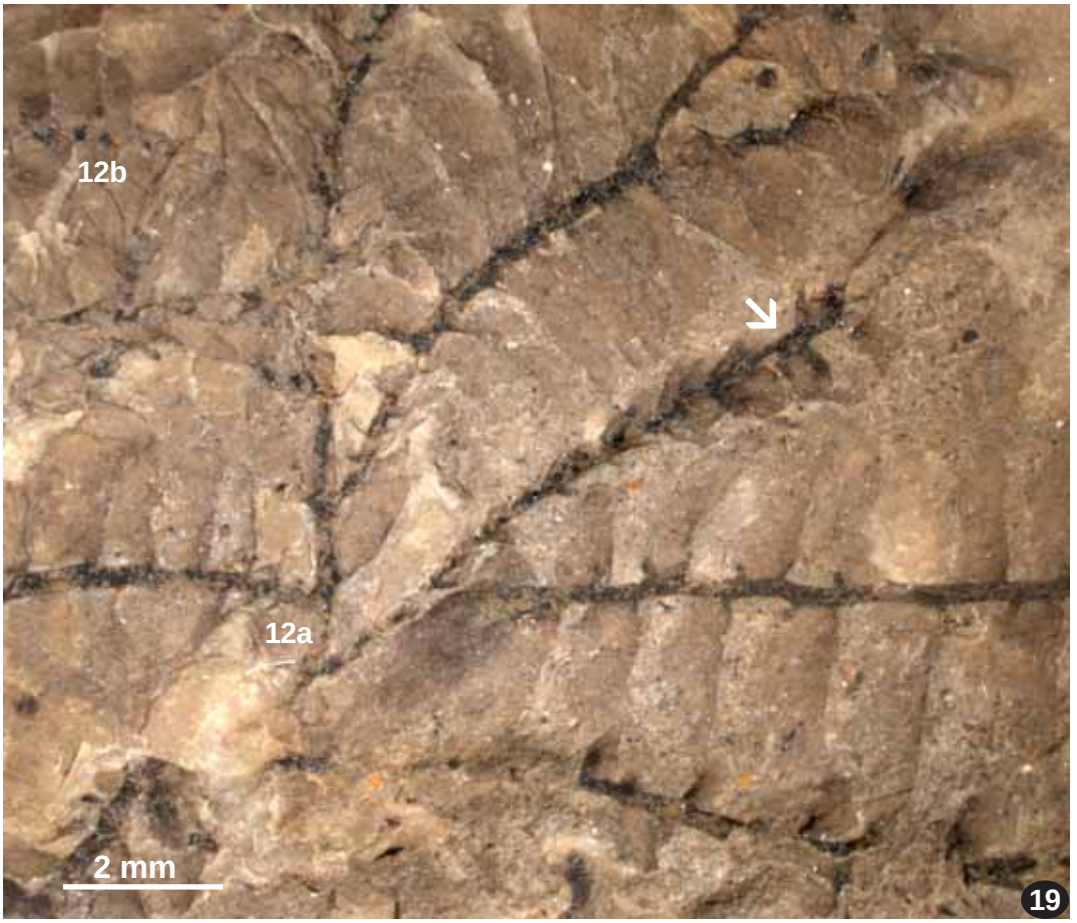
Bryokhutuliinia obtusifolia differs from *B. ingodensis* in somewhat smaller stem leaves (< 3.5 mm vs. 4-5 mm), broadly rounded and usually crowded at shoot apex, stems less regularly pinnate, without apparent differentiation in foliage between stem and branches (cf. Ignatov & Shcherbakov, 2011).

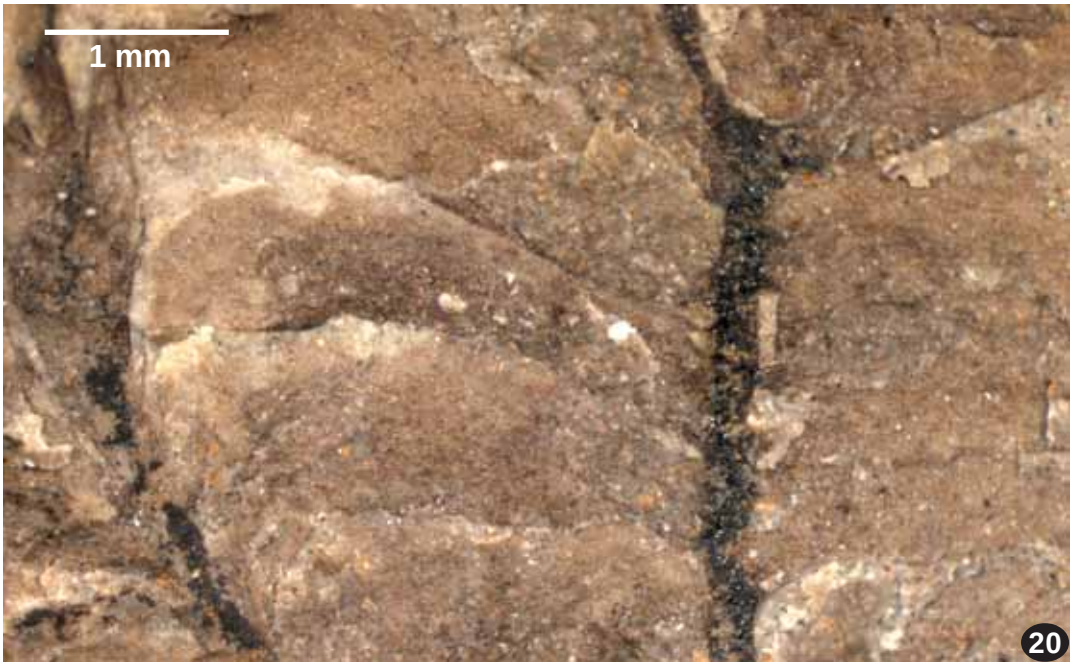
Bryokhutuliinia jurassica from Mongolia has less dense branch foliage, more remote and broadly acute branch leaves. The present additional material on *B. ingodensis* indicates that these two species are less different. In the original description of *B. jurassica*, the comparison with *B. ingodensis* was based on only few shoots of the latter species (Ignatov, 1992). It seems that they were not optimally developed, so their length was estimated as 3-4 mm, while now its longer leaves were found to be 4.0-4.7 mm long (cf. up to 5.0 mm long in *B. jurassica*). So, the quite regular branching and dense foliage in *B. ingodensus* is the main character differentiating these species. In addition, cells in *B. ingodensis* are 60-105 μm long, while in *B. jurassica* they reach 150 μm long and occasionally 200 μm long.

