

More fossil bryophytes from Baltic amber

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Abstract: Eight specimens of bryophytes from Baltic amber are described and illustrated, five mosses and three hepatics. The genus *Grimmia* as well as *Brothera leana* are reported for the first time as fossils. The mosses *Ctenidium capillifolium*, *Atrichum groehnii* and *Hypnodontopsis fossilis* as well as the hepatics *Cylindrocolea dimorpha* and *Scapania hoffeinsiana* are reported repeatedly. The hepatic *Spruceanthus polonicus* is recorded the second time and photographs are presented for the first time. In addition, a haplolepideous moss capsule as well as a unknown apparently pleurocarpous moss are illustrated.

Fossils from (Baltic, Saxonian and Dominican) amber are the richest source for bryophyte fossils, which gives a vivid impression of the bryoflora of the Tertiary. The knowledge of the liverworts from Baltic and Bitterfeld amber accumulated in numerous single publications were summarized by Grolle & Meister (2004), of the mosses by Frahm (2010).

Recently, Ignatov & Perkovsky (2011) published fossils from Ukrainian amber. Many species revealed to be the same as already published from Saxonian and Baltic amber; others were described as new. Surprisingly, many species from Ukrainian, Baltic and Saxon amber are known from several to many collections in spite of the fact that the area of origin in Fennoscandia was quite large and that the "time window" in which the amber was produced was quite broad. Thus we had a comparable uniform bryophyte flora over a period of several hundred thousand years if not more. In contrast, have comparably gigantic changes in the vegetation during the past one million years and also in the bryophyte flora due to the dramatic climatic changes during the Pleistocene and even during the vegetation history of the past 10.000 years.

Recent additions to the collection of the second author, which are summarized here, revealed again interesting specimens, which help to enhance the knowledge of an extinct flora dating back to the Eocene. Even species well known from previous publications give additional information on the frequency of species and thus the reconstruction of the former bryoflora.

***Grimmia* sp. (Gröhn 5202, fig. 1)**

The specimen consists of a single plant (rosette) three millimetres wide. The leaves are up to 1.8 mm long, are lanceolate, carinate and end in a long, entire hairpoint of 0.8 mm. The laminal cells are roundish, extremely small and mammillose. The costa fills 1/5 of the leaf width or less.

There are only two acrocarpous mosses with hairpoints known from Baltic amber: *Muscites pilifer* and *Hypnodontopsis pilifer*. The first has elongate laminal cells, the second has similar cells, however in only 5-6 rows on both sides of the costa. The new species looks similar in general, but has the leaves not appressed but in an open rosette (which reflects the situation when the plant was embedded) and more important, has much more longitudinal rows of cells. Furthermore, the

laminal cells cover the costa in part. Therefore it is not a species described before from Baltic amber.

Ignatov & Perkovsky (2011) describe a fragment of 4 piliferous leaves which they attribute to *Hypnodontopsis pilifer*. It has much smaller leaves (1 mm long with a hairpoint of 0.2 mm) and 10 cell rows at each side of the costa.

***Brothera leana* (Gröhn 5810, fig. 3-4)**

Preserved is an apical part of an acrocarpous moss with about a dozen erect spreading leaves. In the leaves, a broad costa is clearly visible, which fills $\frac{3}{4}$ of the leaf width and is sharply delimited from the lamina. Plants with such broad nerves are found within the Dicranaceae (Campyloporoideae and Pareuobryoideae), however, such plants can usually not be identified because transverse sections of the costa are necessary for identification. By chance, some leaves end at the surface of the piece of amber (they were apparently polished) and one of the leaves show a transverse section with a distinct patterns of ventral and dorsal hyalocysts and median chlorocysts. Such structure is only found within the Paraleucobryoideae in the genera *Paraleucobryum* and *Brothera*. Within *Paraleucobryum*, this type is only present in *P. enerve*, which has a costa filling almost the whole leaf width. This species is alpine in distribution and can be excluded (similarly to all other species which are boreo-montane). *Brothera* is, however, a monotypic genus with an ancient range in East Asia and the Himalaya, Central America and south Africa. It occurs in the Himalaya with *Campyloporodiella himalayana*, which was also found in Baltic amber. The identification is supported by brood leaves, which originate in the axils of the upper leaves

***Ctenidium capillifolium* (Gröhn 5807)**

This species has already been found several times in Baltic amber, was also illustrated several times (Frahm 2010) and was also found in Ukrainian amber (Ignatov and Perkovsky 2011). It is an extant species from E-Asia, which is identified by its almost circular curved linear leaves.

