

Tropical Bryology 20: 39-42, 2001

New records of mosses from Dominican amber

Jan-Peter Frahm

Botanisches Institut, Meckenheimer Allee 170, 53115 Bonn, Germany

Abstract: *Hypnum cupressiforme*, *Entodon macropus*, *Homalia glabella* and *Calypsothecium duplicatum* are recorded as new from Dominican amber. Earlier records of *Neckera* spec. have to be transferred to *Calypsothecium duplicatum*. These records raise the total number of all mosses known from Dominican amber to 14. All mosses so far reported from Dominican amber are extant species which occur today in the Dominican Republic. This could indicate that the mossflora in the island of Hispaniola has not changed during the past 20-40 Mio years, but also falsifications of fossils in amber have to be taken into account, which can be suspected from the quality of some of the specimens.

The moss flora of Dominican amber (from the Dominican Republic, island of Hispaniola in the Caribbean) is only insufficiently known. The first records were published by Frahm (1993). They were based on 15 specimens from 7 species. Four could be attributed to extant species, three to extant genera. Another 15 specimens were studied by Frahm (1996). They belong to three extant species and three extant genera, which raised the knowledge of this fossil flora to 11 taxa. Frahm & Reese (1998) added another species of Calymperaceae to the knowledge of this fossil flora, which dates back to Eocene and Oligocene, 20-40 Mio years ago (Schlee 1990). By courtesy of Dr. Grolle I received three specimens of fossil mosses from Dominican amber, which were imported as gem stones from the Dominican Republic but provided for

scientific study by Mr. Dommel (Düsseldorf). The specimens are deposited at BONN. Another specimen of Dominican amber was provided for study by Mr. Dirk Teuber (Gütersloh) from his collections. The identification revealed four species which have so far not been reported from Dominican amber.

1. *Hypnum* cf. *cupressiforme* (Frahm D 3, fig. 1).

The fossil consists of an upper part of the stem of an pleurocarpous moss of 4 mm length with numerous lanceolate leaves, which are concave and bent inwards at tips. The laminal cells are narrow-elongate, a costa is lacking. The leaf margins are entire.

The specimen with its ecostate falcate leaves gives the impression of a species of *Hypnum*.

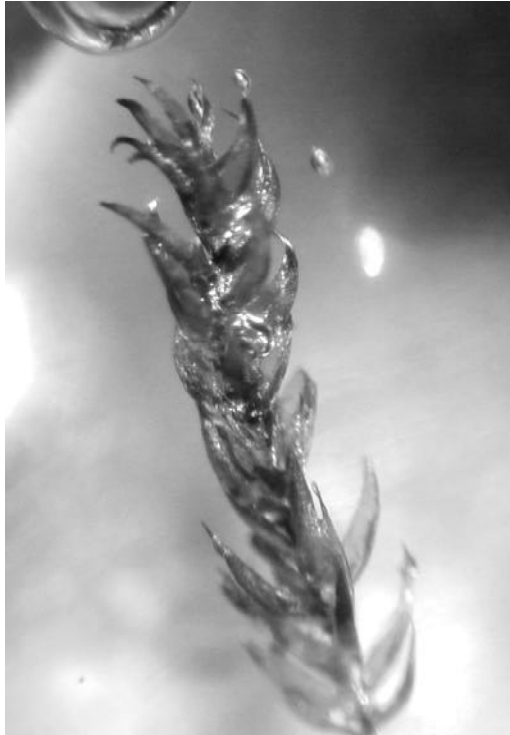


Fig. 1: *Hypnum* cf. *cupressiforme* (Frahm D3)



Fig. 2: *Entodon macropus* (Frahm D2)

Buck (1998) enumerates 3 species from the Caribbean: *H. amabile*, *H. polypterum* and *H. cupressiforme*. The former two have plicate leaves with serrate margins, which does not match this fossil. The third extant species, *H. cupressiforme*, is characterized in the Caribbean by concave, non plicate leaves and (compared to other species of *Hypnum* and other origins of *H. cupressiforme*) less falcate second leaves. It resembles much this fossil specimen, although a definite determination seems to be impossible without being able to study characters such as alar cells, which are not visible on the fossil. It is, however, not identical with the fossil *Hypnum* spec. listed by Frahm (1993), which has stronger curved leaves and serrate leaf margins, thus resembling *H. amabile* or *H. polypterum*, which were taken into account for that specimen. If this specimen would belong to *H. cupressiforme*, it would be remarkable that this morphological aberrant population on Hispaniola did already exist in Tertiary.

2. *Entodon macropus* (Frahm D2, fig. 2)

A 4 mm long piece of a pleurocarpous moss with distinct complanate foliation. The leaves are longly lingulate with acute apex and ecostate. The laminal cells are narrow elongate and shorter in the apex.