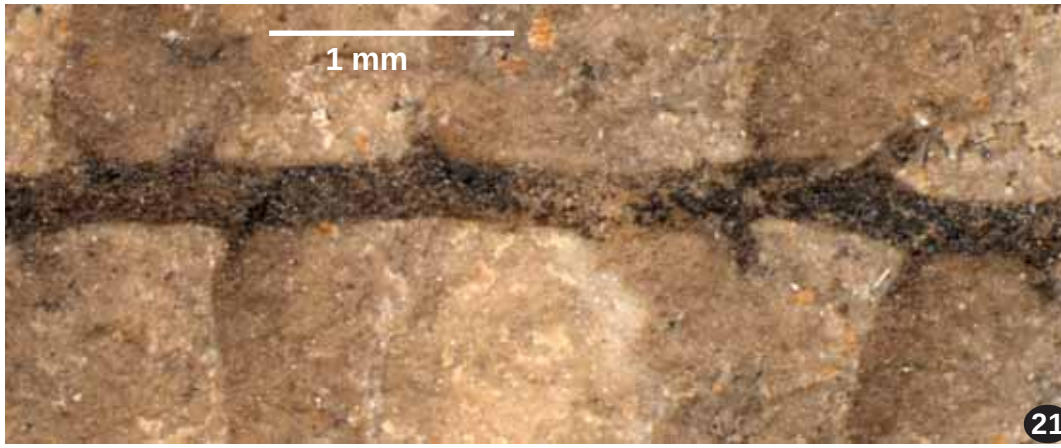
Baigulia gen.nov.

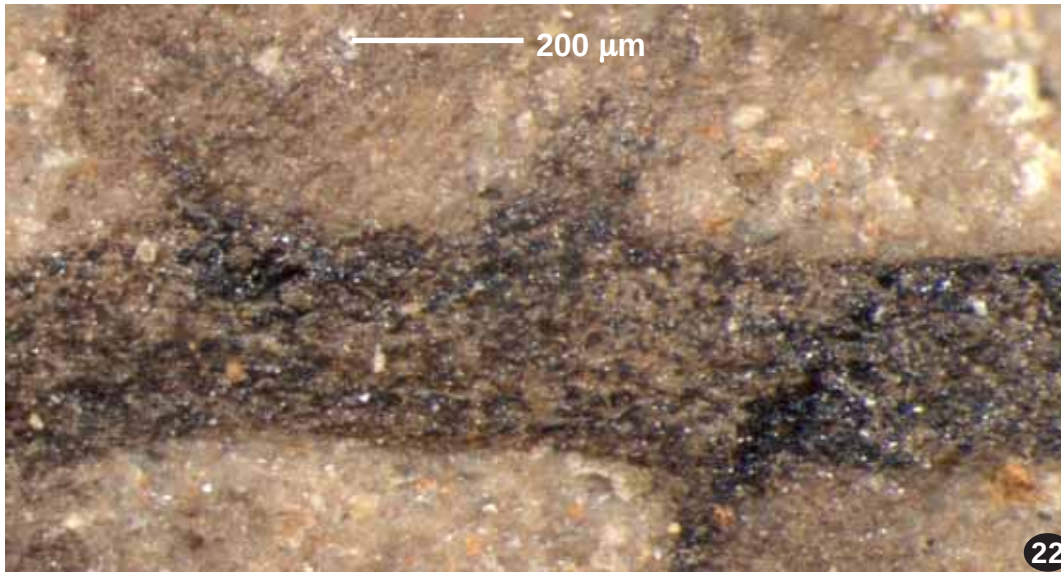
Description: Stem irregularly pinnately branched. Leaves remotely arranged, spreading at a broad angle, straight to reflexed, obliquely inserted on stem, broadly oblong to oblong-ovate, somewhat concave at base; margin entire, not bordered; distinct single costa absent; laminal

(continued on page 61).