***Hypnodontopsis cf. fossilis* (Gröhn 5805)**

This species and *H. mexicana* can only be distinguished by the shape of the capsule, and since the specimen is sterile, it cannot safely be determined. However, the numerous known specimens of *H. fossilis* are usually larger and have more crowded and longer leaves, that this specimen is referred to this species with some doubt.

***Atrichum groehnii* (Gröhn 5806, fig. 5-6)**

Preserved is a single plant of 1 cm length growing on quartz sand. The leaves are rolled in, an indication that the plant was imbedded in dry state.

In general appearance this plant looks like a Polytrichaceae, however, some leaves were cut when the amber was polished and allow the aspect of a transverse section. This reveals a narrow costa with ventral lamellae, indicating a species of *Atrichum*. The number and length of the lamellae refer to *A. groehnii*, an extinct species.

LIVERWORTS

***Cylindrocolea dimorpha* (Gröhn 5813)**

This *Cephalozia*-like liverwort was already recorded several times (Grolle & Mister 2004).

Scapania hoffsiana (Gröhn 5824, fig. 7-8)

This remarkable and easily recognisable liverwort is known from several collections (Grolle & Meister 2004). The present specimen seems to be the largest with 3.8 mm, which is, however, still minute as compared with extant species of the genus.

Spruceanthus polonicus (Gröhn 5808)

This is the second record of this fossil species, of which only two drawings were available (Grolle & Meister 2004) but not yet a photograph. The species can be recognized by its large holostipous underleaves and the spreading, oblong leaves which are two times longer than wide.

UNIDENTIFIED MATERIAL

Haplolepidous moss capsule (Gröhn 6541, fig. 2)

Although not identified, this specimen is illustrated here to show the perfect conditions of the preservation. Preserved is a capsule of 1.2 mm length, symmetric, not strumose, c. 1,5 times longer than wide, on a 6 mm long straight but twisted seta. The peristome is haplolepidous and the teeth are split half the length ("dicranoid"). Haplolepidous capsules on a straight seta are not rare and are found in Dicranaceae and Fissidentaceae, but twisted setae are rare

Unknown pleurocarpous moss (Gröhn 5804, fig. 11)

The fragments remind at a species of Trachycystis with remote leaves which are ovate-lanceolate and sharply dentate at margins. The costa, however, ends above midleaf and the lamina cells are elongate oval.

We like to thank H. Greven (Wageningen) for the confirmation of *Grimmia* sp.

Frahm, J.-P. 2010. Die Laubmoosflora des Baltischen Bernsteinwaldes. Jena (Weissdorn Verlag).

Grolle, R., Meister, K. 2004. The liverworts in Baltic and Bitterfeld Amber. Jena (Weissdorn-Verlag).

Ignatov, M.S., Perkovsky, E.E. 2011. Mosses from Rovno amber (Ukraine). *Arctoa* 20:



Fig. 1 : Grimmia sp.