There are several mosses which have complanate leaves in the Caribbean such as *Pilosium chlorophyllum* (Hornsch.) C. Müll. (Stereophyllaceae), *Entodon macropus* (Entodontaceae), species of *Vesicularia* (Hypnaceae) and species of *Plagiothecium* (Plagiotheciaceae). *Pilosium* and *Vesicularia* have dorsal and ventral leaves differentiated and can therefore be excluded. With respect to the leaf form, acute apex and short laminal cells in the apex, *Entodon macropus* fits the fossil plant fragment.

3. *Homalia glabella* (Hedw.) B.S.G. (D1)

In contrast to the specimens D1 and D2, this amber is cracked and contains dust and dirt



Fig. 3: *Calyptothecium duplicatum* (Teuber 1672)

particles. It contains a moss of 12 mm length, which is much eroded. The plant has three branches on the upper part, one of them producing a flagelliferous shoot. The leaves are rounded with obtuse, erose dentate apex and ecostate. The laminal cells are oval. Although the plant is much distorted, the leaves resemble those of *Homalia* and the presence of flagelliferous shoots *H. glabella*.

A species of *Homalia* was already reported from Dominican amber by Frahm (1993).

4. *Calyptothecium duplicatum* (Teuber 1672)

A small fragment of a pleurocarpous moss. It consists of the final part of a stem, which is defoliate below, with one branch. The plant is appressed foliate with leaves which are conspicuously carinate. The costa is relatively weak and ends above midleaf or reaches 2/3 of the leaf length. The laminal cells are elongate.

The specimen resembles records of *Neckera* spec. from Dominican amber (Frahm 1993, 1996),

which have, however, finely serrate leaf margins and flat, not concave leaves without costa. Furthermore none of the both species presently occurring in the Caribbean (*N. scabridens* and *N. urnigera*, cf. Buck 1998) can be taken into account since these species have both undulate leaves, whereas the fossil plants have smooth leaves. It was formerly overlooked, however, that the plants have folded, carinate leaves and thus resemble *Calyptothecium*.

Calyptothecium is a pantropical genus with almost 50 species worldwide (Wijk et al. 1959-69). Most of the species are found in tropical Africa and Asia, only 5 are reported for the Neotropics, only one occurs in the Caribbean. The fossil specimen resembles fully this Caribbean species, which is described and illustrated by Buck (1998) as *C. duplicatum*.

The following mosses are so far known from Dominican amber:

Leucobryaceae:

Octoblepharum cf. *pulvinatum* (Frahm 1993, 1996)

Calymperaceae:

Syrrhopodon africanus ssp. *graminicola* (Frahm 1996)

Syrrhopodon incompletus var. *incompletus* (Frahm 1993, 1996)

Calymperes palisotii (Frahm & Reese 1998)

Hookeriaceae:

Adelothecium bogotense (Frahm 1993)

Neckeraceae:

Homalia spec. (Frahm 1993)

Homalia glabella (this paper)

Calyptothecium duplicatum (this paper, Frahm 1993, 1996 as *Neckera* spec.)

Meteoriaceae:

Pilotrichella spec. (Frahm 1993, 1996)

Sematophyllaceae:

Clastobryum spec. (Frahm 1993)

Entodontaceae:

Entodon macrocarpus (this paper)

Hypnaceae:

Hypnum spec. (Frahm 1993, 1996)

Hypnum cf. *cupressiforme* (this paper)

Mittenothamnium spec. (Frahm 1996)

The fossil mosses in Dominican amber consist predominantly of single plant fragments enclosed in amber of oval or round, pearl like shape which are conspicuously clear. This is in strong contrast to Baltic or Saxonian amber, which is often dim or has cracks and contains dirt as well as other fossil contents (insects, stamina). This effect is usually attributed to different embedding conditions and a different chemism of the Dominican amber, which was not produced by conifers like the Baltic and Saxonian amber but by a Papilionaceae (*Hymenaea* spec.). The perfect conditions of some of the specimens of Dominican amber (D2 and D3 in this publication) is in sharp contrast with others (D1 in this publication), in which cracks and dust particles are visible and the plants are eroded, much distorted and the laminal cells are not perfectly visible. Furthermore, the fact that all so far known "fossil" mosses belong to species and genera, which still exist in the Dominican Republic, make it possible that these "good" specimens are falsifications. According to amber collectors, it is possible to melt amber and to produce artefacts by this way, which can chemically not be distinguished from originals. And since a piece of amber with fossil plants is much more valuable than piece without "fossil", it could be that falsifications are produced for commercial purposes. Some famous specimens (for instance a complete plant of *Calyptothecium duplicatum* with no other inclusion in the possession of the Naturkundemuseum Stuttgart, see Frahm [1993] fig. 1 as *Neckera* spec.) are almost "too good". Insofar there should be certain reservation with the interpretation of the identifications derived from Dominican amber. According to personal communications of chemists, there is no way to determine whether the amber has been melted or not. Only the radiocarbon method, although it dates back to 50.000 years, could at least verify whether an inclusion is older or not.

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