12b
12a
2 mm
19

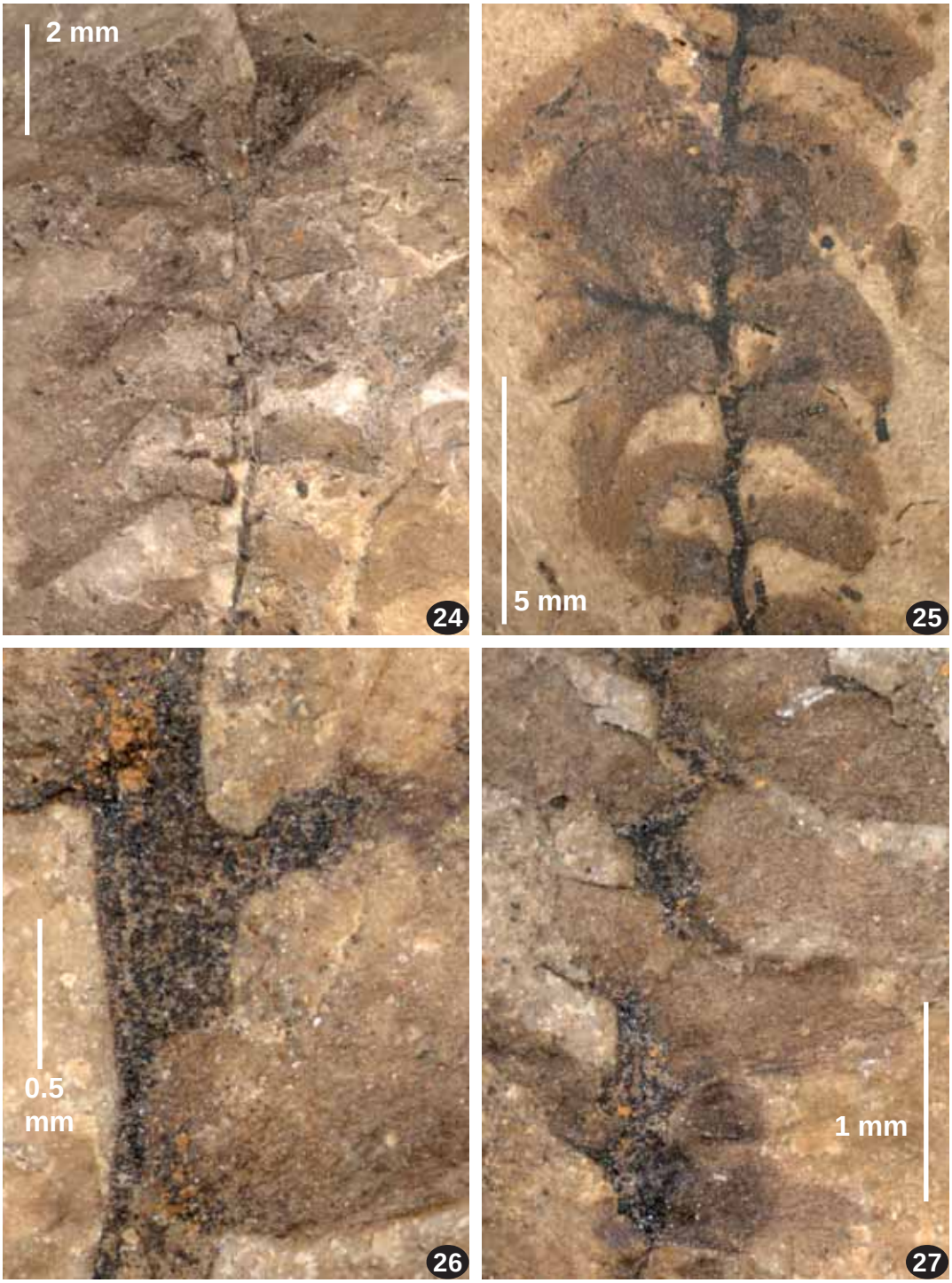

1 mm
20



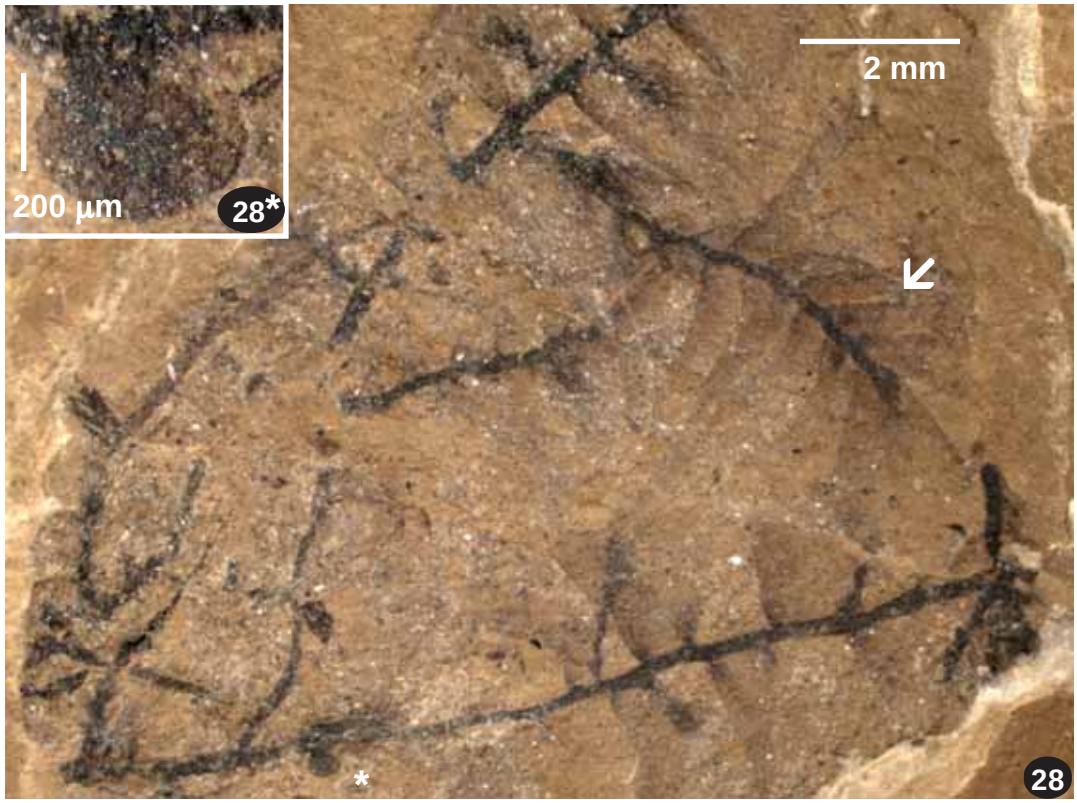


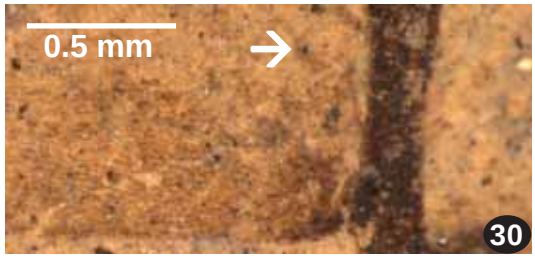
Figs. 21-23. *Baigulia complanata* (Baigul, PIN 5424/12a, holotype). 21-22 – stems with lower part of leaves: note an oblique insertion of leaves; 23 – areolation of the lower half of leaf (from shoot shown in Fig. 21).

Figs. 19-20 (opposite page). *Baigulia complanata* (Baigul, PIN 5424/12a, holotype, marked as 12a) and in 19 (upper left, marked as 12b) with admixture of shoots of *Bryokhutuliinia ingodensis* (note bordered leaves). 19-20 – habit, showing complanate foliage in *Baigulia*.