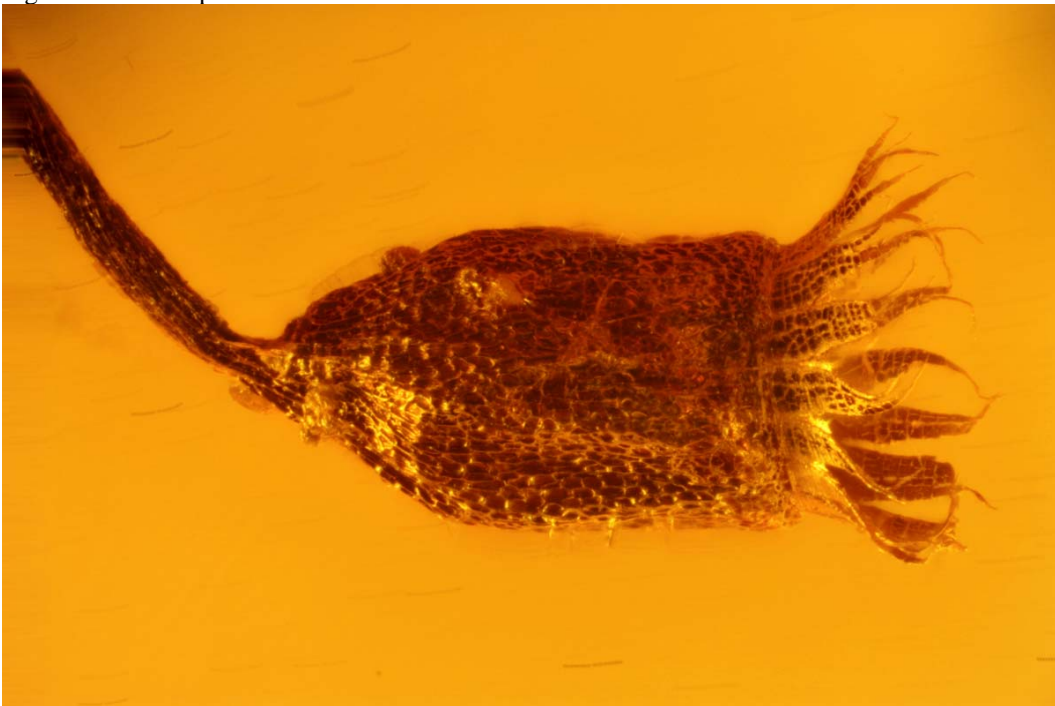


Fig. 2: dicranoid capsule.