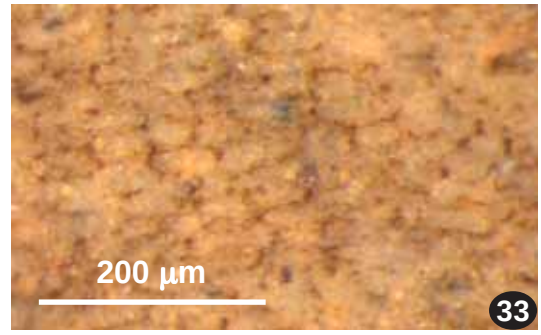


Figs. 24-27. *Baigulia complanata* (Baigul, 24-25 & 27 PIN 5424/7; 26 – PIN 5424/10). 24-25 – habit; 26-27 – stems with lower parts of leaves, showing basal areolation.





Figs. 28-30. *Baigulia complanata* (Baigul, PIN 5424/7). 28 – habit, * indicates an ovate structure, either attached to stem, or it can be a dispersed part of another plant, fossilized near moss shoot (arrowed is branch with axillary buds magnified in Fig. 34); 29 – stem with leaf bases and proximal branch with small leaves; 30 – stem with proximal part of leaf, showing areolation.



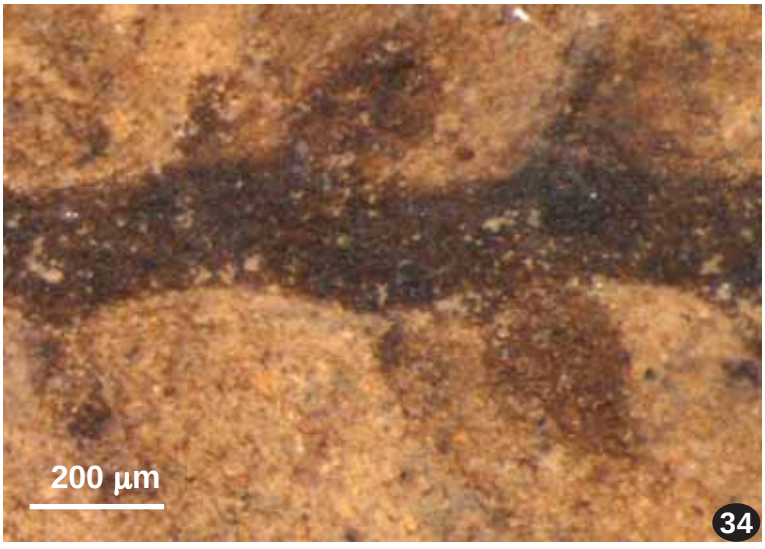
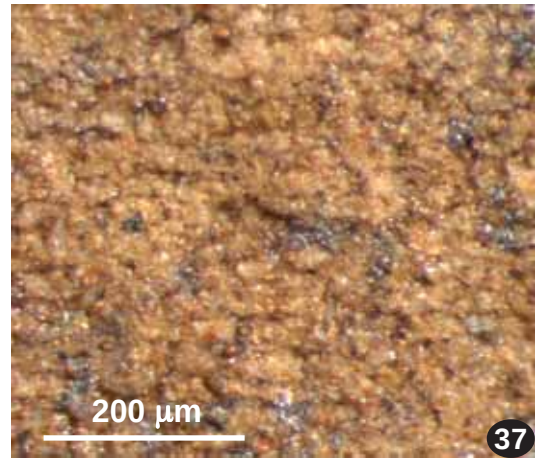


Fig. 31-34. *Baigulia complanata* (Baigul, 31-32: PIN 5424/3; 33-34: PIN 5424/7): 31 – stem with proximal parts of leaves and branch; 32 – stem with proximal parts of leaves; 33 – basal leaf areolation; 34 – stem with proximal parts of leaves and bud-like structures in leaf axils, apparently branch primordia (magnified from Fig. 28, arrowed).



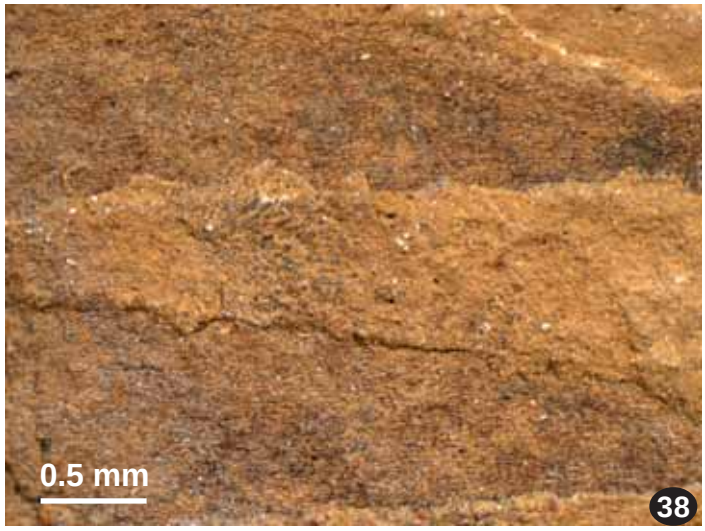


Fig. 35-38. *Baigulia complanata* (Baigul, PIN 5424/14): 35 – habit; 36 – distal part of stem with densely arranged leaves; 37 – cells in mid-leaf (from one of shown in Fig. 38); 38 – leaves from shoot fragment.

Fig. 39. *Baigulia complanata* (Baigul, PIN 5424/14): habit, showing increase of leaf size towards shoot apex.

cells rectangular, (1.5-)2-4(-5):1, towards base shorter, to 1-2:1, but not much broader. Branch leaves lanceolate, proximal branch leaves shorter, without apperent foliose structures on stem around branches. Branch initials in leaf axils, bud-like.

Type species: *Baigulia complanata* sp. nov. (Baigul, Transbaikalia; Upper Jurasic).

The genus includes one species.

Comparison*: Baigulia* differs from *Bryokhutuliinia* in less regularly branched stem, elimbate leaves obliquely inserted on stem, making foliage complanate, and shorter laminal cells.

Baigulia complanata sp. nov.

Figs. 19-39.

Holotype: Baigul, Upper Jurassic, PIN 5424/12 (Figs. 19-23).

Description: Plants in loose wefts. Stem more than 4.2 cm long, rather thin, ca. 0.25-0.40 mm wide, straight to more or less geniculate, remotely (6-14 leaves per 5 mm in middle part of stem) and complanately foliate, freely branched, minimal distance between branches 1 mm, branch angle with stem (30-)70-90°, branch foliage similar to that of stems or more dense; in proximal part branches leafless or with smaller leaves. Stem leaves deviating from stem at an angle (55-)80-100°, spreading, oblique at insertion, (3.5-) 5-8×1.0-1.5 mm, oblong-lanceolate, broadly oblong or oblong-ovate, rounded at apex, slightly tapered toward base; margin entire, not bordered, plane except for the base where it is recurved what is seen as dark "border" at lower and upper angles of leaf; laminal cells rectangular, sometimes almost quadrate, (1.5-)2-3(-4):1, 40-85×20-30 μm, in alar region shorter and broader, to 40-45×35-40 μm. Branch leaves to 2.0-0.5 mm long. Juvenille shoots bud-like in leaf axils, 200-250 μm in diameter.

Material. Shoots of *Baigulia* were found in six rock pieces, partly in mixture with *Bryokhutuliinia ingodensis*.