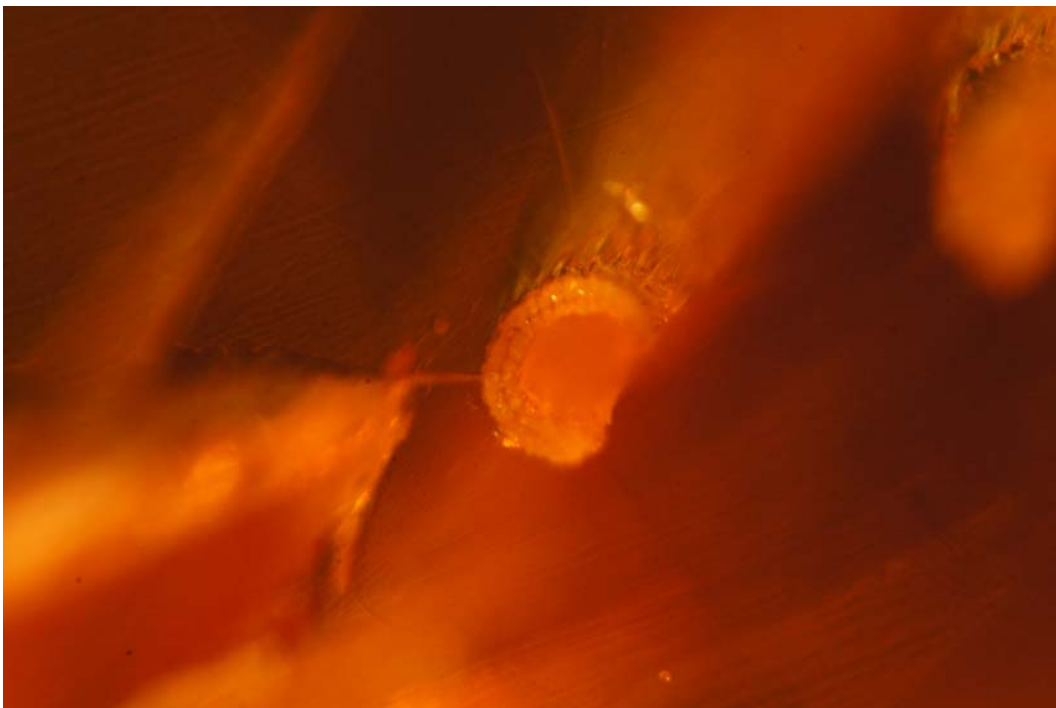


Fig. 3,4: *Brothiera leana*

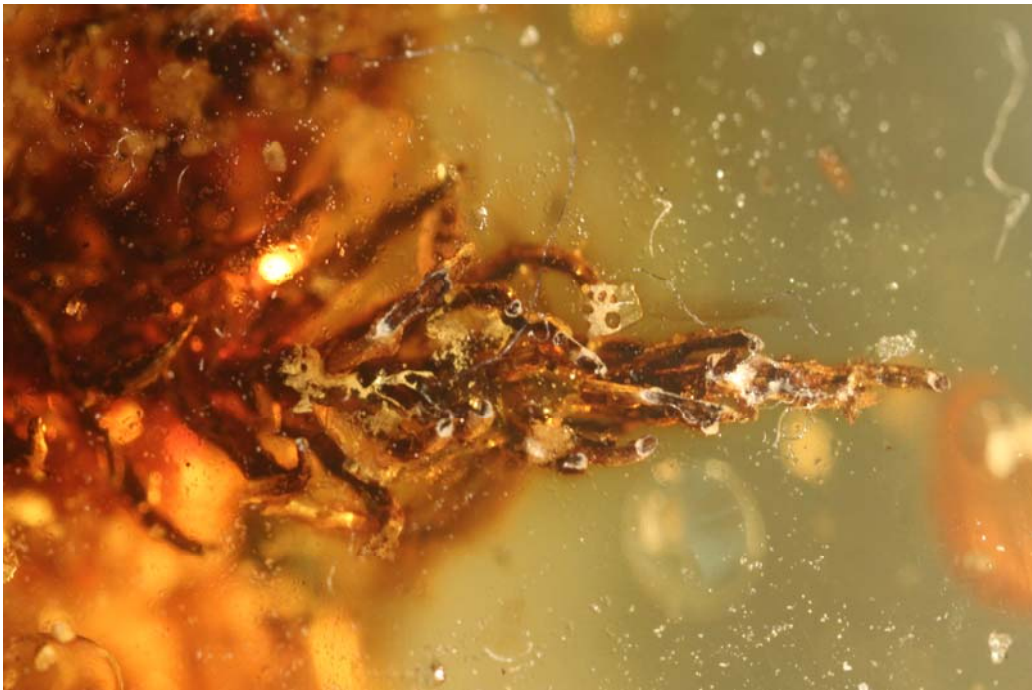
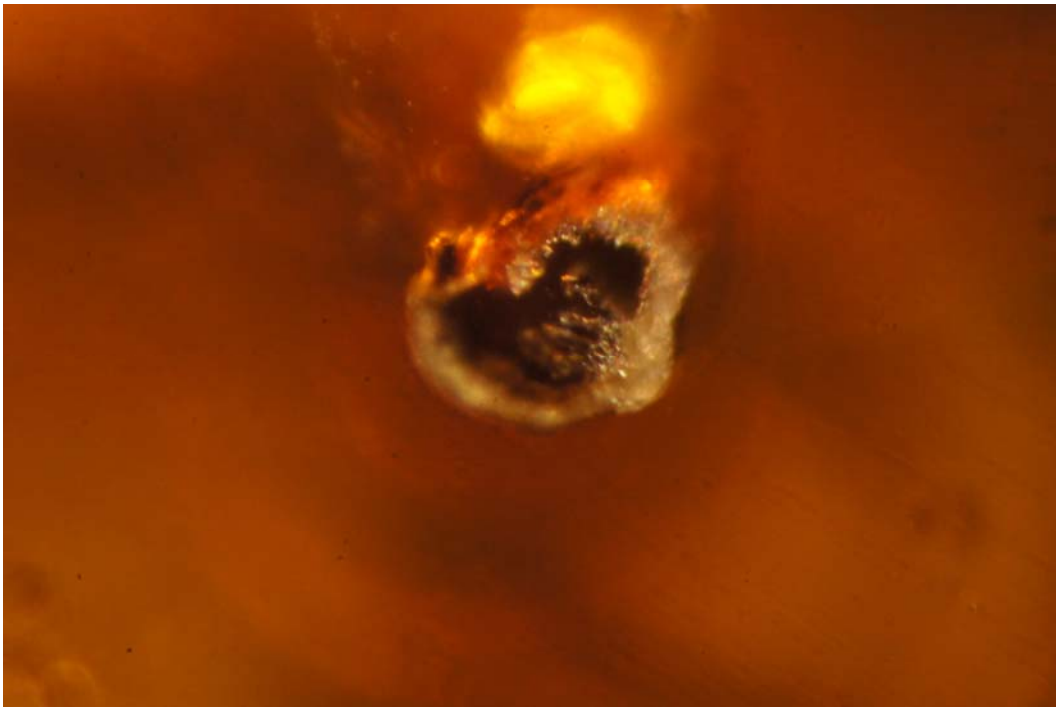