The material of *Baigulia* is not homogeneous in habit. The longest shoot (Fig. 39) was found in a moderately fine sandstone, having poorer preservation, but instead representing the bigger fragment of this moss. Only this specimen has maximal size of leaves, up to 8 mm long, while in others leaves are 5-6 mm (Figs. 24-25) or about 4 mm long (Fig. 19). In many shoots leaves are clearly seen only in their proximal parts, as the upper parts are poorly preserved, likely due to delicate plant stature.

We refer all these fragments to one species basing on (1) complanate leaf foliage; (2) elimbate leaves; (3) relatively short laminal cells. Recurved parts at leaf bases are often well seen, providing characteristic dark areas on both sides of leaf (Figs. 19, 21-22).

In other compressions of *Baigulia,* the only one dark and narrow 'fan-shaped' area is seen (Figs. 28-29) instead of two dark areas. However in places where cell structure is apparent, the broadly rounded leaf base is seen (Figs. 30-31, arrowed), indicating identity with leaves where two sides of leaf base are contrasted (cf. Figs. 21-22).

For these reasons we refer specimens from Figs. 19-39 to one species.

Laminal cells are short rectangular throughout leaf, and can be measured in many places (Figs. 23, 27, 33, 37). Alar cells are inconspicuously enlarged.

Proximal parts of plants (cf. Fig. 28) are totally leafless and have a strange ovate structure (Fig. 28*). Although it is still needed to prove that it is part of *Baigulia,* we would like to point out this structure in case of further findings of a better preserved material.

Specimen examined: PIN 5424/3, /7, /10, /11, / 12a (holotype), /14.

Comparison: One moss from another nearby locality, the Pravy Samkhak River, *Muscites samchakianus* (Srebrodolskaya, 1980) is similar to *Baigulia.* It has leaves deviating from stem at ca. 90°, 2-2.5×0.5 mm, ca. 5 leaves per 5 mm. However, its cell structure is unknown, and the plant size is sufficiently smaller. By these two reasons we prefer to describe the Baigul material as a new genus. However, further structurally preserved material from the same deposits of the Pravy Samkhak River might proof identity of these species.

Strongly complanate foliage of *Baigulia* may indicate its position in liverworts, but elongate-rectangular laminal cells and plant habit make this hypothesis unlikely. Although Mesozoic *Dicttertia montanensis* (Schuster & Janssens, 1989) is an interesting exception, this plant has bilobed leaves, clearly indicating its position in Hepatics,

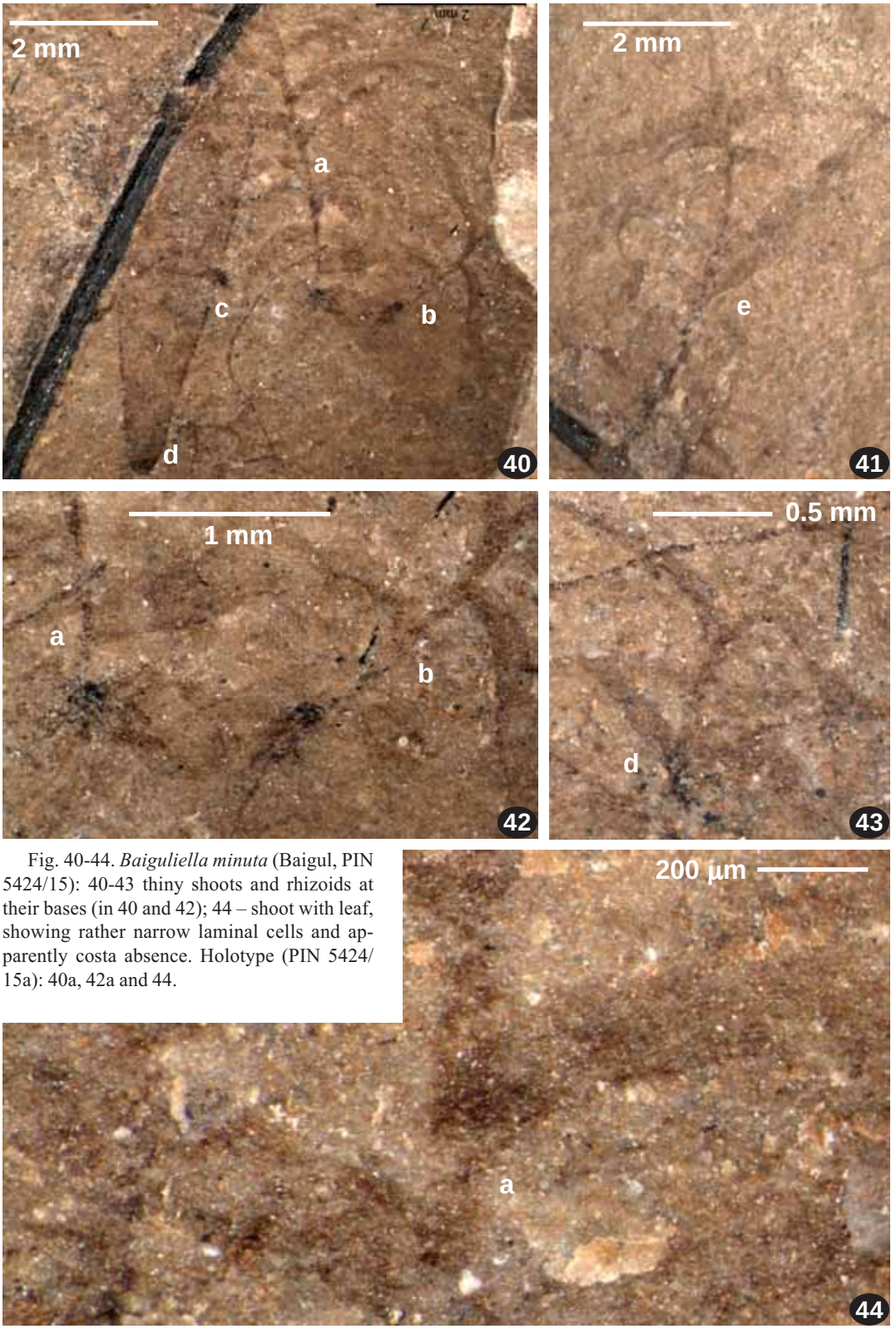


Fig. 40-44. *Baiguliella minuta* (Baigul, PIN 5424/15): 40-43 thiny shoots and rhizoids at their bases (in 40 and 42); 44 – shoot with leaf, showing rather narrow laminal cells and apparently costa absence. Holotype (PIN 5424/15a): 40a, 42a and 44.

while in Baigulia there is no other evidence for this except for complanate foliage which is not rare in mosses as well.

Among mosses, the branching pattern of *Baigulia* and the costa absence indicate its relation to pleurocarps, however among the latter its position is difficult to determine. Complanate foliage and irregular branching is similar to *Plagiothecium*, but laminal cells of the latter genus are rhombic-elongate to linear. An areolation similar to *Baigulia* is somewhat corresponding to that in modern genus *Cyclodictyon*; however, this plant has a long double costa.

It seems that *Baigulia*, although being quite distinct from *Bryokhutuliinia,* may belong to the same group. The main argument for this placement is laminal areolation: being somewhat longer cells in *Bryokhutuliinia* are similar in shape, as the transversal cell walls are perpendicular to the leaf length. The pattern of variation in foliage (from clearly to indistinctly complanate, with reflexed leaves in distal part of shoots) also indicates their affinity, but the explanation of this similarity by growth in the same habitats is possible as well.

Baiguliella gen.nov.

Description: Plants small. Stems unbranched, loosely foliate, leaves crowded near apex; rhizoids clustered at base. Leaves spreading at about right angle, linear lanceolate; costa absent or weak and indistinct; laminal cells narrow, ca. 10 μm wide.

Type species: *Baiguliella minuta* sp. nov.

Baiguliella differs from *Bryokhutuliinia* and *Baigulia* in smaller pants and narrow laminal cells.

Baiguliella minuta sp. nov.

Figs. 40-44.

Holotype: Baigul, Upper Jurassic. PIN 5424/15 (Figs. 40a, 42a and 44).

Plants growing as individual shoots. Stem erect, up to 3.5 mm tall, with ca. 10 leaves, loosely arranged and terminally crowded; rhizoids are clustered at stem base, the longest of them being 0.7 mm long. Leaves spreading at base at ca. 45°, then reflecting at about right angle, straight to gently arching in the middle, 1-2 mm long, 0.2-0.3 mm wide, linear-lanceolate, somewhat keeled, margin plane, not bordered, without distinct serration; costa absent or weak and indistinct; laminal cells elongate, 30-45×10-11 μm.

Material: The species is represented on one rock slab by five small shoots that are likely almost the whole plants, as four of them have a cluster of rhizoids at their base and at least one of them, the holotype, is terminated by a crowded leaves that is typical at shoot apex in modern acrocarpous mosses.

Rhizoids are seen at base of four shoots. Their structure and oblique cell walls are not observed, but position at stem base and pattern of clustering are highly similar to that known in small modern species, like *Dicranella, Leptobryum, Archidium*, etc. Leaves are channeled and compressed from side, so the whole leaf structure cannot be seen, and even the presence/absence of costa cannot be understood for sure. Costa is invariably present in modern mosses of similar habit, and if it was weak (like, e.g., in some species of *Archidium*) it probably would be unapparent, like in these specimens. Cells are seen in rather few places, especially in leaves of the holotype. Their width is invariable, 10-11 μm, while length is less apparent, ranging in better seen places from 30 to 45 μm, but the variation is likely broader.

The star-like groups of leaves crowded at shoot apex are especially clear in specimen shown in Fig. 41. The innermost leaves that are erect in the center of the group are shorter and narrower, i.e., similar to the pattern of the inner perochaetial leaves in modern mosses. Thus, it is quite likely that the plant in Fig. 41 is a female one, although preservation does not allow confirmation of this with high confidence.

It is worthy to note that *Baiguliella* plants are paler and more inconspicuous compared with *Bryokhutuliinia*, whose leaf is present on the same rock face (Fig. 40).

Specimens examined: PIN 5424/15a,b,c,d,e.