Fig. 5-6: *Atrichum groehni*.

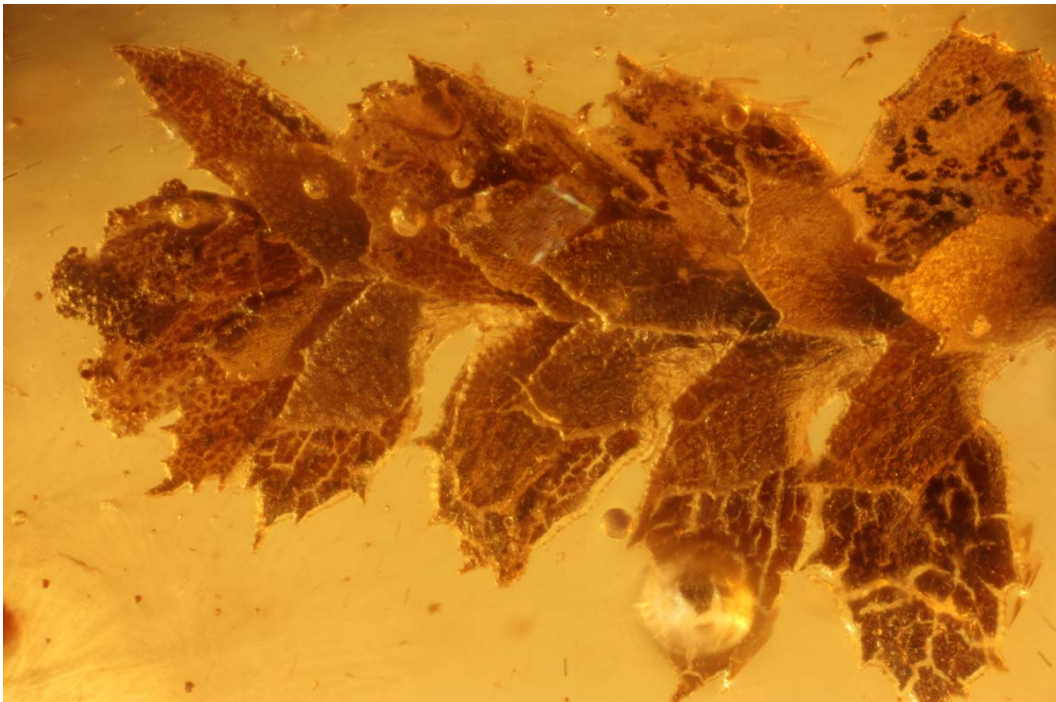


Fig. 7-8: *Scapania hoffeinsiana*.



Fig. 9-10: *Spruceanthus polonicus*.



Fig. 11: Unknown moss (Gröhn 5804)