Comparison: The habit of *Baiguliella* indicates its position in acrocarpous mosses and the only thing in doubt is that there is no clear view of costa. One possible explanation is the overall delicate stature of plants. An alternative explanation, that *Baiguliella* has a really ecostate leaf, cannot be excluded; admitting this, we probably can compare it with *Bryokhutuliinia* and *Baigulia* [that are referred to pleurocarps basing on branching pattern], considering it, e.g., as juvenille plants of

the latter. However in young pleurocarpous mosses rhizoids are never clustered at stem base, so the pleurocarpous affinity of *Baiguliella* would be difficult to defence.

The comparison with modern groups cannot be very definite, as similar appearance is known in the Archidiaceae, Dicranaceae, Ditrichaceae, Meesiaceae, Pottiaceae, Seligeriaceae, etc. The two latter families are unlikely to be relatives of *Baiguliella*, because they are not very characteristic (in modern biota) for silty inundated banks of lakes or river beds, which is most likely its habitat, judging from co-occurrence with *Bryokhutuliinia*. Yet, the representatives of four former families often occur at present in this type of habitats, and all of them may be considered to be related to *Baiguliella*, unless a better material allows to identify it more definitely.

ACKNOWLEDGEMENTS

We are grateful to N.V. Gordenko for valuable help in identification of vascular plants from the collection and to A.Ivanova for correcting English. The work was partly supported by RFBR 10-04-00678.

LITERATURE CITED

IGNATOV, M.S. 1992. Bryokhutuliinia jurassica, gen. et spec. nova, a remarkable fossil moss from Mongolia. – *J. Hattori Bot. Lab.* **71**: *377-388.*

IGNATOV, M.S. & D.E. SHCHERBAKOV 2011. Lower Cretaceous mosses from Khasurtyj (Transbaikalia). – *Arctoa* **20**: *19-42.*

IGNATOV, M.S. & D.E. SHCHERBAKOV 2007. Did pleurocarpous mosses originate before the Cretaceous? – *In: Newton, A.E. & R. Tangney (eds.) Pleurocarpous mosses: systematics and evolution. [Syst. Ass. Special Vol. 71)] CRC Press, Boca Raton–London–New York: 321-336.*

KOZUB, D., V. KHMELIK, YU. SHAPOVAL, V. CHENTSOV, S. YATSENKO, B. LITOVCHENKO & V. STARYKH 2008. Heicon Focus Software. http://www.heliconsoft.com

KRASSILOV, V.A. 1973. Mesozoic bryophytes from the Bureja Basin, Far East of the USSR. – *Palaeontographica, Abt. B*, **143**: *95-105 + Pl. 41-51.*

[RASNITSYN, A.P. (ed.)] РАСНИЦЫН А.П. (ред.) 1990. Позднемезозойские насекомые Восточного Забайкалья. – [The Late Mesozoic Insects from Eastern Transbaikalia] *Труды ПИН [Trudy Paleontologicheskogo Instituta Akademii Nauk SSSR]* **239**: *1-222.*

RASNITSYN, A.P. & D.L.J. QUICKE (eds.) 2002. History of Insects. – *Kluwer Academic Publishers, Dordrecht–Boston–London.*

SCHUSTER, R.M. & J.A. JANSSENS 1989. On Dietertia, an isolated Mesozoic member of Jungermanniales. – *Rev. Palaeobot. Palynol.* **57**: *277-287.*

[SINITSA, S.M.] СИНИЦА С.М. 1993. Юра и нижний мел Центральной Монголии (остракоды, стратиграфия и палеореконструкция). – [The Jurassic and Lower Cretaceous of Central Mongolia (Ostracodes: Stratigraphy and Paleoreconstruction)] *Труды СРМПЭ [Trudy Sovmestnoj Rossiisko-Mongolskoj Paleontologicheskoj Ekspedizii]* **42**: *1-239.*

[SINITSA, S.M. & L.P. STARUKHINA] СИНИЦА С.М., Л.П. СТАРУХИНА 1986. Новые данные и проблемы стратиграфии и палеонтологии верхнего мезозоя Восточного Забайкалья. – [New data and problems in stratigraphy and palaeontology of the Upper Mesozoic in East Transbaikalia] *В кн.: Новые данные по геологии Забайкалья, М., Мин. Геол. РСФСР [In Novye dannye po geologii Zabaikal'ya, Moscow, Ministerstvo Geologii RSFSR]: 46-51.*

[SREBRODOLSKAYA, I. N.] СРЕБРОДОЛЬСКАЯ И.Н. 1980. Новые позднемезозойские листостебельные мхи из Забайкалья. – [New Late Mesozoic mosses from Transbaikalia] *Труды ВСЕГЕИ [Trudy Vsesoyuznogo Nauchno-Issledovatelskogo Geol. Inst.]* **204**: *27-28.*

WU, X.-W., X.-Y. WU & Y.-D. WANG 2000. Two new forms of Bryiidae (Musci) from the Jurassic of Junggar Basin in Xinjiang, China. – *Acta Palaeontol. Sinica* **39**, **Suppl**: *167-175.*

[ZHERIKHIN, V. V.] ЖЕРИХИН В.В. 1978. Развитие и смена меловых и кайнозойских фаунистических комплексов (трахейные и хелицеровые). – [Development and changes of the Cretaceous and Cenozoic faunal assemblages (Tracheata and Chelicerata)] *Труды ПИН [Trudy Paleontologicheskogo Instituta Akademii Nauk SSSR]* **165**: *1-198.*